

# EXHIBIT A

254 **Feed Ingredient Definitions**

**OFFICIAL NAMES AND DEFINITIONS OF FEED  
INGREDIENTS AS ESTABLISHED BY THE ASSOCIATION  
OF AMERICAN FEED CONTROL OFFICIALS**

The **bold print name** and international feed name (IFN) are both acceptable ingredient names, unless designated otherwise in the definition.

Occasionally an item may be suggested as an ingredient in a mixed feed that is not listed in this publication. When this happens, the appropriate investigator should be contacted, a term developed, and the product defined. Some ingredients, e.g. sugar, are so common there is no need to define them.

**3. ALFALFA PRODUCTS**

Investigator and Section Editor—Ann Brueck, ID

**Official**

**3.1 Suncured Alfalfa Meal, or Pellets or Ground Alfalfa Hay** is the aerial portion of the alfalfa plant, reasonably free of other crop plants, weeds, and mold, which has been dried by solar means, stored as bales or stacks, and finely or coarsely ground. If it is chopped instead of ground, it must be designated as "Suncured Chopped Alfalfa" or "Chopped Alfalfa Hay." (Adopted prior to 1928, Amended 1937, 1965, 2004.)

- IFN 1-00-104 Alfalfa hay sun-cured chopped
- IFN 1-00-090 Alfalfa hay sun-cured 13% Protein
- IFN 1-00-095 Alfalfa hay sun-cured 15% Protein
- IFN 1-00-096 Alfalfa hay sun-cured 17% Protein
- IFN 1-30-293 Alfalfa hay sun-cured 18% Protein
- IFN 1-00-088 Alfalfa hay sun-cured 20% Protein
- IFN 1-30-295 Alfalfa hay sun-cured 22% Protein
- IFN 1-00-111 Alfalfa hay sun-cured ground
- IFN 1-00-112 Alfalfa hay sun-cured ground 13% Protein
- IFN 1-00-113 Alfalfa hay sun-cured ground 15% Protein
- IFN 1-00-114 Alfalfa hay sun-cured ground 17% Protein
- IFN 1-30-296 Alfalfa hay sun-cured ground 18% Protein
- IFN 1-00-116 Alfalfa hay sun-cured ground 20% Protein
- IFN 1-00-117 Alfalfa hay sun-cured ground 22% Protein

**3.2 Dehydrated Alfalfa Meal or Pellets** is the aerial portion of the alfalfa plant, reasonably free of other crop plants, weeds, and mold, which has been finely ground and dried by thermal means under controlled conditions. (Adopted 1928, Amended 1965, 1995, 2004.)

- IFN 1-00-025 Alfalfa Meal dehydrated
- IFN 1-00-021 Alfalfa Meal dehydrated 13% Protein
- IFN 1-00-022 Alfalfa Meal dehydrated 15% Protein
- IFN 1-00-023 Alfalfa Meal dehydrated 17% Protein
- IFN 1-30-297 Alfalfa Meal dehydrated 18% Protein
- IFN 1-00-024 Alfalfa Meal dehydrated 20% Protein
- IFN 1-07-851 Alfalfa Meal dehydrated 22% Protein

NOTE 1: The following guarantees are recommended for the various grades of alfalfa meal and ground alfalfa hay:

- For 15% Crude Protein, Crude Fiber not more than 30%
- For 17% Crude Protein, Crude Fiber not more than 27%
- For 18% Crude Protein, Crude Fiber not more than 25%
- For 20% Crude Protein, Crude Fiber not more than 22%

For 22% Crude Protein, Crude Fiber not more than 20%

NOTE 2: A guarantee of the beta carotene content of alfalfa products expressed in milligrams per pound, and accompanied by an expiration date may be included on the label if the distributor so desires.

*Guarantees made on the label (including the invoice), on the delivery ticket, on a "certificate of analysis", or other document associated with the distribution of an alfalfa product are to be in terms of milligrams per pound of beta carotene without reference to quantity of Vitamin A which may be derived therefrom by the animal.*

Example: Beta carotene 60 milligrams per pound (a source of Vitamin A) (Adopted 1941, Amended 1945 and 1966.)

NOTE 3: Brand names, such as "Doe's \_\_\_\_\_ % Alfalfa Meal with Animal Fat or Vegetable Oil", must be used to show that the product is a mixture and not simply alfalfa meal. The chemical name of the antioxidant or antioxidants must be listed in the ingredient statement. (Adopted 1963.)

**3.3 Alfalfa Nutrient Concentrate** is the product obtained from the extracted juice of freshly cut alfalfa, by coagulation, separation from the alfalfa solubles and subsequent dehydration. The product should express both protein and Xanthophyll guarantees. (Proposed 1982, Adopted 1983)

IFN 4-16-026 Alfalfa nutrient concentrate dehydrated.

**3.4 Concentrated Alfalfa Solubles** is the product obtained by the concentration of the liquid remaining after the separation of Alfalfa Nutrient Concentrate from the juice of freshly cut alfalfa. The moisture level should not exceed 50%. (Proposed 1982, Adopted 1983)

IFN 4-16-027 Alfalfa solubles condensed.

## 6. AMINO ACIDS AND RELATED PRODUCTS

Investigator and Section Editor--Richard Ten Eyck, OR

### Official

**6.3 Glycine** is a product which contains a minimum of 97% amino acetic acid. The percentage of glycine must be guaranteed. (Adopted 1957.) 21 CFR 582.5049

IFN 5-02-127 Glycine

**6.4 L-Lysine** is a product which contains a minimum of 95% L-2,6-diaminohexanoic acid. The percentage of L-lysine must be guaranteed. (Proposed 1966, Adopted 1969, Amended 1975.) 21 CFR 582.5411

IFN 5-08-022 L-Lysine

**6.5 L-Threonine** is a product which contains a minimum of 95% L-2-amino-3-hydroxybutyric acid. The percentage of L-threonine must be guaranteed. (Proposed 1967, Adopted 1969, Amended 1975.) 21 CFR 582.5881

IFN 5-08-092 L-Threonine

**6.6 DL-Tryptophan** is a product which contains a minimum of 97% racemic 2-amino-3-(3'indolyl)-propionic acid. The percentage of DL-tryptophan must be guaranteed. Excessive tryptophan consumption in cattle (in excess of 0.17g tryptophan/100 pounds bodyweight/day) is associated with bovine pulmonary emphysema. (Proposed 1967, Adopted 1969, Amended 1975, Amended 2001, Adopted 2003.) 21 CFR 582.5915

IFN 5-08-093 DL-Tryptophan

**6.10 L-Tryptophan** is a product which contains a minimum of 97% L-2-amino-3-(3'indolyl)-propionic acid. The percentage of L-tryptophan must be guaranteed. Excessive tryptophan consumption in cattle (in excess of 0.17g tryptophan/100

256 **Feed Ingredient Definitions**

pounds bodyweight/day) is associated with bovine pulmonary emphysema (Proposed 1985, Adopted 1987, Amended 2001, Adopted 2003) 21 CFR 582.5915

IFN 5-18-776 L-Tryptophan

**6.11 L-Lysine Monohydrochloride** is a product which contains a minimum of 95% L-2, 6-diaminohexanoic acid monohydrochloride. The percentage of L-lysine must be guaranteed. (Adopted 1989)

IFN 5-19-118 L-Lysine Monohydrochloride

**6.12 Taurine** is a product which contains a minimum of 97% 2-aminoethanesulfonic acid. The percentage of taurine must be guaranteed. It is used as a nutritional supplement in cat foods (growth, reproduction, and adult maintenance), dog foods (growth, reproduction, and adult maintenance), and in the feed of growing chickens. When added to complete chicken feed, the total taurine shall not exceed 0.054% of the feed. 21 CFR 573.980. (Adopted 1989, Amended 2006)

IFN 5-09-821 Taurine

**6.13 L-Arginine** is a product which contains a minimum of 98% L-2-amino-5-guanidyl-valeric acid. The percentage of L-Arginine must be guaranteed. 21 CFR 582.5145 (Adopted 1990)

IFN 5-32-043 L-Arginine

**6.14 DL-Arginine** is a product which contains a minimum of 98% racemic 2-amino-5-guanidyl-valeric acid. The percentage of DL-Arginine must be guaranteed. 21 CFR 582.5145 (Adopted 1990)

IFN 5-32-044 DL-Arginine

**6.15 L-Tyrosine** is a product which contains a minimum of 98% L-2-amino-3-(4-hydroxyphenyl) propionic acid. The percentage of L-Tyrosine must be guaranteed. 21 CFR 582.5920 (Adopted 1990)

IFN 5-32-045 L-Tyrosine

**6.16 L-Lysine Liquid** is a product that contains a minimum of 50% L-2, 6-diaminohexanoic acid by weight in a water solution. The L-lysine content must not be less than 85% on a moisture-free basis. The percentage of L-lysine must be guaranteed. 21 CFR 582.5411 (Proposed 1999, Adopted 2001)

#### Tentative

**T6.1 DL-Methionine Hydroxy Analogue Calcium** is a product which contains a minimum of 97% racemic 2-hydroxy-4-methylthiobutyric acid calcium salt. The percentage of DL-Methionine Hydroxy Analogue Calcium must be guaranteed. (Adopted 1959, Amended 1974, 1978, 1989, 2005). 21 CFR 582.5477

IFN 5-03-087 DL-Methionine Hydroxy Analogue Calcium

**T6.2 DL-Methionine** is a product which contains a minimum of 99% racemic 2-amino-4-methylthiobutyric acid. The percentage of DL-Methionine must be guaranteed. (Adopted 1957, Amended 1975, 1978, 1989, 2005). 21 CFR 582.5475

IFN 5-03-086 DL-Methionine

**T6.7 DL-Methionine hydroxyl analogue isopropyl ester** is a product that contains a minimum of 90% racemic 2-hydroxy-4-methylthiobutanoic acid isopropyl ester monomer for use as a source of methionine activity in cattle diets. The percentage of DL-methionine hydroxyl analogue isopropyl ester monomer must be guaranteed.

**T6.8 DL-Methionine Hydroxy Analogue** is a product which contains a minimum of 88% racemic 2-hydroxy-4-methylthiobutyric acid. The percentage of DL-Methionine Hydroxy Analogue must be guaranteed. (Proposed 1980, Adopted 1985 Amended 1989, 2005) 21 CFR 582.5477

IFN 5-30-281 DL-Methionine Hydroxy Analogue

**T6.9 DL-Methionine Sodium** is a product which contains a minimum of 45.9% racemic 2-amino-methylthiobutyric acid sodium salt. The percentage of DL-methionine must be guaranteed. (Proposed 1983, Amended 1989, Adopted 1990, Amended 2005),

IFN 5-16-730 DL-Methionine Sodium

Note 1. Guarantees for amino acids should be expressed as percent on feed labels.

Note 2. Unless indicated otherwise, the amino acids defined above can be added to animal feed for nutritional purposes in accord with good manufacturing or feeding practices.

## 9. ANIMAL PRODUCTS

Investigator and Section Editor—VACANT

### Official

\*Use of this ingredient, from mammalian origins, is restricted to non-ruminant feeds unless specifically exempted by 21 CFR 589.2000. Feeds containing prohibited material must bear the following label statement: **"Do not feed to cattle or other ruminants"**.

**\*9.2 Meat** is the clean flesh derived from slaughtered mammals and is limited to that part of the striate muscle which is skeletal or that which is found in the tongue, in the diaphragm, in the heart, or in the esophagus; with or without the accompanying and overlying fat and the portions of the skin, sinew, nerve, and blood vessels which normally accompany the flesh. It shall be suitable for use in animal food. If it bears a name descriptive of its kind, it must correspond thereto. (Adopted 1938, Amended 1939, 1963.)

IFN 5-00-394 Animal meat fresh

**\*9.3 Meat by-products** is the non-rendered, clean parts, other than meat, derived from slaughtered mammals. It includes, but is not limited to, lungs, spleen, kidneys, brain, livers, blood, bone, partially defatted low temperature fatty tissue, and stomachs and intestines freed of their contents. It does not include hair, horns, teeth and hoofs. It shall be suitable for use in animal food. If it bears name descriptive of its kind, it must correspond thereto. (Proposed 1973, Adopted 1974, Amended 1978)

IFN 5-00-395 Animal meat by-products fresh

**\*9.7 Animal liver** if it bears a name descriptive of its kind, it must correspond thereto. Meal is obtained by drying and grinding liver from slaughtered animals. (Adopted 1954, Amended 2006)

IFN 5-00-389 Animal livers meal

**9.10 Poultry By-Product Meal** consists of the ground, rendered, clean parts of the carcass of slaughtered poultry, such as necks, feet, undeveloped eggs, and intestines, exclusive of feathers, except in such amounts as might occur unavoidably in good processing practices. The label shall include guarantees for minimum crude protein, minimum crude fat, maximum crude fiber, minimum Phosphorus (P), and minimum and maximum calcium (Ca). The Calcium (Ca) level shall not exceed the actual level of phosphorus (P) by more than 2.2 times. If the product bears a name descriptive of its kind, the name must correspond thereto. (Proposed 1985, Adopted 1990, Amended 2000)

IFN 5-03-798 Poultry by-product meal rendered.

## 258 Feed Ingredient Definitions

**9.11 Poultry Hatchery By-Product** is a mixture of eggshells, infertile and unhatched eggs, and culled chicks which have been cooked, dried, and ground, with or without removal of part of the fat. (Adopted 1957.)

IFN 5-03-796

**\*9.12 Dried Meat Solubles** is obtained by drying the defatted water extract of the clean, wholesome parts of slaughtered animals prepared by steaming or hot water extraction. It must be designated according to its crude protein content which shall be no less than 70%. (Proposed 1961, Adopted 1962, Amended 1964, 1967.)

IFN 5-00-393 Animal meat solubles dehydrated

**9.14 Poultry By-Products** must consist of non-rendered clean parts of carcasses of slaughtered poultry such as heads, feet, viscera, free from fecal content and foreign matter except in such trace amounts as might occur unavoidably in good factory practice. If the product bears a name descriptive of its kind, the name must correspond thereto. (Proposed 1963, Adopted 1964, Amended 2000.)

IFN 5-03-800 Poultry by-product fresh

**9.15 Hydrolyzed Poultry Feathers** is the product resulting from the treatment under pressure of clean, undecomposed feathers from slaughtered poultry, free of additives, and/or accelerators. Not less than 75% of its crude protein content must be digestible by the pepsin digestibility method.\*\* (Proposed 1961, Adopted 1965.)

IFN 5-03-795 Poultry feathers meal hydrolyzed

**\*9.16 Fleshings Hydrolysate** is obtained by acid hydrolysis of the flesh from fresh or salted hides. It is defatted, strained, and neutralized. If evaporated to 50% solids, it shall be designated "Condensed Fleshings Hydrolysate." It must have a minimum crude protein and maximum salt guarantee. (Proposed 1967, Adopted 1968.) Reg. 573.200

IFN 5-08-094 Animal skin fleshings hydrolyzed rendered

**9.20 Animal Serum** is the product obtained by removing the fibrin from liquid animal plasma by chemical and mechanical processes. The serum protein portion of this product is primarily albumin and globulin proteins. The minimum percent crude protein, maximum percent ash, minimum albumin content, and the minimum globulin content must be guaranteed on the label. The minimum albumin content is 42% (as a percent of total protein) determined by colorimetric assay (Doumas, B.T., Watson, W.A., Biggs, H.G., Clin. Chim Acta. 1971) and the minimum globulin content is 20% (As a percent of total protein) as measured by an assay method such as the Becker titer analysis (Becker, W. 1969 Immunochemistry 6: 539-546). If the product bears a name descriptive of its kind, origin or composition, it must correspond thereto. (Proposed 1996, Adopted 2000)

**9.21 Serum Albumin** is the product obtained by removing the fibrin and globulin proteins from liquid animal plasma by chemical and mechanical processes. The resultant product will be greater than 60% albumin (as a percent of total protein) as measured by colorimetric assay (Doumas, B.T., Watson, W.A., Biggs, H.G., Clin Chim Acta. 1971). The minimum percent crude protein and the maximum percent ash must be guaranteed on the label as well as the minimum albumin concentration. If the product bears a name descriptive of its kind, origin or composition, it must correspond thereto. (Proposed 1996, Adopted 2000)

**9.22 Serum Globulin** is the product obtained by removing the fibrin and albumin proteins from liquid animal plasma by chemical and mechanical processes. The resultant product will be greater than 40% globulin (as a percent of total protein) as measured by an assay method such as the Becker titer analysis (Becker, W. 1969 Immunochemistry 6: 539-546). The minimum percent crude protein and the

maximum percent ash must be guaranteed on the label as well as the minimum globulin concentration. If the product bears a name descriptive of its kind, origin or composition, it must correspond thereto. (Proposed 1996, Adopted 2000)

**9.24 Spray Dried Animal Blood Cells** is the product obtained by spray drying red and white blood cells which have been separated from the plasma of clean, fresh, whole animal blood with only such amounts of plasma as might occur unavoidably in good processing practices. The blood cells are dried by spraying into a draft of warm, dry air which reduces the blood to finely divided particles. The guaranteed analysis is: a maximum moisture of 8 percent; a minimum crude protein of 90 percent; and a minimum solubility in water of 75 percent. If the product bears a name descriptive of its kind, origin, or composition, it must correspond thereto. (Proposed 1996, Adopted 1998)

**\*9.40 Meat Meal** is the rendered product from mammal tissues, exclusive of any added blood, hair, hoof, horn, hide trimmings, manure, stomach and rumen contents except in such amounts as may occur unavoidably in good processing practices. It shall not contain added extraneous materials not provided for by this definition. The Calcium (Ca) level shall not exceed the actual level of Phosphorus (P) by more than 2.2 times. It shall not contain more than 12% Pepsin indigestible residue\*\* and not more than 9% of the crude protein in the product shall be pepsin indigestible\*\*. The label shall include guarantees for minimum crude protein, minimum crude fat, maximum crude fiber, minimum Phosphorus (P) and minimum and maximum Calcium (Ca). If the product bears a name descriptive of its kind, composition or origin, it must correspond thereto. (Proposed 1971, Adopted 1972, Amended 1985, Adopted 1993.)

IFN 5-00-385 Animal meat meal rendered.

**\*9.41 Meat and Bone Meal** is the rendered product from mammal tissues, including bone, exclusive of any added blood, hair, hoof, horn, hide trimmings, manure, stomach and rumen contents, except in such amounts as may occur unavoidably in good processing practices. It shall not contain added extraneous materials not provided for in this definition. It shall contain a minimum of 4.0% Phosphorus (P) and the Calcium (Ca) level shall not be more than 2.2 times the actual Phosphorus (P) level. It shall not contain more than 12% pepsin indigestible residue\*\* and not more than 9% of the crude protein in the product shall be pepsin indigestible\*\*. The label shall include guarantees for minimum crude protein, minimum crude fat, maximum crude fiber, minimum Phosphorus (P) and minimum and maximum Calcium (Ca). If it bears a name description of its kind, composition or origin it must correspond thereto. (Proposed 1985, Amended 1992, Adopted 1994.)

IFN 5-00-388 Animal meat with bone rendered.

**\*9.42 Animal By-Product Meal** is the rendered product from animal tissues, exclusive of any added hair, hoof, horn, hide trimmings, manure, stomach and rumen contents, except in such amounts as may occur unavoidably in good processing practices. It shall not contain added extraneous materials not provided for by this definition. This ingredient definition is intended to cover those individual rendered animal tissue products that cannot meet the criteria as set forth elsewhere in this section. This ingredient is not intended to be used to label a mixture of animal tissue products. (Proposed 1985, Amended 1992, Adopted 1993.)

IFN 5-08-786.

**\*9.50 Meat Meal Tankage** is the rendered product from mammal tissues, exclusive of any added hair, hoof, horn, hide trimmings, manure, stomach and rumen contents, except in such amounts as may occur unavoidably in processing factory

## 260 Feed Ingredient Definitions

practices. It may contain added blood or blood meal, however, it shall not contain any other added extraneous materials not provided for by this definition. The Calcium (Ca) level shall not exceed the actual level of Phosphorus (P) by more than 2.2 times. It shall not contain more than 12% pepsin indigestible residue\*\* and not more than 9% of the crude protein in the product shall be pepsin indigestible\*\*. The label shall include guarantees for minimum crude protein, minimum crude fat, maximum crude fiber, minimum Phosphorus (P) and minimum and maximum Calcium (Ca). If the product bears a name descriptive of its kind, composition or origin it must correspond thereto. (Proposed 1985, Amended 1992, Adopted 1994.)

IFN 5-00-386 Animal tankage meal rendered.

**\*9.51 Meat and Bone Meal Tankage** is the rendered product from mammal tissues, including bone, exclusive of any added hair, hoof, horn, hide trimmings, manure, stomach and rumen contents except in such amounts as may occur unavoidably in good processing practices. It may contain added blood or blood meal, however, it shall not contain any added extraneous materials not provided for in this definition. It shall contain a minimum of 4.0% Phosphorus (P) and the Calcium (Ca) level shall not be more than 2.2 times the actual Phosphorus (P) level. It shall not contain more than 12% pepsin indigestible residue\*\* and not more than 9% of the crude protein in the product shall be pepsin indigestible\*\*. The label shall include guarantees for minimum crude protein, minimum crude fat, maximum crude fiber, minimum Phosphorus (P) and minimum and maximum Calcium (Ca). If the product bears a name descriptive of its kind, composition or origin it must correspond thereto. (Proposed 1985, Adopted 1994.)

IFN 5-00-387 Animal tankage with bone rendered.

**\*9.54 Hydrolyzed Hair** is a product prepared from clean, undecomposed hair, by heat and pressure to produce a product suitable for animal feeding. Not less than 80% of its crude protein must be digestible by the pepsin digestibility method\*\* (Proposed 1968, Adopted 1970.)

IFN 5-08-997 Animal hair hydrolyzed

**\*9.55 Hydrolyzed Leather Meal** is produced from leather scrap that is treated with steam for not less than 33 minutes at a pressure not less than 125 pounds per square inch and further processed to contain not more than 10% moisture, not less than 60% crude protein, not more than 6% crude fiber, not more than 2.75% chromium, and with not less than 80% of its crude protein digestible by the pepsin digestibility method\*\*. Hydrolyzed leather meal may be utilized in livestock feeds as provided in food additive regulation 573.540 (Proposed 1968, Adopted 1970.)

IFN 5-08-998 Animal leather meal hydrolyzed

**9.56 Spray Dried Animal Blood** is produced from clean, fresh animal blood, exclusive of all extraneous material such as hair, stomach belching, urine, except in such traces as might occur unavoidably in good factory practice. Moisture is removed from the blood by a low temperature, evaporator under vacuum until it contains approximately 30% solids. It is then dried by spraying into a draft of warm, dry air which reduces the blood to finely divided particles with a maximum moisture of 8% and a minimum crude protein of 85%. It must be designated according to its minimum water solubility. (Proposed 1972, Amended 1976, Adopted 1978.)

IFN 5-00-381 Animal blood spray dehydrated

**9.57 Poultry** is the clean combination of flesh and skin with or without accompanying bone, derived from the parts or whole carcasses of poultry or a combination thereof, exclusive of feathers, heads, feet and entrails. It shall be suitable for use in animal food. If it bears a name descriptive of its kind, it must correspond thereto. If the bone has been removed, the process may be so designated



by use of the appropriate feed term. (Proposed 1978, Adopted 1979, Amended 1995, Amended 1997)

**9.58 Hydrolyzed Whole Poultry** is the product resulting from the hydrolyzation of whole carcasses of culled or dead, undecomposed, poultry including feathers, heads, feet, entrails, undeveloped eggs, blood and any other specific portions of the carcass. The product must be consistent with the actual proportions of whole poultry and must be free of added parts; including, but not limited to entrails, blood or feathers. The poultry may be fermented as a part of the manufacturing process. The product shall be processed in such a fashion as to make it suitable for animal food, including heating (boiling at 212°F, or 100°C at sea level, for 30 minutes; dry extrusion at a minimum temperature of 284°F or 140°C for 30 seconds with a pressure differential of approximately 40 atmospheres as the product exits the extruder; or their equivalents) and agitating (except in steam cooking equipment). The product may, if acid or alkaline treated, be subsequently neutralized. If the product bears a name descriptive of its kind, the name must correspond thereto. (Proposed 1995, Adopted 1997, Amended 2000, Adopted 2003)

**9.59 Hydrolyzed Poultry By-Products Aggregate** is the product resulting from hydrolyzation, heat treatment, or a combination thereof, of all by-products of slaughter poultry, clean and undecomposed, including such parts as heads, feet, undeveloped eggs, intestines, feathers and blood. The parts may be fermented as a part of the manufacturing process. The product shall be processed in such a fashion as to make it suitable for animal food, including heating (boiling at 212°F, or 100°C at sea level for 30 minutes, or its equivalent, and agitated, except in steam cooking equipment). It may, if acid treated, be subsequently neutralized. If the product bears a name descriptive of its kind, the name must correspond thereto. (Proposed 1978, Adopted 1980 Amended 1995, Adopted 1997)

**9.60 Egg Shell Meal** is a mixture of eggshells, shell membranes and egg content obtained by drying the residue from an egg breaking plant in a dehydrator to an end product temperature of 180° F. It must be designated according to its protein and calcium content.(Prop. 1975,Adopted 1982)

IFN 6-26-004 Poultry egg shells meal

**9.61 Blood Meal** \_\_\_\_\_ is produced from clean, fresh animal blood, exclusive of all extraneous materials such as hair, stomach belchings and urine, except as might occur unavoidably in good processing practices. The process used must be listed as a part of the product name such as conventional cooker dried, steamed or hydrolyzed. The product usually has a dark black like color and is rather insoluble in water. (Proposed 1975, Adopted 1979, Amended 1991, Adopted 1993).

IFN 5-26-005 Animal blood meal conventional cooker dehydrated

IFN Number \_\_\_\_\_ Animal blood meal steamed dehydrated

IFN Number \_\_\_\_\_ Animal blood meal hydrolyzed dehydrated.

**9.62 Blood Meal, Flash Dried** is produced from clean, fresh animal blood, exclusive of all extraneous material such as hair, stomach belchings and urine except as might occur unavoidably in good manufacturing processes. A large portion of the moisture (water) is usually removed by a mechanical dewatering process or by condensing by cooking to a semi-solid state. The semi-solid blood mass is then transferred to a rapid drying facility where the more tightly bound water is rapidly removed. The minimum biological activity of lysine shall be 80%. (Proposed 1975, Adopted 1980.)

IFN 5-26-006 Animal blood meal flash dehydrated

## 262 Feed Ingredient Definitions

**9.63 Blood Protein** is produced by quick freezing and/or transporting in a chilled state, clean, fresh, whole or dewatered animal blood exclusive of all extraneous material such as hair, stomach belchings and urine except as might occur unavoidably in good manufacturing processes. If the product bears a name descriptive of its kind, composition or origin, it must correspond thereto. (Proposed 1975, Amended 1980, Adopted 1982, Amended 1993, Adopted 1994.)

IFN 5-25-007 Animal blood fresh

**\*9.65 Glandular Meal and Extracted Glandular Meal** is obtained by drying liver and other glandular tissues from slaughtered mammals. When a significant portion of the water-soluble material has been removed, it may be called Extracted Glandular Meal. (Proposed 1979, Adopted 1980.)

IFN 5-12-247 Animal glands meal

IFN 5-30-080 Animal glands meal water extracted

**\*9.67 Unborn Calf Carcasses** is the product obtained from whole unborn carcasses taken from slaughtered cows at government inspected slaughter plants. The product is produced by grinding the whole unborn carcass, exclusive of calf hides. The product is denatured, fresh frozen and shall be suitable for use as an animal feed. (Proposed 1979, Adopted 1980.)

IFN 5-30-081 Cattle fetus carcass without skin fresh

**\*9.68 Animal Digest** is a material which results from chemical and/or enzymatic hydrolysis of clean and undecomposed animal tissue. The animal tissues used shall be exclusive of hair, horns, teeth, hooves and feathers, except in such trace amounts as might occur unavoidably in good factory practice and shall be suitable for animal feed. If it bears a name descriptive of its kind or flavor(s), it must correspond thereto. (Proposed 1981, Amended 1983, Adopted 1990)

IFN 5-06-935 Animal Digest Condensed.

**\*9.69 Cooked Bone Marrow** is the soft material coming from the center of large bones, such as leg bones. This material, which is predominantly fat with some protein, must be separated from the bone material by cooking with steam. It shall not contain added extraneous materials not provided for by this definition except for small amount of tissue which may adhere to the bone unavoidably in good processing practice. The labeling of this product shall include, but is not limited to, guarantees for minimum crude protein and minimum crude fat. (Proposed 1988, Adopted 1992)

**\*9.70 Mechanically Separated Bone Marrow** is the soft material coming from the center of large bones, such as leg bones. This material, which is predominantly fat with some protein, must be separated from the bone material by mechanical separation. It shall not contain added extraneous materials not provided for by this definition except for small amount of tissue which may adhere to the bone unavoidably in good processing practice. The labeling of this product shall include, but is not limited to, guarantees for minimum crude protein and minimum crude fat. (Proposed 1988, Adopted 1992)

**9.71 Poultry Meal** is the dry rendered product from a combination of clean flesh and skin with or without accompanying bone, derived from the parts of whole carcasses of poultry or a combination thereof, exclusive of feathers, heads, feet, and entrails. It shall be suitable for use in animal food. If it bears a name descriptive of its kind, it must correspond thereto. (Proposed 1988, Adopted 1992)

**9.72 Animal Plasma** is the product obtained by spray drying plasma which has been separated away from the cellular matter (red and white blood cells) of fresh whole blood by chemical and mechanical processing. The protein portion of this

product is primarily albumin, globulin, and fibrinogen type proteins. The minimum percent crude protein and the maximum percent ash must be guaranteed on the label. If it bears a name descriptive of its kind, composition, or origin, it must correspond thereto. (Proposed 1990, Adopted 1993)

**9.73 Ensiled Paunch** is a product composed of the contents of rumen of cattle slaughtered at USDA inspected facilities. The moisture level is reduced to 50-68%. The product is then packed into an airtight environment, such as a silo, where it undergoes an acid fermentation that retards spoilage. The ensiled product will have a Ph of 4.0 or less. (Proposed 1990, Adopted 1992)

**9.74 Egg Product** is product obtained from egg graders, egg breakers and/or hatchery operations that is dehydrated, handled as liquid, or frozen. These shall be labeled as per USDA regulations governing eggs and egg products (9CFR, Part 59). This product shall be free of shells or other non-egg materials except in such amounts which might occur unavoidably in good processing practices, and contain a maximum ash content of 6% on a dry matter basis. (Proposed 1991, Adopted 1996)

**9.75 Leather Hydrolysate** is obtained from chromium tanned unfinished leather shavings, trimmings, and/or lime fleshings that may or may not be pressure cooked with the addition of steam, sodium hydroxide, lime or magnesium oxide. Chromium is precipitated and separated so that only trivalent chromium at less than 1000 ppm on a dry matter basis remains in the hydrolysate. This product is available as a liquid ingredient or as a spray dried powder. In either form, the analysis on a solids basis will not be less than 75% crude protein and not less than 85% of the protein shall be pepsin digestible\*\*. (Adopted 1993, Amended 1999, Adopted 2001)

**\*9.77 \_\_\_\_\_ Stock/Broth** is obtained by cooking mammalian or poultry bones, parts, and/or muscle tissue. The crude protein content of stock/broth must be no less than 90% on a dry matter basis. In order for the stock/broth to be labeled as such, the moisture to crude protein ratio must not exceed 135:1 (135 parts water to 1 part crude protein). The product must bear a name descriptive of its kind, composition or origin, such as, but not limited to, meat, beef, pork, poultry, chicken, turkey; and may be called either stock or broth. (Proposed 1997, Amended 2001, Adopted 2002)

**\*9.78 Meat Protein Isolate** is produced by separating meat protein from fresh, clean, unadulterated bones by heat processing followed by low temperature drying to preserve function and nutrition. This product is characterized by a fresh meaty aroma, a 90% minimum protein level, 1% maximum fat and 2% maximum ash. (Proposed 1993, Adopted 1994)

\*\*Determined by AOAC method listed in the Check Sample Reference for Analytical Variations.

## 12. BARLEY PRODUCTS

Investigator and Section Editor--Ali Kashani, WA

### Official

**12.1 Barley Hulls** consist of the outer covering of the barley. (Adopted prior to 1928)

IFN 1-00-496 Barley hulls

**12.3 Pearl Barley By-Product** is the entire by-product resulting from the manufacture of pearl barley from clean barley. (Proposed 1961, Adopted 1962)

IFN 5-00-548 Barley pearl by-product

264 **Feed Ingredient Definitions**

**12.4 Barley Mill By-Product** is the entire residue from the milling of barley flour from clean barley and is composed of barley hulls and barley middlings. (Proposed 1961, Adopted 1962)

IFN 4-00-523 Barley mill run

**Tentative**

**12.5 Quinoa Seed** consists of cleaned, sound, whole seed of the quinoa plant (*Chenopodium quinoa*) from which the saponin contained in the seed's outer layer has been removed. (Proposed 2002)

**15. BREWERS PRODUCTS**

Investigator and Section Editor--Tony Claxton, MO

**Official**

**15.1 Brewers Dried Grains** is the dried extracted residue of barley malt alone or in mixture with other cereal grain or grain products resulting from the manufacture of wort or beer and may contain pulverized dried spent hops in an amount not to exceed 3%, evenly distributed. (Adopted 1965, Amended 1972.)

IFN 5-00-516 Barley brewers grains dehydrated

**15.2 Malt Sprouts** is obtained from malted barley by the removal of the rootlets and sprouts which may include some of the malt hulls, other parts of malt and foreign material unavoidably present. It must contain not less than 24% crude protein. The term malt sprouts when applied to a corresponding portion of other malted cereals must be used in qualified form: i.e., "Rye Malt Sprouts", "Wheat Malt Sprouts", etc. (Adopted 1942, Amended 1964, 1980.)

IFN 5-00-545 Barley malt sprouts dehydrated

IFN 5-04-048 Rye malt sprouts dehydrated

IFN 5-29-796 Wheat malt sprouts dehydrated

**15.3 Malt Cleanings** is obtained from the cleaning of malted barley or from the recleaning of malt which does not meet the minimum crude protein standard of malt sprouts. It must be designated and sold according to its crude protein content. (Adopted 1942)

IFN 5-00-544 Barley malt cleanings dehydrated

**15.4 Malt Hulls** consists almost entirely of hulls as obtained in the cleaning of malted barley. (Adopted 1942)

IFN 1-00-497 Barley malt hulls

**15.5 Dried Spent Hops** is obtained by drying the material filtered from hopped wort. (Adopted 1944)

IFN 5-02-396 Hop common fruit (hops) spent dehydrated.

**15.6 Brewers Wet Grains** is the extracted residue resulting from the manufacture of wort from barley malt alone or in mixture with other cereal grains or grain products. The guaranteed analysis shall include the maximum moisture. (Proposed 1971, Adopted 1974)

IFN 5-00-517 Barley brewers grains wet

**15.7 Brewers Condensed Solubles** is obtained by condensing liquids resulting as by-products from manufacturing beer or wort. It must contain not less than 20% total solids, 70% carbohydrates on a dry matter basis and the guaranteed analysis shall include maximum moisture. (Proposed 1975)

IFN 5-12-239 Barley brewers soluble condensed

**18. CHEMICAL PRESERVATIVES**

Investigator and Section Editor—Linda Benjamin, FDA

**Official****18.1 Chemical Preservatives**

<i>Name</i>	<i>FDA Regulations</i>	<i>Classification Under Food Additives Amendment</i>	<i>Limitations or Restrictions</i>
Ascorbic acid IFN 7-00-433	Reg. 582.3013	Chemical Preservative	**None
Ascorbyl palmitate IFN 8-26-245	Reg. 582.3149	Chemical Preservative	**None
Benzoic acid IFN 8-26-244	Reg. 582.3021	Chemical Preservative	Not to exceed 0.1%
Butylated hydroxyanisole (BHA)* IFN 8-01-044	Reg. 582.3169	Chemical Preservative	Total content of preservatives not more than 0.02% of fat or oil content including essential (volatile) oil content of food
Butylated hydroxytoluene (BHT)* IFN 8-01-045	Reg. 582.3173	Chemical Preservative	Same as above
Calcium ascorbate IFN 8-26-246	Reg. 582.3189	Chemical Preservative	**None
Calcium propionate IFN 8-01-085	Reg. 582.3221	Chemical Preservative	**None
Calcium sorbate IFN 8-01-086	Reg. 582.3225	Chemical Preservative	**None
Citric acid IFN 8-01-233	Reg. 582.6033	Chemical Preservative	**None
Dilauryl thiodipropionate IFN 8-01-789	Reg. 582.3280	Chemical Preservative	Total content of preservatives not more than 0.02% of fat or oil content including essential (volatile) oil content of food.
Distearyl thiodipropionate IFN 8-01-792	Reg. 582.3280	Chemical Preservative	Same as above
Erythroic acid IFN 8-09-823	Reg. 582.3041	Chemical Preservative	**None
Ethoxyquin IFN 8-01-841	Reg. 573.380	Chemical Preservative	0.015% in or on feed
Formic acid IFN 8-20-739	Reg. 573.480	Preservatives in hay crop silage	Not to exceed 2.25% of the silage (dry weight) or 0.45% (direct cut)

## 266 Feed Ingredient Definitions

Methylparaben IFN 8-03-088	Reg. 582.3490	Chemical Preservative	0.1%
Potassium bisulfite IFN 8-26-302	Reg. 582.3616	Chemical Preservative	Not for use in meats or vitamin B1 sources
Potassium meta-bisulfite IFN 8-26-203	Reg. 582.3637	Chemical Preservative	Not for use in meats or vitamin B1 sources
Potassium sorbate IFN 8-03-761	Reg. 582.3640	Chemical Preservative	**None
Propionic acid IFN 8-02-807	Reg. 582.3081	Chemical Preservative	**None
Propyl gallate IFN 8-03-308	Reg. 582.3660	Chemical Preservative	Total content of preservatives not more than 0.02% of fat or oil content including essential (volatile) oil content of food.
Propylparaben IFN 8-03-810	Reg. 582.3670	Chemical Preservative	0.1%
Resin guaiac (same as guaiac gum) IFN 8-03-909	Reg. 582.3336	Chemical Preservative	0.1% (Equivalent preservative activity 0.01%) in edible fats or oils.
Sodium ascorbate IFN 8-26-304	Reg. 582.3731	Chemical Preservative	**None
Sodium benzoate IFN 8-04-271	Reg. 582.3733	Chemical Preservative	0.1%
Sodium bisulfite IFN 8-26-305	Reg. 582.3739	Chemical Preservative	Not for use in meats or vitamin B1 sources
Sodium metabisulfite IFN 8-26-306	Reg. 582.3766	Chemical Preservative	Not for use in meats or vitamin B1 sources
Sodium nitrite IFN 8-04-283	Reg. 573.700	Preservative & color fixative in canned pet food containing fish; meat; and fish and meat by-products	20 ppm (0.002%)
Sodium propionate IFN 8-04-289	Reg. 582.3784	Chemical Preservative	**None
Sodium sorbate IFN 8-04-290	Reg. 582.3795	Chemical Preservative	**None
Sodium sulfite IFN 8-26-307	Reg. 582.3798	Chemical Preservative	Not for use in meats or vitamin B1 sources
Sorbic acid IFN 8-04-297	Reg. 582.3089	Chemical Preservative	**None
Stannous chloride IFN 8-26-308	Reg. 582.3845	Chemical Preservative	Not to exceed 0.0015 as tin

## Feed Ingredient Definitions 267

Sulfur dioxide IFN 8-26-309	Reg. 582.3862	Chemical Preservative	Not for use in meats or vitamin B1 sources
Tertiary butyl hydroquinone (TBHQ) IFN 8-04-829	I.R.P.***	Chemical Preservative	Total content of preservatives more than 0.02% of fat or oil content including essential (volatile) oil content of food.
Thiodipropionic acid IFN 8-04-830	Reg. 582.3109	Chemical Preservative	Total contents of preservatives not more than 0.02% of fat or oil content including essential (volatile) oil content of food.
Tocopherols IFN 7-05-038	Reg. 582.3890	Chemical Preservative	**None

\*For BHA and BHT either the name or the abbreviation may be used.

\*\*None--No quantitative restrictions although use must conform to good manufacturing practices.

NOTE: When using any of the above materials, a statement of the fact that a chemical preservative has been added must be shown. Examples: BHA (a preservative), or preserved with BHT, or sorbic acid added to retard mold growth, etc.

NOTE: International feed name and AAFCO name are identical for the above chemical preservatives.

\*\*\*I.R.P. means Informal Review Process

## 21. CITRUS PRODUCTS

Investigator and Section Editor—Kent Kitade, CA

### Official

**21.1 Dried Citrus Pulp** is the ground peel, residue of the inside portions, and occasional cull fruits of the citrus family which have been dried, producing a coarse, flaky product. It may contain dried citrus meal or pellets and whole citrus seeds. If calcium oxide or calcium hydroxide is added as an aid in processing, the maximum percentage present, expressed as calcium (Ca), must be shown. If it bears a name descriptive of its kind or origin, it must correspond thereto. (Adopted 1958, Amended 1965.)

IFN 4-01-237 Citrus pomace without fines dehydrated (pulp)

**21.2 Dried Citrus Meal** is the finer particles obtained by screening dried citrus pulp. (Adopted 1958, Amended 1965)

IFN 4-01-235 Citrus pomace fines dehydrated (pulp)

**21.3 Citrus Seed Meal, Mechanical Extracted**, is the seed or seed meats of orange and grapefruit from which most of the oil has been removed by means of pressure. It is composed mostly of the kernel with such portions of the hull and pulp as cannot be avoided in the manufacture of Citrus Seed Oil. It may be designated and sold according to its crude protein content. (Adopted 1958, Amended 1965)

IFN 5-01-239 Citrus seeds meal mechanical extracted.

## 268 Feed Ingredient Definitions

**22. COLLECTIVE TERMS**

Investigator and Section Editor--Larry Whitlock, TX

**Official**

Collective terms recognize a general classification of ingredient origin, which perform a similar function, but do not imply equivalent nutritional values.

When a collective term is used, individual ingredients within that group cannot be listed on the label.

The control official shall be provided, upon request, the ingredients that are being used within each collective term by the manufacturer using collective terms.

**22.1 Animal Protein Products** may include one or more of the following:

9.61	Animal Blood Dried	*9.40	Meat Meal
*9.42	Animal By-Product Meal	*9.50	Meat Meal Tankage
54.2	Buttermilk, Condensed	*9.12	Meat Solubles, Dried
54.1	Buttermilk, Dried	54.18	Lactalbumin, Dried
54.16	Casein	54.19	Milk, Dried Feed Grade
54.21	Casein, Dried Hydrolyzed	54.20	Milk Protein, Dried
54.17	Cheese Rind	9.14	Poultry By-Products
51.4	Crab Meal	9.10	Poultry By-Product Meal
51.10	Fish By-Products	9.11	Poultry Hatchery By-Product
51.34	Fish Liver & Glandular Meal	51.5	Shrimp Meal
51.14	Fish Meal	54.4	Skimmed Milk, Condensed
51.9	Fish Protein Concentrate	54.6	Skimmed Milk, Cond. Cultured
51.24	Fish Residue Meal	54.3	Skimmed Milk, Dried
51.6	Fish Solubles, Condensed	54.5	Skimmed Milk, Dried Cultured
51.7	Fish Solubles, Dried	54.8	Whey, Condensed
*9.16	Fleshings Hydrolysate	54.15	Whey, Condensed Cultured
*9.54	Hydrolyzed Hair	54.12	Whey, Condensed Hydrolyzed
*9.55	Hydrolyzed Leather Meal	54.7	Whey, Dried
9.59	Hydrolyzed Poultry By-Product Aggregate	54.11	Whey, Dried Hydrolyzed
9.15	Hydrolyzed Poultry Feathers	54.13	Whey-Product, Condensed
9.58	Hydrolyzed Whole Poultry	54.14	Whey-Product, Dried
9.75	Leather Hydrolysate	54.10	Whey Solubles, Condensed
*9.41	Meat & Bone Meal	54.9	Whey Solubles, Dried
*9.51	Meat & Bone Meal Tankage		

\*Use of this ingredient, from mammalian origins, is restricted to non-ruminant feeds unless specifically exempted by 21 CFR 589.2000. Feeds containing prohibited material must bear the following label statement: **"Do not feed to cattle or other ruminants"**.

**22.2 Forage Products** may include one or more of the following:

3.2	Alfalfa Meal, Dehydrated	71.3	Flax Plant Product
3.1	Alfalfa Hay, Ground	60.11	Ground Grass
3.1	Alfalfa Meal, Suncured	45.1	Lespedeza Meal
60.27	Coastal Bermuda grass Hay	45.2	Lespedeza Stem Meal
48.20	Corn Plant, Dehydrated	84.2	Soybean Hay, Ground
60.	Dehydrated Silage (Ensilage Pellets)		



## Feed Ingredient Definitions 269

**22.3 Grain Products**--In any of the normal forms such as whole, ground, cracked, screen cracked, flaked, kibbled, toasted, or heat processed:

*	Barley	*	Wheat
48.3, 48.4, 48.5, 48.6	Corn	75.5	Rice--Ground Brown,
48.11, 48.12, 48.19	(corn)	75.2	Ground Paddy, Ground Rough,
42.1, 42.6, 42.7	Grain Sorghum	75.4	Broken, or Chipped Rice
69.6	Mixed Feed Oats	75.4	Rice, Brewers
*	Oats	*	Rye
*	Triticale		

\* No official definition for the grain product.

**22.4 Plant Protein Products** may include one or more of the following:

87.1	Algae Meal	71.130, 17.131	Safflower Meal
60.34	Beans, Dried	84.12	Soy Protein Concentrate
71.77	Canola Meal	84.4	Soybean Feed
71.60, 71.61	Coconut Meal	84.1	Soybeans, Ground
24.30, 24.31	Cottonseed Flakes	84.7, 84.60, 84.61	Soybean Meal
24.2	Cottonseed Cake	84.13	Soybean Meal, Kibbled
24.10, 24.12	Cottonseed Meal	84.11, 84.15	Soybeans Heat Processed
24.50, 24.51	Cottonseed Meal, Low Gossypol	84.51 84.5	Soy Flour
			Soy Grits
24.4	Cottonseed, Whole Pressed	71.220, 71.221 71.210, 71.211	Sunflower Meal
			Sunflower Meal, Dehulled
60.18	Guar Meal	96.2	Yeast, Active Dry
71.1, 71.11	Linseed Meal	96.4	Yeast Brewers
71.9	Peanut Meal	96.8	Yeast, Culture
*	Peas	96.1	Yeast, Dried
60.94	Potato Protein	96.1	Yeast, Primary Dried
71.25	Rapeseed Meal	96.7	Yeast, Torula Dried

**22.5 Processed Grain By-Products** may include one or more of the following:

60.43	Aspirated Grain Fractions	48.16, 48.26	Hominy Feed
15.1	Brewers Dried Grains	15.2	Malt Sprouts
60.6	Buckwheat Middlings	69.1	Oat Groats
27.7	Condensed Distillers, Solubles	69.3	Oat Meal, Feeding
48.24	Condensed Fermented Corn Extractives w/ Germ Meal Bran	12.3 71.21	Pearl Barley By-Products
			Peanut Skins
48.2	Corn Bran	75.3, 75.7	Rice Bran
48.8	Corn Flour	75.1	Rice Polishings
48.22, 48.23	Corn Germ Meal (Wet & Dry Milled)	78.2 42.8	Rye Middlings
			Sorghum Grain Flour, Gelatinized
48.13	Corn Gluten Feed		Sorghum Grain Flour, Partially
48.14	Corn Gluten Meal	42.9	Partially Aspirated, Gelat.
48.7	Corn Grits		Wheat Bran
27.5	_____ Distillers Dried Grains	93.1	Wheat Flour
27.6	_____ Distillers Dried Grains/ Solubles	93.2 93.6	Wheat Shorts
			Wheat Germ Meal
27.4	_____ Distillers Dried Solubles	93.3	Wheat Germ Meal, Defatted
*	_____ Flour	93.8	Wheat Middlings
42.4	Grain Sorghum Germ Cake	93.5	Wheat Mill Run
42.4	Grain Sorghum Germ Meal	93.4	Wheat Red Dog
42.7	Grain Sorghum Grits	93.7	
42.10	Grain Sorghum Mill Feed		

\* Should designate type of grain with flour.

**270 Feed Ingredient Definitions****22.6 Roughage Products** may include one or more of the following:

60.7	Almond Hulls, Ground	60.84	Husks, Psyllium Seed
60.2	Apple Pectin Pulp, Dried	15.4	Malt Hulls
60.1	Apple Pomace, Dried	69.4	Oat Mill By-Product, Clipped
63.26	Bagasse	69.2	Oat Hulls
12.1	Barley Hulls	69.7	Oat Mill By-Product
12.4	Barley Mill By-Product	71.6	Peanut Hulls
63.36	Beet Pulp, Dried	75.6	Rice Hulls
60.17	Buckwheat Hulls	75.8	Rice Mill By-Product
21.2	Citrus Meal, Dried	78.1	Rye Mill Run
21.1	Citrus Pulp, Dried	84.3	Soybean Hulls
21.3	Citrus Seed Meal	84.8	Soybean Mill Feed
48.1, 48.21	Corn Cob Fractions	84.9	Soybean Mill Run
24.6	Cottonseed Hulls	71.23	Sunflower Hulls
71.4	Flax Straw By-Products	60.10	Straw, Ground
		60.8	Tomato Pomace, Dried

**\*22.7 Molasses Products** may include one or more of the following:

63.1	Beet Molasses	36.10	Condensed Molasses
63.39	Beet Molasses, Dried Product		Fermentation Solubles
63.37	Beet Pulp, Dried, Molasses	63.6	Starch Molasses
63.7	Cane Molasses	27.2	Molasses Distillers
63.3	Citrus Molasses		Condensed Solubles
96.9	Molasses Yeast Condensed Solubles	27.1	Molasses Distillers Dried Solubles
63.81	Concentrated Separator By-Product		

\* The molasses collective term is not recognized by FDA (21 CFR 501.110)

**24. COTTONSEED PRODUCTS**

Investigator and Section Editor—Kent Kitade, CA

**Official**

**24.14 Ammoniated Cottonseed Meal** is obtained by the treatment of cottonseed meal with anhydrous ammonia until a pressure of 50 pounds per square inch gauge is reached. It is to be used in the feed of ruminants as a source of protein and/or as the sole source of non-protein nitrogen in an amount not to exceed 20% of the total ration.

The label of the additive and of any feed additive supplement, feed additive concentrate, or feed additive premix prepared therefrom, must contain the following information in addition to any other required information:

- (1) The name of the additive.
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for use to provide not more than 20% of the additive in the total ration and a prominent statement: "Warning--This feed should be used only in accordance with the directions furnished on the label." (Reg. 573.140) (Proposed 1969, Adopted 1970.)

IFN 5-09-352 Cotton seeds meal solvent extracted ammoniated

**24.10 Cottonseed Meal, Mechanical Extracted**, is the product obtained by finely grinding the cake, which remains after removal of most of the oil from cottonseed by a mechanical extraction process. It must contain not less than 36% crude protein. It may contain an inert, non-toxic conditioning agent either nutritive or non-nutritive or any combination thereof, to reduce caking and improve

flowability in an amount not to exceed that necessary to accomplish its intended effect and in no case exceed 0.5%. The name of the conditioning agent must be shown as an added ingredient. The words "mechanical extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1984, Adopted 2002)

IFN 5-01-625 Cotton seeds meal mechanical extracted 36% protein.

**24.12 Cottonseed Meal, Solvent Extracted**, is the product obtained by finely grinding the flakes, which remain after removal of most of the oil from cottonseed by a solvent extraction process. It must contain not less than 36% crude protein. It may contain an inert, non-toxic conditioning agent either nutritive or non-nutritive or any combination thereof, to reduce caking and improve flowability in an amount not to exceed that necessary to accomplish its intended effect and in no case exceed 0.5%. The name of the conditioning agent must be shown as an added ingredient. The words "solvent extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1984, Adopted 2002)

IFN 5-01-632 Cotton seeds meal solvent extracted 36% protein

**24.2 Cottonseed Cake, Mechanical Extracted**, is the unground product composed of the kernel and such portions of the lint, hull, and oil as remain after removal of most of the oil from cottonseed by a mechanical process. It must contain not less than 36% crude protein. The words "mechanical extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1964, Adopted 1966, Amended 1968.)

IFN 5-01-623 Cotton seeds mechanical extracted caked 36% protein

**24.30 Cottonseed Flakes, Mechanical Extracted**, is the unground product, composed of the kernel and such portions of the lint, hull, and oil as remain after removal of the oil from cottonseed by a mechanical extraction process. It must contain not less than 36% crude protein. The words "mechanical extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1964, Adopted 1966, Amended 1968.)

IFN 5-08-820 Cotton seeds mechanical extracted flaked 36% protein

**24.31 Cottonseed Flakes, Solvent Extracted**, is the unground product, composed of the kernel and such portions of the lint, hull, and oil as remain after removal of the oil from cottonseed by a solvent extraction process. It must contain not less than 36% crude protein. The words "solvent extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1964, Adopted 1966, Amended 1968.)

IFN 5-01-629 Cotton seeds solvent extracted flaked 36% protein

NOTE: The following levels of minimum crude fat and maximum crude fiber are adopted for cottonseed meals, cake, or flakes, of respective grade.

--Crude Fat--

Crude Protein	Mechanical	Solvent	Crude Fiber
36%	2.0%	0.5%	17%
41%	2.0%	0.5%	14%
43%	2.0%	0.5%	13%

IFN 5-01-617 Cotton seeds meal mechanical extracted 41% protein

IFN 5-01-627 Cotton seeds meal mechanical extracted 43% protein

IFN 5-01-621 Cotton seeds meal solvent extracted 41% protein

IFN 5-01-630 Cotton seeds meal solvent extracted 43% protein

This product (when sold or distributed singly) may be additionally labeled with the following bold face terms when the requirements thereafter are met;

272 **Feed Ingredient Definitions**

\_\_\_\_\_, **Prime Quality** must be free of mold, excess lint, and sour, musty, or burnt odors.

\_\_\_\_\_, **Off Quality** shall be that which does not meet the prime quality requirements.

**24.4 Whole-Pressed Cottonseed, Mechanical Extracted**, is composed of sound, mature, clean, delinted, and unhulled cottonseed, from which most of the oil has been removed by mechanical pressure. It must be designated and sold by its crude protein content. If ground, it must be so designated. The words "mechanical extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1964, Adopted 1966, Amended 1968.)

IFN 5-01-609 Cotton seeds meal mechanical extracted

**24.50 Low Gossypol Cottonseed Meal, Mechanical Extracted**, is a meal in which the gossypol is not more than 0.04% free gossypol. The words "mechanical extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1964, Adopted 1966, Amended 1968.)

IFN 5-09-002 Cotton seeds low gossypol meal mechanical extracted

**24.51 Low Gossypol Cottonseed Meal, Solvent Extracted**, is a meal in which the gossypol is not more than 0.04% free gossypol. The words "solvent extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1964, Adopted 1966, Amended 1968.)

IFN 5-01-633 Cotton seeds low gossypol meal solvent extracted

**24.6 Cottonseed Hulls** consist primarily of the outer covering of the cottonseed. (Proposed 1964, Adopted 1966.) IFN 1-01-599 Cotton hulls

**24.7 Cottonseed Screenings**, is obtained in the commercial delinting and processing of cottonseeds for planting purposes. It consists of lint, stems, leaves, small and immature seeds, sand and/or dirt. It must contain a minimum of 12% crude protein and not more than 30% crude fiber. It must be labeled with minimum guarantees for crude protein and crude fat and maximum guarantees for crude fiber and ash. If it contains more than 6.5% ash, the words "sand" and/or "dirt" must appear in the product name. (Proposed 1980, Adopted 1983.)

IFN 4-12-023 Cotton seed screenings

**24.8 Cotton Plant By-Product** is the residue from the ginning of cotton. It consists of cotton burrs, leaves, stems, lint, immature seeds, and sand and/or dirt. It shall not contain more than 38% crude fiber, nor more than 15% ash. It must be labeled with minimum guarantees for crude protein and crude fat and maximum guarantees for crude fiber and ash. If it contains more than 15.0% ash, the words "sand and/or dirt" must appear in the product name. (Proposed 1980, Adopted 1983, Amended 1984.)

IFN 1-08-413 Cotton gin by-product

**27. DISTILLERS PRODUCTS**

Investigator and Section Editor--Brett Groves, IN

**Official**

**27.1 Molasses Distillers Dried Solubles** is obtained by drying the residue from the yeast fermentation of molasses after the removal of the alcohol by distillation. (Adopted 1943, Amended 1944.)

IFN 4-04-698 Sugarcane molasses distillers solubles dehydrated

**27.2 Molasses Distillers Condensed Solubles** is obtained by condensing to a syrupy consistency the residue from the yeast fermentation of molasses after the removal of the alcohol by distillation. (Adopted 1946.)

IFN 4-04-697 Sugarcane molasses distillers solubles condensed

**27.3 Potato Distillers Dried Residue** is the dried product obtained after the manufacture of alcohol and distilled liquors from potatoes or from a mixture in which potatoes predominate. (Adopted 1947.)

IFN 5-03-773 Potato distillers residue dehydrated

**27.4 \_\_\_\_\_ Distillers Dried Solubles** is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain mixture by condensing the thin stillage fraction and drying it by methods employed in the grain distilling industry. The predominating grain must be declared as the first word in the name. (Proposed 1963, Adopted 1964.)

IFN 5-00-520 Barley distillers solubles dehydrated

IFN 5-02-147 Cereals distillers solubles dehydrated

IFN 5-02-844 Maize distillers solubles dehydrated

IFN 5-04-026 Rye distillers solubles dehydrated

IFN 5-04-376 Sorghum distillers solubles dehydrated

IFN 5-05-195 Wheat distillers solubles dehydrated

**27.5 \_\_\_\_\_ Distillers Dried Grains** is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by separating the resultant coarse grain fraction of the whole stillage and drying it by methods employed in the grain distilling industry. The predominating grain shall be declared as the first word in the name. (Proposed 1963, Adopted 1964.)

IFN 5-00-518 Barley distillers grains dehydrated

IFN 5-02-144 Cereals distillers grains dehydrated

IFN 5-02-842 Maize distillers grains dehydrated

IFN 5-04-023 Rye distillers grains dehydrated

IFN 5-04-374 Sorghum distillers grains dehydrated

IFN 5-05-193 Wheat distillers grains dehydrated

**27.6 \_\_\_\_\_ Distillers Dried Grains with Solubles** is the product obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by condensing and drying at least 3/4 of the solids of the resultant whole stillage by methods employed in the grain distilling industry. The predominating grain shall be declared as the first word in the name. (Proposed 1963, Adopted 1964.)

IFN 5-12-185 Barley distillers grains with solubles dehydrated

IFN 5-07-987 Cereals distillers grains with solubles dehydrated

IFN 5-02-843 Maize distillers grains with solubles dehydrated

IFN 5-04-024 Rye distillers grains with solubles dehydrated

IFN 5-04-375 Sorghum distillers grains with solubles dehydrated

IFN 5-05-194 Wheat distillers grains with solubles dehydrated

274 **Feed Ingredient Definitions**

**27.7** \_\_\_\_\_ **Condensed Distillers Solubles** is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by condensing the thin stillage fraction to a semi-solid. The predominating grain must be declared as the first word in the name. (Proposed 1969, Adopted 1970.)

IFN 5-12-210 Barley distillers solubles condensed

IFN 5-02-146 Cereals distillers solubles condensed

IFN 5-12-211 Maize distillers solubles condensed

IFN 5-12-212 Rye distillers solubles condensed

IFN 5-12-231 Sorghum distillers solubles condensed

IFN 5-12-213 Wheat distillers solubles condensed

**27.8 Distillers Wet Grains** is the product obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain mixture. The guaranteed analysis shall include the maximum moisture. (Proposed 1981, Adopted 1982.) IFN 5-16-149 Cereals distillers grains wet

**DRUGS AND FEED ADDITIVES**

Investigator and Section Editor--Jo Gulley, FDA

(See Medicated Feed Section)

**30. ENZYMES**

Investigator and Section Editor--Mika Alewynse, FDA

\*See the "Enzyme Marketing Coordination" document which appears immediately following this section.

The immediate following pages contain the Enzymes/Source Organisms Acceptable for Use in Animal Feeds.

## 30.1 Enzymes/Source Organisms Acceptable for Use in Animal Feeds

In the case of microbial enzymes it is understood that they are produced from nonpathogenic and nontoxic strains.

Classification/Name	Source Organism	Typical Substrate <sup>1</sup>	Function	Current Supported Use
<b>Carbohydrases</b>				
alpha-Amylase	Animal pancreatic tissue <i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> , var. <i>Bacillus amyloliquefaciens</i> <i>Bacillus lentus</i> <i>Bacillus licheniformis</i> <i>Bacillus licheniformis</i> containing a <i>Bacillus stearothermophilus</i> gene for alpha-Amylase <i>Bacillus stearothermophilus</i> <i>Bacillus subtilis</i> containing a <i>Bacillus megaterium</i> gene for alpha-Amylase <i>Bacillus subtilis</i> containing a <i>Bacillus stearothermophilus</i> gene for alpha-Amylase <i>Bacillus subtilis</i> , var. Barley malt <i>Rhizopus niveus</i> <i>Rhizopus oryzae</i> , var.	corn silage, corn, corn feed meal, corn gluten feed, soybean meal, wheat, wheat middlings, wheat feed meal, barley, grain sorghum, pea, oat, tapioca, millet, rice, rice feed meal	hydrolyzes starch	
Maltogenic alpha-Amylase	<i>Bacillus subtilis</i> containing a <i>Bacillus stearothermophilus</i> gene for Maltogenic alpha-Amylase Barley malt	see alpha-Amylase	hydrolyzes starch with production of maltose	
beta-Amylase	Barley malt	see alpha-Amylase	hydrolyzes starch with production of maltose breaks down cellulose	
Cellulase	<i>Aspergillus niger</i> , var. <i>Humicola insolens</i> <i>Trichoderma longibrachiatum</i> (also known as <i>T. reesei</i> or <i>T. viride</i> )	corn, barley, wheat, wheat bran, rye, grain sorghum		

## 276 Feed Ingredient Definitions

Classification/Name	Source Organism	Typical Substrate <sup>1</sup>	Function	Current Supported Use
alpha-Galactosidase	<i>Aspergillus niger</i> , var. <i>Mortierella vinaceae</i> var. <i>raffinoseutilizer</i> <i>Saccharomyces</i> sp.	sweet lupin, soybean meal	hydrolyzes oligosaccharides	
beta-Glucanase	<i>Aspergillus niger</i> , var. <i>Aspergillus aculeatus</i> <i>Bacillus lentus</i> <i>Bacillus subtilis</i> , var. <i>Humicola insolens</i> <i>Penicillium funiculosum</i> <i>Trichoderma longibrachiatum</i> (also known as <i>T. reesei</i> or <i>T. viride</i> )	wheat, barley, canola meal, wheat byproduct, oat groats, rye, triticale, grain sorghum	hydrolysis of β-glucans, a type of non-starch polysaccharide	reduction of digesta viscosity with barley based poultry diets, reduces soluble non-starch polysaccharides in digesta
beta-Glucosidase	<i>Aspergillus niger</i> , var.	plant cell wall constituents	hydrolyzes cellulose degradation products to glucose	
Glucosylase (Amyloglucosidase)	<i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> , var. <i>Rhizopus niveus</i> <i>Rhizopus oryzae</i> , var.	see alpha-Amylase	hydrolyzes starch with production of glucose	
Hemicellulase	<i>Aspergillus aculeatus</i> <i>Aspergillus niger</i> , var. <i>Bacillus lentus</i> <i>Bacillus subtilis</i> , var. <i>Humicola insolens</i> <i>Trichoderma longibrachiatum</i> (also known as <i>T. reesei</i> or <i>T. viride</i> )	corn, soybean meal, guar meal, barley, rye, grain sorghum, wheat, oats, peas, lentils	breaks down hemicellulose	reduction in stickiness of excreta in poultry fed guar meal
Invertase	<i>Aspergillus niger</i> , var. <i>Saccharomyces</i> sp.	sucrose containing products and byproducts	hydrolyzes sucrose to glucose and fructose	



## Feed Ingredient Definitions 277

Classification/Name	Source Organism	Typical Substrate <sup>1</sup>	Function	Current Supported Use
Lactase	<i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> , var. <i>Candida pseudotropicalis</i> <i>Kluyveromyces marxianus</i> var. <i>lactis</i> (formerly <i>Saccharomyces</i> sp.)	lactose containing products and byproducts	hydrolyzes lactose to glucose and galactose	
beta-Mannanase	<i>Aspergillus niger</i> , var. <i>Bacillus lentus</i> <i>Trichoderma longibrachiatum</i> (also known as <i>T. reesei</i> or <i>T. viride</i> )	corn, soybean meal, guar meal, copra meal	hydrolyzes $\beta$ -mannans, a component of hemicellulose	reduction in stickiness of excreta in poultry fed guar meal
Pectinase	<i>Aspergillus aculeatus</i> <i>Aspergillus niger</i> , var. <i>Rhizopus oryzae</i>	corn, wheat	breaks down pectin	
Pullulanase	<i>Bacillus acidopullulyticus</i> <i>Bacillus licheniformis</i> containing a <i>Bacillus deramificans</i> gene for pullulanase	see alpha-Amylase	hydrolyzes starch	
Xylanase	<i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> expressing a <i>Thermomyces lanuginosus</i> xylanase gene <i>Bacillus lentus</i> <i>Bacillus subtilis</i> , var. <i>Humicola insolens</i> <i>Penicillium funiculosum</i> <i>Trichoderma longibrachiatum</i> (also known as <i>T. reesei</i> or <i>T. viride</i> )	corn, barley, rye, wheat, grain sorghum, triticale, oats	hydrolyzes xylans, a component of hemicellulose	reduction of digesta viscosity with poultry diets
<b>Lipases</b>				
Lipase	Animal pancreatic tissue <i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> , var. <i>Candida rugosa</i> (formerly <i>cylindracea</i> ) Edible forestomach of calves, kids, and lambs <i>Rhizomucor (Mucor-) miehei</i> <i>Rhizopus oryzae</i>	plant and animal sources of fats and oils	hydrolyzes triglycerides	

278 Feed Ingredient Definitions

Classification/Name	Source Organism	Typical Substrate <sup>1</sup>	Function	Current Supported Use
<b>Proteases</b>				
Bromelain	Pineapples - stem, fruit	plant and animal proteins	hydrolyzes proteins	
Ficin	Figs	plant and animal proteins	hydrolyzes proteins	
Keratinase	<i>Bacillus licheniformis</i>	plant and animal proteins	hydrolyzes proteins	
Papain	Papaya	plant and animal proteins	hydrolyzes proteins	
Pepsin	Porcine or other animal stomachs	plant and animal proteins	hydrolyzes proteins	
Protease (general)	<i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> , var. <i>Bacillus amyloliquefaciens</i> <i>Bacillus licheniformis</i> <i>Bacillus subtilis</i> , var. <i>Bacillus subtilis</i> containing a <i>Bacillus amyloliquefaciens</i> gene for protease	plant and animal proteins	hydrolyzes proteins	
Trypsin	Animal pancreas	plant proteins	hydrolyzes proteins	
<b>Oxidoreductases</b>				
Catalase	<i>Aspergillus niger</i> , var. <i>Micrococcus lysodeikticus</i>	hydrogen peroxide	produces water and oxygen from hydrogen peroxide	
Glucose Oxidase	<i>Aspergillus niger</i> , var.	glucose	degrades glucose to hydrogen peroxide and gluconic acid	
<b>Phosphatases</b>				
Phytase	<i>Aspergillus niger</i> , var. <i>Aspergillus oryzae</i> , var. Phytase canola ( <i>Brassica napus</i> expressing the <i>Aspergillus niger</i> phytase gene) <i>Aspergillus oryzae</i> expressing the <i>Peniophora lycii</i> phytase gene. <i>Schizosaccharomyces pombe</i> expressing an <i>Escherichia coli</i> strain B phytase gene	corn, soybean meal, sunflower meal, hominy, tapioca, plant byproducts	hydrolyzes phytate	increases the digestibility of phytin-bound phosphorus in swine and poultry diets

<sup>1</sup> This list is to provide guidance and is not all-inclusive.

## ENZYME MARKETING COORDINATION

*NOTE: Sponsors of new enzyme/source organisms shall fully comply with this document by January 1, 1998.*

### BACKGROUND

Enzymes are organic catalysts that affect the rate at which chemical reactions occur for specific substrates, including foods. AAFCO Policy Statement 7 describes the current sources of enzymes permitted in animal feeds. Rennet and papain are listed as GRAS under 21 CFR 582. All other enzyme materials to be used in animal feeds require a Food Additive regulation unless they are determined to be GRAS. The Center for Food Safety and Applied Nutrition (CFSAN) has published regulations for some enzyme preparations for use in human nutrition as secondary direct food additives under 21 CFR 173 and as GRAS food substances in 21 CFR 184. However, these applications are not directly transferable to animal use.

### DEFINITIONS

The terms presented below are to clarify this document and do not represent nomenclature utilized by all enzyme manufacturers.

Enzyme. A protein made up of amino acids or their derivatives, which catalyzes a defined chemical reaction. Required cofactors should be considered an integral part of the enzyme.

Note: All other organic catalysts are excluded from consideration under this marketing coordination scheme.

Source organism. The organism that actually produces the enzyme(s).

Manufacturer. The firm or individual that actually produces the enzyme from the source organism.

Sponsor. The firm or individual that proposes adding an enzyme/source organism to the list published in the AAFCO Official Publication (Official Publication).

Enzyme preparation. A partially purified, unstandardized mixture of the enzyme(s) of interest and residues from the source organism. Enzyme preparations are not intended for sale or distribution for direct use on animal feed products without undergoing further processing.

Enzyme containing material. A material which is manufactured from the enzyme preparation, but is not necessarily, the final enzyme product. This material, if used in product development trials, must be substantially similar to the proposed product.

Enzyme product. A processed, standardized enzyme-containing material which has been produced with the intention of being sold for use on animal feed and feed ingredients. Examples of enzyme products would include feed grain treatments, commercial premixes and ready-to-use or apply materials.

Enzyme substrate. The material or substance which is acted upon catalytically by the enzyme.

Enzymatic activity (unit of). The catalytic activity required to convert a given amount of assay substrate to a given amount of product per unit time under the standard conditions set forth in the assay procedure.

### REGULATORY APPROACH

The U.S. Food and Drug Administration (FDA) considers all feed enzymes to be either food additives or GRAS substances as defined by the Federal Food, Drug, and Cosmetic Act. However, the FDA plans at the present time to utilize regulatory discretion in the regulation of feed enzymes that present no safety concerns. A food additive petition will not be required for many products. However, if the Agency has concerns about an enzyme/source organism, a formal food additive petition may be required.

280 **Feed Ingredient Definitions**

This document, written jointly by the AAFCO, FDA, Agriculture and Agri-Food Canada and industry, describes the information which may be necessary for confirmation of the suitability of an enzyme/source organism for inclusion in the Official Publication. Issuance of a favorable informal opinion by the FDA may provide the safety and functionality substantiation necessary for AAFCO to adopt an official definition for a feed enzyme/source organism. All marketed enzymes must meet at least one of the following criteria: 1) be published in the Official Publication; 2) be the subject of a Food Additive regulation under 21 CFR 573; 3) be affirmed as GRAS; 4) be GRAS; or 5) be the subject of an informal no objection letter from the FDA (will be published in the next Official Publication). If an enzyme is published in the Code of Federal Regulations as an approved food additive it will also be included in the Official Publication. It should be noted that publication of an enzyme/source organism in the Official Publication does not remove a firm's responsibility of complying with applicable Canadian regulations.

The sponsor of an unpublished enzyme/source organism is to provide information which addresses issues of safety, functionality, labeling, and manufacturing. The request for review should be sent to the designated AAFCO contact. The supporting information should be sent to the Division of Animal Feeds, Center for Veterinary Medicine, FDA. The FDA will be asked to evaluate the information and determine its adequacy. If the FDA determines that the enzyme/source organism does not require an approved food additive petition to ensure its safe use, AAFCO will be asked to propose a new or modify an existing definition under which the enzyme/source organism would be published in the Official Publication. Any restrictions on claims and use conditions will be addressed by the FDA in its statements to AAFCO and the sponsor. The official definition will include: trivial name and/or International Union of Biochemistry (IUB) name, if available; enzyme classification; source organism; and substrate(s).

In the information package the sponsor may include material from the literature or current research. International data are acceptable provided conditions of testing simulate practices in this country. Supporting empirical information should be summarized and appropriate statistical analysis applied. Information that must be submitted by the sponsor includes: the sponsor's name and address, the enzyme, its proposed use and source organism. If any material written in a foreign language is included, a complete translation must be provided.

An appropriate section of the Official Publication is to be reserved for listing an enzyme and its source organism(s). After FDA evaluation of the information submitted for a new enzyme/source organism, a letter will be sent to the designated AAFCO contact. A copy of the letter will also be sent to the sponsor. Both the States and FDA will monitor the industry for compliance.

The following specific areas must be addressed by the sponsor:

**ENZYME IDENTITY**

The enzyme present in the enzyme preparation or product is to be identified and activity determined. The enzyme preparation or product is to be shown to contain no viable source organisms above an appropriate background. A suggested maximum is  $1 \times 10^4$  colony forming units (CFU/gram) of the source organism. If the source organism is published in the Official Publication under definition 36.14, there shall be no restriction on source organism numbers.

Identity information should include the following:

- a. Active enzyme substance-- should be identified, preferably using the nomenclature system developed by the IUB. Specific terminology, such as phytase, pectinase, amylase or glucanase, is preferred.
- b. Enzyme substrate-- the specific substance on which the enzyme acts should be identified. General terminology such as carbohydrate, fiber, lipids, and protein are acceptable; however, specific terminology such as starch, cellulose, phytin, and lactose are preferred.
- c. Reaction products-- the primary resultant product(s) from the enzyme-substrate reaction should be identified to the extent that it is practical.
- d. Site of enzyme activity-- the site of activity is recognized to be on the feed/ingesta. Any other statement regarding site of activity is subject to FDA review.

#### **BIOENGINEERED SOURCES OF ENZYMES**

A source organism may be bioengineered using recombinant deoxyribonucleic acid (rDNA) technology. This type of technology is defined as "any method by which DNA is manipulated in vitro and introduced into the source organism." Initially, use of bioengineered source organisms will be handled on a case-by-case basis. If the structure/amino acid sequence of an enzyme has not been significantly affected by changes in the genome of the source organism, it is not anticipated that additional requirements will be imposed for inclusion in the Official Publication. However, if a source organism has been modified by rDNA techniques to contain an antibiotic resistance gene, then the enzyme product should contain no detectable, viable source organisms and no transformable antibiotic resistance DNA.

#### **SAFETY--Animal/Human/Environment**

Safety is the overriding issue with food and food ingredients and thus, for enzyme/source materials for animal use. Initial questions will reside around whether the enzyme preparation has adverse effects on either the animal, the environment, or humans via edible products from animals fed the enzyme.

#### **ANIMAL SAFETY**

Enzymes, as defined in this document, are amino acid-based catalysts used at low levels to alter animal feedstuffs. Because of this basic structure, it is reasonable to assume that these molecules will be digested in the gastro-intestinal tract, as would any other protein. Since an enzyme will be broken down into its constituent amino acids and cofactors and thus, be indistinguishable from other food molecules, the potential for residues in edible animal tissues appears minimal. Thus, the only other major factor which may raise a safety concern is the possible presence of compounds produced by or derived from the source organism. Pariza and Foster (1983)<sup>1</sup> have developed a set of guidelines to assess the safety of enzymes used in food processing. These guidelines address the safety of the source organism and the enzyme itself. Enzyme preparations that meet or surpass the criteria proposed by Pariza and Foster for human food should be safe for use in animal feed when utilized at the low levels normally employed for these catalysts.

Alternatively, the sponsor can provide data demonstrating no adverse effects when the most sensitive target animal is fed at least 5 times the maximum supplementation level for a period of 90 days or 50% of the species normal growing period, whichever is less. The species will be determined by product labeling and/or manufacturer suggestions.

Enzyme sponsors should also address the presence of enzymatic cofactors in the enzyme preparation. The presence of cofactors, such as the vitamins or nicotinamide adenine dinucleotide (NAD) is not of concern, but should be reported. If the enzyme

## 282 Feed Ingredient Definitions

requires potentially toxic cofactors, such as selenium or molybdenum, the submission should indicate the identity and amount of the cofactor.

Enzymes produced using current good manufacturing practices from food animals, edible and nontoxic plants or nontoxigenic and nonpathogenic microorganisms which do not produce antibiotics, should be safe for consumption at the low levels one would normally expect to encounter in animal feeds. In addition, the enzyme preparation should comply with the chemical and microbiological purity standards established by the Joint FAO/WHO Expert Committee on Food Additives<sup>2</sup> and the Food Chemical Codex<sup>3</sup>.

Carriers, diluents, and processing aids used in the production of enzyme preparations and products must be substances that are acceptable for feed usage. If an enzyme preparation or product is standardized or diluted with feed grade material, then applicable chemical and microbiological standards for the feed material will apply.

### HUMAN SAFETY

Enzymes, as defined in this document, are amino acid-based catalysts used at low levels to alter animal feedstuffs. Because of this basic structure, it is reasonable to assume that these molecules will be digested in the gastro-intestinal tract, as would any other protein. However, it is the responsibility of the sponsor to provide appropriate data to assure human safety. Enzymes used in animal feed that pass the safety assessment proposed by Pariza and Foster should raise no human safety concerns.

If the Pariza and Foster decision tree is not used to evaluate the enzyme preparation, the sponsor must provide information regarding the fate of the enzyme in the target animal. If it cannot be assured that the enzyme is broken down to non-toxic metabolites, it may be necessary to quantify the amount of residue and identify safety concerns for these molecules. If an enzyme preparation is currently approved for addition to or conditioning of human foods, human safety data may not be required. However, human food use must be substantiated and a statement of similar/identical usage will be required. If human food safety is an issue, a food additive petition under 21 CFR 570 will be required.

### ENVIRONMENTAL SAFETY

Information is required on each enzyme/source organism to assure that it does not adversely affect the environment. Information showing that the enzyme is composed of or broken down to normal non-toxic degradation products in the digestive tract of supplemented animals would be adequate to answer questions of environmental safety. If degradation metabolites have an unusual chemical composition not normally present in foods, it may be necessary to demonstrate metabolite safety for non-target species that may be exposed to target animal wastes. Environmental safety concerns could also be allayed if it could be demonstrated that the same or similar enzymes in approximately the same concentrations are excreted by free living organisms in a similar environment.

### FUNCTIONALITY

The functionality of the enzyme itself must be documented. Either *in vivo* or *in vitro* data are acceptable to demonstrate enzyme functionality. The functionality statement associated with an enzyme/source organism combination will be determined by the data submitted under this proposal. The chosen research approach, either *in vivo* or *in vitro*, should answer questions relating to the amount of enzyme material necessary to have the intended effect and the use conditions (restrictions) for the enzyme. All experimental protocols should be described as would be required for publication in a peer-review journal. The procedure used to determine enzyme

functionality should be described in detail. If functionality is determined by end product measurements, assay sensitivity and cross-reactivity to other constituents/contaminants should be discussed. Functionality data must substantiate the proposed label. Animal experiments demonstrating enzyme functionality are highly recommended. Trial design should ensure that statistical analysis of experimental data is possible. The number of trials should be adequate to document enzyme functionality under field conditions. Indicators of enzyme functionality could include increased nutrient digestibility and/or increased free nutrient levels. Sponsors should note, however, that label/advertising claims for improved animal performance or health will cause an enzyme to be classified as a new animal drug.

Functionality can also be addressed using *in vitro* studies with either complete feeds, feed ingredients or feed substrates being utilized as the enzyme substrate. Experimental design and the accompanying statistical analysis must be adequate to support enzyme functionality under field conditions. Dependent on the reaction catalyzed, the sponsor may wish to measure the disappearance of un-degraded feed substrate or the appearance of enzyme reaction products. This approach directly measures the enzymatic digestion of feedstuffs when compared to a similarly treated control sample. Either experimental approach is acceptable. However, the sponsor must explain how observed *in vitro* effects translate to practical functionality of the enzyme on feed or feed ingredients.

Factors which should be explained in detail in the submission include the apparatus/reagents/protocol used to conduct all functionality experiments. Buffer solutions should be selected so as to provide appropriate pH environments similar to those in which the enzyme product is expected to be used. All control (untreated) samples of feedstuffs shall be treated identically to the enzyme samples, except for the addition of the enzyme. Incubation temperatures for the digestion period should not exceed the range of temperatures normally encountered under practical conditions for enzyme use. The enzyme containing material may be either research or technical grade, but must be similar to that which will be used commercially.

Complete feeds, feed ingredients or feed substrates obtained from a feed ingredient, can be used to simulate the feed to which the enzyme will be applied. These experimental substrates should be similar in analysis and in physical/chemical treatment to the feed which the enzyme will be used for in commercial situations. No less than five samples of each grain/treatment should be used in the trial. Use of feed, feed ingredients or substrates containing grain from several different lots (origins) would be desirable. However, the experimental design should ensure that lots (origins) are not confounded with enzyme treatment, i.e. all of lot 1 treated with the enzyme, while all control samples came from a different lot.

#### **Enzyme Functionality Tested by *in vitro* Activity on Feed**

Collect samples of typical target feed or feed ingredient.

Treat with candidate enzyme mixture for a given period of time at appropriate pH and temperature

Analyze samples for increased levels of breakdown products or decreased concentrations of targeted substrate

Compare results with untreated control samples.

Enzyme treatments which result in significantly altered concentrations of targeted substrate or breakdown products are judged to be utilitarian for practical application

284 **Feed Ingredient Definitions****QUANTIFICATION OF ENZYME PRODUCT**

Methodology is needed to measure the amount of activity of the enzyme product in its marketed concentrated (premix) form. Activity should be expressed as micromoles (moles) of released catalytic product per minute per gram of market product or in other standardized units. It is the responsibility of the sponsor to provide this methodology along with supporting information about its specificity, sensitivity, and accuracy.

- a. Assay Methodology
  1. Enzyme product; and/or
  2. Finished feed
- b. Specificity/Sensitivity
  1. Two-external laboratory validation; or
  2. AOAC International validation, which can include the short form; or
  3. Other recognized methods

**LABELING**

The label should: describe the enzyme source (specific microbial or other source) that is recognized by FDA/AAFCO as safe and useful for the intended purpose; have a full listing of ingredients in order of preponderance; have a guaranteed analysis that is stated in meaningful terms; show a net quantity of product; contain warning and caution statements as needed; not have therapeutic or production claims; allow product identification by means such as lot numbers, expiration dates or another appropriate method of identification; and provide information on product storage, if necessary.

The product should be labeled in accordance with AAFCO and federal regulations. The label will include a guarantee of enzyme activity(ies), expressed in appropriate units. Clear directions for use which are reasonably certain to be followed in practice must be included, as should any known product limitations, such as ineffectiveness on specific forages. Adequate directions for use to enable the user to achieve the functionality of the enzyme(s) should be included, such as the feed ingredient(s) that the enzyme(s) acts on, the amount of product necessary to produce the intended effect, and the length of time required to achieve this effect. If environmental factors, such as feed pH or moisture, or mechanical processing methods, like pelleting or extrusion affect enzyme activity, these restrictions should also be noted on the label. Draft labeling should be included in the initial request of the sponsor.

The label must contain the following sections:

**Name of Product.**

**Functionality Statement.** "Contains a source of     (enzymatic activity)     which can     (function and/or current supported use as stated in Section30.1).    " (statement based on information present in submission)

**Guaranteed Analyses.** (see AAFCO regulations 3 and 4.)

Enzymatic guarantees shall be expressed in appropriate units using either metric or avoirdupois measurements. The chosen units shall correspond with those present in the Use section. The source organism for each type of enzymatic activity shall be specified, such as: Protease (Bacillus subtilis) 5.5 mg amino acids liberated/min./milligram.

If two sources have the same type of activity, they shall be listed in order of predominance based on the amount of enzymatic activity provided. However, the order of the ingredients in the Ingredients section is still determined by the amount (weight) of the different materials in the product.

**Ingredients.** (listed in order of predominance by weight)



**Directions for Use.** Use instructions shall clearly state amount of enzyme required to achieve intended effect and other necessary information required for enzyme functionality.

**Caution/Warning Statements.** (when required)

**Quantity Statement.**

### MANUFACTURING

The sponsor is to provide information on the manufacture of the enzyme or quality controls (specifications) on the enzyme. The quality controls on the raw materials, on the manufacturing process/conditions, and on the enzyme product are to be presented. Appropriate information on product stability, labeling restrictions and special marketing controls are to be provided.

<sup>1</sup>Pariza, M.W. and E.M. Foster. 1983. Determining the safety of enzyme used in food processing. *Journal of Food Protection*. 46(5): 453-468.

<sup>2</sup>JointFAO/WHO Expert Committee on Food Additives. 1990. General specifications for enzyme preparations used in food processing. *Food and Nutrition Paper No. 49*. Pages 80-03.

<sup>3</sup>Anonymous. 1980. *Food Chemical Codex*. Page 107. National Academy Press: Washington.

## 33. FATS AND OILS

Investigator and Section Editor—Kim Young, FDA

NOTE: The use of the term "feed grade" requires that the specific type of product be adequately tested to prove its safety for feeding purposes. In mixed feeds containing fats or fat derivatives the term "feed grade" may be omitted in the ingredient declaration.

NOTE: Any mixture of two or more fats or fat derivatives defined below is to be identified by listing each component: i.e., "animal fat and hydrolyzed vegetable oil."

NOTE: Fats or fat derivatives must come from acceptable animal feed sources. Waste water sludge that contains sanitary sewer water, is not an acceptable source of animal feed. FDA should be contacted regarding the safe use in animal feed of all other sludge material that does not contain sanitary waste water. (Sludge: The suspended or dissolved solid matter resulting from the processing of animal or plant tissue for human food. Waste Water Sludge: The sanitary sewer water and suspended or dissolved solid matter resulting from the processing of animal or plant tissues for human food.

### Official

**33.1 Animal Fat** is obtained from the tissues of mammals and/or poultry in the commercial processes of rendering or extracting. It consists predominantly of glyceride esters of fatty acids and contains no additions of free fatty acids or other materials obtained from fats. It must contain, and be guaranteed for, not less than 90% total fatty acids, not more than 2.5% unsaponifiable matter, and not more than 1% insoluble impurities. Maximum free fatty acids and moisture must also be guaranteed. If the product bears a name descriptive of its kind or origin; i.e., "beef", "pork", "poultry", it must correspond thereto. If an antioxidant is used, the common name or names must be indicated, followed by the words "used as a preservative". (Proposed 1989)

IFN 4-00-409 Animal poultry fat

**33.2 Vegetable Fat, or Oil** is the product of vegetable origin obtained by extracting the oil from seeds or fruits which are commonly processed for edible purposes. It consists predominantly of glyceride esters of fatty acids and contains no additions of free fatty acids or other materials obtained from fats. It must contain,

286 **Feed Ingredient Definitions**

and be guaranteed for, not less than 90% total fatty acids, not more than 2% unsaponifiable matter and not more than 1% insoluble impurities. Maximum free fatty acids and moisture must also be guaranteed. If the product bears a name descriptive of its kind or origin; i.e., "soybean oil", "cottonseed oil", it must correspond thereto. If an antioxidant(s) is used, the common name or names must be indicated, followed by the words "used as a preservative". (Proposed 1989)

IFN 4-05-077 Vegetable oil

**33.3 Hydrolyzed \_\_\_\_\_ Fat, or Oil, Feed Grade** is obtained in the fat processing procedures commonly used in edible fat processing or soap making. It consists predominately of fatty acids and must contain, and be guaranteed for, not less than 85% total fatty acids, not more than 6% unsaponifiable matter, and not more than 1% insoluble impurities. Maximum moisture must also be guaranteed. Its source must be stated in the product name; i.e., "hydrolyzed animal fat", "hydrolyzed vegetable fat", or "hydrolyzed animal and vegetable fat". If an antioxidant(s) is used, the common name or names must be indicated, followed by the words "used as a preservative". (Proposed 1989)

IFN 4-00-376 Animal fat hydrolyzed, IFN 4-05-076 Vegetable oil hydrolyzed

**33.4 \_\_\_\_\_ Ester \_\_\_\_\_, Feed Grade** is the product consisting of methyl, ethyl, or other non-glyceride ester of fatty acids derived from animal and/or vegetable fats. It consists predominantly of the ester and must contain not less than 85% total fatty acids, not more than 10% free fatty acids, not more than 6% unsaponifiable matter (2% for methyl esters) and not more than 1% insoluble matter. Its source must be stated in the product name; i.e., "methyl ester of animal fatty acids", "ethyl ester of vegetable oil fatty acids". Methyl esters must contain not more than 150 parts per million (0.015%) free methyl alcohol. If an antioxidant(s) is used, the common name or names must be indicated, followed by the word "preservative(s)". (Proposed 1958, Amended 1962, Adopted 1968.) Reg. 573.640

IFN 4-00-377 Animal fatty acids of ethyl ester

IFN 4-00-378 Animal fatty acids of methyl ester

IFN 4-00-379 Animal fatty acids of non-glyceride ester

IFN 4-12-240 Vegetable fatty acids of ethyl ester

IFN 4-05-075 Vegetable fatty acids of non-glyceride ester

IFN 4-05-074 Vegetable fatty acids of methyl ester

**33.5 Fat Product, Feed Grade** is any fat product which does not meet the definitions for animal fat, vegetable fat or oil, hydrolyzed fat or fat ester. It must be sold on its individual specifications which will include the minimum percentage of total fatty acids, the maximum percentage of unsaponifiable matter, the maximum percentage of insoluble impurities, the maximum percentage of free fatty acids and moisture. The above listed specifications must be guaranteed on the label. If an antioxidant(s) is used, the common name or names must be indicated, followed by the words "used as a preservative". (Proposed 1989)

IFN 4-00-414 Animal vegetable fat product

**33.6 Corn Endosperm Oil** is obtained by the extraction of oil from corn gluten. It consists predominantly of free fatty acids and glycerides, and must contain not less than 85% total fatty acids, not more than 14% unsaponifiable matter, and not more than 1% insoluble matter. If an antioxidant(s) is used, the common name or names must be indicated followed by the word "preservative(s)". (Proposed 1963, Adopted 1968.) Reg. 8.322

IFN 4-02-852 Maize endosperm oil

**33.7 Vegetable Oil Refinery Lipid, Feed Grade.** Vegetable Oil Refinery Lipid, Feed Grade is obtained in the alkaline refining of a vegetable oil for edible use. It

consists predominantly of the salts of fatty acids, glycerides, and phosphates. It may contain water and not more than 22% ash on a water-free basis. It may or may not be acidulated before using in commercial feeds, but if acidulated, it should be neutralized. (Proposed 1964, Adopted 1968, Amended 1980, Amended 1996, Adopted 1999)

IFN 4-05-078 Vegetable oil refinery lipid

**33.8 Corn Syrup Refinery Insolubles, Feed Grade** is obtained in the refining of a corn syrup. It consists predominantly of the fatty fraction of corn starch together with protein and residual carbohydrate. It may contain water and not more than 7% ash nor less than 50% fat on a water-free basis. (Proposed 1964, Adopted 1968.)

IFN 4-02-893 Maize syrup process residue

**33.14 Calcium Salts of Long-Chain Fatty Acids** are the reaction products between calcium and long-chain fatty acids of vegetable and/or animal origin. They shall contain a maximum of 20% lipid not bound in the calcium salt form and the percent total fat shall be indicated. The unsaponifiable matter (exclusive of calcium salts) shall not exceed 4% and moisture shall not exceed 5%. If an antioxidant(s) is used, its common name(s) must be indicated on the label. Prior to conducting an assay for total fats, hydrolysis of the calcium salts should be performed to liberate the lipid fraction. (Adopted 1993)

**33.15 Hydrolyzed \_\_\_\_\_ Sucrose Polyesters, Feed Grade** is the product resulting from the acid hydrolysis of sucrose polyesters, such as olestra, to make them digestible. It shall consist predominantly of fatty acids and contain, and be guaranteed for, not less than 85% total fatty acids, not more than 2% Sucrose Polyesters (hex ester and above), not more than 2% unsaponifiable matter, and not more than 2% insoluble impurities. Maximum moisture must also be guaranteed. Its source must be stated in the product name; i.e., "Hydrolyzed animal sucrose polyesters," "Hydrolyzed vegetable sucrose polyesters," or "Hydrolyzed animal and vegetable sucrose polyesters." If an antioxidant(s) is used, the common name or names must be indicated, followed by the words "used as a preservative." (Proposed 1993, Adopted 1994)

## 36. FERMENTATION PRODUCTS

Investigator and Section Editor--Mika Alewynse, FDA

### Official

**36.1 Condensed, Extracted Glutamic Acid Fermentation Product** is a concentrated mixture of the liquor remaining from the extraction of glutamic acid, combined with the cells of *Corynebacterium lilium* or *Corynebacterium glutamicum* used to produce the glutamic acid. (Proposed 1964, Adopted 1965, Amended 1995, Adopted 1997.) Reg. 573.500

IFN 5-01-595 Glutamic acid fermentation residue condensed

**36.2 Extracted \_\_\_\_\_ Presscake** is the filtered and dried mycelium obtained from \_\_\_\_\_ fermentation. (For label identification the source must be indicated as penicillium, streptomyces, citric acid, etc.) (Adopted 1951.)

IFN 5-07-154 Penicillium fermentation presscake dehydrated

IFN 5-07-155 Streptomyces fermentation presscake dehydrated

IFN 5-07-156 Citric acid fermentation presscake dehydrated

**36.3 Extracted \_\_\_\_\_ Meal** is the ground \_\_\_\_\_ presscake. (For label identification the source must be indicated as penicillium, streptomyces, citric acid, etc.) (Adopted 1951.)

IFN 5-06-163 Penicillium fermentation presscake meal extracted

288 **Feed Ingredient Definitions**

IFN 5-06-164 Streptomyces fermentation presscake meal extracted

IFN 5-06-162 Citric acid fermentation presscake meal extracted

**36.4 Dried Extracted \_\_\_\_\_ Fermentation Solubles** is the dried extracted broth obtained from \_\_\_\_\_ fermentation. (For label identification the source must be indicated such as penicillin, streptomyces, or citric acid, or as permitted by FDA.) (Proposed 1988, Amended 1992, Amended 1997, Adopted 2000)

IFN 5-06-166 Penicillium fermentation solubles extracted dehydrated

IFN 5-06-176 Streptomyces fermentation solubles extracted dehydrated

IFN 5-06-165 Citric acid fermentation solubles extracted dehydrated

**36.6 Dried \_\_\_\_\_ Fermentation Extract** is the dried product resulting from extracting and precipitating by means of non-aqueous solvents or other suitable means, the water soluble materials from a fermentation conducted for maximum production of enzymes using a non-pathogenic strain of the microorganism \_\_\_\_\_ in accordance with good manufacturing practices. (For label identification the source must be indicated such as B subtilis, A. oryzae, A. niger, or as permitted by FDA.) (Proposed 1988, Amended 1992, Amended 1997, Adopted 2000)

IFN 5-06-147 Bacillus subtilis fermentation extract dehydrated

IFN 5-06-148 Aspergillus niger fermentation extract dehydrated

IFN 5-06-149 Aspergillus oryzae fermentation extract dehydrated

**36.7 Dried \_\_\_\_\_ Fermentation Solubles** is the dried material resulting from drying the water soluble materials after separation of suspended solids from a fermentation conducted for maximum production of enzymes using a non-pathogenic strain of the microorganism \_\_\_\_\_ in accordance with good manufacturing practices. (For label identification the source must be indicated such as B. subtilis, A. oryzae, A. niger, or as permitted by FDA.) (Proposed 1988, Amended 1992, Amended 1997, Adopted 2000)

IFN 5-29-779 Bacillus subtilis fermentation solubles dehydrated

IFN 5-29-781 Aspergillus niger fermentation solubles dehydrated

IFN 5-29-780 Aspergillus oryzae fermentation solubles dehydrated

**36.9 Undried Extracted \_\_\_\_\_ Solids and Fermentation Solubles** is undried mycelium and extracted broth or the extracted and undried mycelium and broth obtained from \_\_\_\_\_ fermentation. (For label identification the source must be indicated such as penicillium, streptomyces, citric acid, or as permitted by FDA.) (Proposed 1988, Amended 1997, Adopted 2000)

IFN 5-06-171 Citric acid fermentation solids with solubles liquid

IFN 5-06-172 Penicillium fermentation solids with solubles liquid

IFN 5-06-173 Streptomyces fermentation solids with solubles liquid

**36.10 Condensed \_\_\_\_\_ Fermentation Solubles** is the product resulting from the removal of a considerable portion of the liquid by-product resulting from the action of the ferment on the basic medium of grain, molasses, whey, or other media. (For label identification, the source must be indicated as "Condensed (Whey, Grain, or Molasses) Fermentation Solubles." (Adopted 1958, Amended 1951, 1980.)

IFN 5-06-300 Cattle whey fermentation solubles condensed

IFN 4-07-153 Cereals grain fermentation solubles condensed

IFN 5-25-399 Sugarcane molasses fermentation solubles condensed

**36.11 Dried \_\_\_\_\_ Fermentation Product** is the product derived by culturing \_\_\_\_\_ on appropriate nutrient media for the production of one or more of the following: enzymes, fermentation substances, or other microbial metabolites,

and dried in accordance with approved methods and good manufacturing practices. Protein, amino acids, fat, fiber, cell count, enzyme activity or nutrient metabolite level shall be guaranteed where applicable. If *Corynebacterium glutamicum* is used as a source of L-lysine, the label must provide a minimum guarantee for L-lysine and directions for use advising a maximum use limitation of 1% in swine and poultry complete diets. Use of *Lactobacillus buchneri* is limited to silage and high moisture corn grain in plant inoculant products. (For label identification the source must be indicated such as *B. subtilis*, *A. oryzae*, *A. niger*, *Corynebacterium glutamicum*, *Lactobacillus acidophilus*, *Lactobacillus buchneri*, *Lactobacillus bulgaricus* or *Streptococcus faecium*, or as permitted by FDA.) (Proposed 1976, Adopted 1983, Amended 1997, Amended 1999, Amended 2001, Adopted 2003.)

IFN 5-06-150 *Bacillus subtilis* fermentation product dehydrated

IFN 5-06-151 *Aspergillus niger* fermentation product dehydrated

IFN 5-06-152 *Aspergillus oryzae* fermentation product dehydrated

IFN 5-06-153 *Lactobacillus acidophilus* fermentation product dehydrated

IFN 5-06-154 *Lactobacillus bulgaricus* fermentation product dehydrated

IFN 5-06-155 *Enterococcus* (formerly *Streptococcus*) *faecium* fermentation product dehydrated

*Corynebacterium glutamicum* fermentation product dehydrated

**36.12 Liquid \_\_\_\_\_ Fermentation Product** is the liquid product derived by culturing or fermenting \_\_\_\_\_ on appropriate liquid nutrient media for the production of one or more of the following: enzymes, fermentation substances, or other microbial metabolites, and stabilized by approved methods in accordance with good manufacturing practices. Percent solids, cell count, enzyme activity or nutrient metabolite level shall be guaranteed where applicable. (For label identification the source must be indicated such as *B. subtilis*, *A. oryzae*, *A. niger*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus* or *Streptococcus faecium*, or as permitted by FDA.) (Proposed 1976, Amended 1979, Adopted 1983, Amended 1997.)

IFN 5-06-156 *Bacillus subtilis* fermentation product liquid

IFN 5-06-157 *Aspergillus niger* fermentation product liquid

IFN 5-06-158 *Aspergillus oryzae* fermentation product liquid

IFN 5-06-159 *Lactobacillus acidophilus* fermentation product liquid

IFN 5-06-160 *Lactobacillus bulgaricus* fermentation product liquid

IFN 5-06-161 *Enterococcus* (formerly *Streptococcus*) *faecium* fermentation product liquid

Note: Dried Cultured Skimmed Milk--refer to 54.5 Milk Products Section.  
Condensed Cultured Skimmed Milk--refer to 54.6 Milk Products Section.

**36.13 Extracted \_\_\_\_\_** is the filtered and dried mycelium obtained from \_\_\_\_\_ fermentation. (For label identification the source must be indicated as *penicillium*, *streptomyces*, or *citric acid* and must be stated as that in the second word of the name. The third word of the name is for the form of the ingredient, i.e. *presscake*, *meal*, or *pellets*.) (Proposed 1988, Adopted 1997)

IFN 5-07-154 *Penicillium* fermentation *presscake* dehydrated

IFN 5-07-155 *Streptomyces* fermentation *presscake* dehydrated

IFN 5-07-156 *Citric acid* fermentation *presscake* dehydrated

IFN 5-06-163 *Penicillium* fermentation *presscake meal* extracted

IFN 5-06-164 *Streptomyces* fermentation *presscake meal* extracted

IFN 5-06-162 *Citric acid* fermentation *presscake meal* extracted

290 **Feed Ingredient Definitions**

**36.14 Direct-Fed Microorganisms--** The following microorganisms were reviewed by the Food and Drug Administration, Center for Veterinary Medicine and found to present no safety concerns when used in direct-fed microbial products:

Aspergillus niger	Lactobacillus curvatus
Aspergillus oryzae	Lactobacillus delbruekii
Bacillus coagulans	Lactobacillus fermentum
Bacillus lentus	Lactobacillus helveticus
Bacillus licheniformis	Lactobacillus lactis
Bacillus pumilus	Lactobacillus plantarum
Bacillus subtilis	Lactobacillus reuteri
Bacteroides amylophilus	Leuconostoc mesenteroides
Bacteroides capillosus	Pediococcus acidilacticii
Bacteroides ruminicola	Pediococcus cerevisiae (damnosus)
Bacteroides suis	Pediococcus pentosaceus
Bifidobacterium adolescentis	Propionibacterium acidipropionici (cattle only)
Bifidobacterium animalis	Propionibacterium freudenreichii
Bifidobacterium bifidum	Propionibacterium shermanii
Bifidobacterium infantis	Saccharomyces cerevisiae
Bifidobacterium longum	*Enterococcus cremoris
Bifidobacterium thermophilum	*Enterococcus diacetylactis
Lactobacillus acidophilus	*Enterococcus faecium
Lactobacillus brevis	*Enterococcus intermedius
Lactobacillus buchneri (cattle only)	*Enterococcus lactis
Lactobacillus bulgaricus	*Enterococcus thermophilus
Lactobacillus casei	Yeast (as defined elsewhere)
Lactobacillus farciminis (swine only)	
Lactobacillus cellobiosus	

(Proposed 1991, Adopted 1993, Amended 2001, 2004, 2006)

\*Formerly cataloged as Streptococcus.

### 39. FLAX PRODUCTS

(See **OTHER OILSEED PRODUCTS** Section 71)

#### 42. GRAIN SORGHUMS (MILO, HEGARI, KAFFIR, or FETERITA)

Investigator and Section Editor--Roger Hoestenbach, TX

##### Official

**42.1 Ground Grain Sorghum** is the entire product made by grinding the grains of grain sorghum. (Adopted 1947, Amended 1962, 1964.)

IFN 4-04-379 Sorghum grain ground

IFN 4-04-378 Sorghum grain cracked

NOTE: The word "cracked" must be substituted for the word "ground" in the above definition when the product is cracked instead of ground.

**42.2 Grain Sorghum Gluten Feed** is that part of the grain of grain sorghums that remains after the extraction of the larger part of the starch and germ, by the processes employed in the wet milling manufacture of starch or syrup. (Adopted 1948, Amended 1950.)

IFN 5-04-389 Sorghum gluten with bran meal

**42.3 Grain Sorghum Gluten Meal** is that part of the grain of grain sorghums that remains after the extraction of the larger part of the starch and germ, and the

**Feed Ingredient Definitions 291**

separation of the bran by the processes employed in the wet milling manufacture of starch or syrup. (Adopted 1948, Amended 1950.)

IFN 5-04-388 Sorghum gluten meal

**42.4 Grain Sorghum Germ Cake or Grain Sorghum Germ Meal** consists of the germ of grain sorghum grains from which part of the oil has been pressed and is the product obtained in the wet milling process of manufacture of starch, syrup, and other grain sorghum products. (Adopted 1948, Amended 1950, 1960, 1963.)

IFN 5-04-377 Sorghum germs meal mechanical extracted

IFN 5-12-178 Sorghum germs mechanical extracted caked

**42.6 Rolled Grain Sorghum** is obtained by running whole grain sorghum over smooth flaking rolls, after properly tempering, removing most of the fine particles and subsequently dried and cooled. (Adopted 1953.)

IFN 4-04-380 Sorghum grain rolled

**42.7 Grain Sorghum Grits** consists of the hard flinty portions of sorghums containing little or no bran or germ. (Adopted 1959.)

IFN 4-04-384 Sorghum grits

**42.8 Gelatinized Sorghum Grain Flour** is obtained from the endosperm of sorghum grain which has been gelatinized and reduced to a finely ground meal and must contain not more than 1% crude fiber. (Proposed 1965, Adopted 1966.)

IFN 4-08-035 Sorghum flour gelatinized

**42.9 Partially Aspirated Sorghum Grain Flour** is obtained from whole sorghum grain which has been partially aspirated and has been gelatinized and reduced to a finely ground meal and must contain not more than 2.5% crude fiber. (Proposed 1965, Adopted 1966.)

IFN 4-08-036 Sorghum flour partially aspirated gelatinized

**42.10 Grain Sorghum Mill Feed** is a mixture of grain sorghum bran, grain sorghum germ, part of the starchy portion of grain sorghum kernels, or mixture thereof as produced in the manufacture of grain sorghum grits and refined meal and flour and must contain not less than 5% crude fat and not more than 6% crude fiber. (Proposed 1964, Adopted 1968.)

IFN 4-04-385 Sorghum grits by-product

**NOTE:** Any of the types shown parenthetically in the heading for this section may be substituted for the words "grain sorghums" in the above definitions. If the name of the type is given it must correspond thereto.

**45. LESPEDEZA PRODUCTS****Official**

**45.1 Lespedeza Meal** is obtained by grinding lespedeza hay which is reasonably free of other crop plants, weeds, and mold. It must not contain more than 28% crude fiber. (Adopted 1938, Amended 1963.)

IFN 1-02-523 Lespedeza hay sun-cured ground

**45.2 Lespedeza Stem Meal** is the ground product remaining after the separation of the leafy material from lespedeza hay or meal. It must be reasonably free from other crop plants and weeds. (Adopted 1938, Amended 1963.)

IFN 1-02-529 Lespedeza stems sun-cured ground

**48. MAIZE**

Investigator and Section Editor--Ken Jackson, NE

**Official**

292 **Feed Ingredient Definitions**

**48.1 Corn Cob Fractions** is obtained by the mechanical separation of one or more fractions of corn cobs. For identification purposes the name of the fraction must be included parenthetically following the name of the product; i.e., Corn Cob Fractions (Hard Woody Ring and Beeswings). (Proposed 1958, Adopted 1964.)

IFN 1-02-779 Maize cob fractions screened

**48.2 Corn Bran** is the outer coating of the corn kernel, with little or none of the starchy part of germ. (Adopted 1931.)

IFN 4-02-841 Maize bran

**48.3 Corn Feed Meal** is the fine siftings obtained from screened cracked corn, with or without its aspiration products added. (Adopted 1941.)

IFN 4-02-880 Maize grain fines

**48.4 Ground Corn** is the entire corn kernel ground or chopped. It must contain not more than 4% foreign material. May also appear in the ingredient list of a mixed feed as Corn Meal or Corn Chop. (Adopted 1931.)

IFN 4-02-861 Maize grain ground

**48.5 Cracked Corn** is the entire corn kernel ground or chopped. It must contain not more than 4% foreign material. (Adopted 1931.)

IFN 4-02-854 Maize grain cracked

**48.6 Screened Cracked Corn** is the coarse portion of cracked corn from which most of the fine particles have been removed and may be fine, medium, or coarse. It must contain not more than 4% foreign material. (Adopted 1941.)

IFN 4-02-862 Maize grain cracked screened

**48.7 Corn Grits** is the medium sized hard flinty portions of ground corn containing little or none of the bran or germ. May also appear in the ingredient list of a mixed feed as Hominy Grits. (Adopted 1941.)

IFN 4-02-886 Maize grits

**48.8 Corn Flour** is the fine sized hard flinty portions of ground corn containing little or none of the bran or germ. (Adopted 1941, Amended 1960.)

IFN 4-08-024 Maize flour

**48.9 Ground Ear Corn** is the entire ear of corn ground, without husks, with no greater portion of cob than occurs in the ear corn in its natural state. May also appear in the ingredient list of a mixed feed as Corn and Cob Meal or Ear Corn Chop. (Adopted prior to 1928, Amended 1956.)

IFN 4-02-849 Maize ears ground

**48.10 Ground Ear Corn with Husks** is the entire ear of corn with husks ground or chopped, with not greater proportion of cob than occurs in the ear corn in its natural state. May also appear in the ingredient list of a mixed feed as Corn and Cob Meal with Husks, or Ear Corn Chop with Husks. (Adopted prior to 1928, Amended 1956.)

IFN 4-02-850 Maize ears with husks ground

**48.11 Flaked Corn** is obtained by running cracked corn which has been aspirated and properly tempered, over smooth flaking rolls and subsequently dried and cooled. (Adopted 1946.)

IFN 4-02-859 Maize grain flaked

**48.12 Toasted Corn Flakes** is obtained by running cracked corn which has been aspirated and properly tempered, over smooth flaking rolls, and subsequently dried, cooled, and toasted. (Adopted 1953.)

IFN 4-02-860 Maize grain flaked toasted



**48.13 Corn Gluten Feed** is that part of the commercial shelled corn that remains after the extraction of the larger portion of the starch, gluten, and germ by the processes employed in the wet milling manufacture of corn starch or syrup. It may or may not contain one or more of the following: fermented corn extractives, corn germ meal. (Adopted 1936, Amended 1960.)

IFN 5-02-903 Maize gluten with bran

**48.14 Corn Gluten Meal** is the dried residue from corn after the removal of the larger part of the starch and germ, and the separation of the bran by the process employed in the wet milling manufacture of corn starch or syrup, or by enzymatic treatment of the endosperm. It may contain fermented corn extractives and/or corn germ meal. (Adopted 1936, Amended 1960.)

IFN 5-02-900 Maize gluten meal

**48.16 Hominy Feed** is a mixture of corn bran, corn germ, and part of the starchy portion of either white or yellow corn kernels or mixture thereof, as produced in the manufacture of pearl hominy, hominy grits, or table meal, and must contain not less than 4% crude fat. If prefixed with the words "white" or "yellow", the product must correspond thereto. (Adopted 1935.)

IFN 4-02-887 Maize grits by-product (Hominy Feed)

IFN 4-02-011 Maize dent yellow grits by-product (Hominy Feed)

IFN 4-02-990 Maize dent white grits by-product (Hominy Feed)

**48.17 Dried Corn Syrup** is a dried product from corn syrup, a purified concentrated aqueous solution of nutritive saccharides obtained from starch having a dextrose equivalent of 20 or more. (Proposed 1971, Adopted 1973.)

IFN 4-02-892 Maize syrup dehydrated

**48.18 Hydrolyzed Corn Protein** is the product resulting from complete hydrolysis of isolated corn gluten, and after partial removal of the glutamic acid. (Adopted 1956.)

IFN 5-02-901 Maize gluten hydrolyzed

**48.19 Kibbled Corn** is obtained by cooking cracked corn under steam pressure and extruding from an expeller or other mechanical pressure device. (Adopted 1958.)

IFN 4-02-866 Maize grain kibbled

**48.20 Dehydrated Corn Plant** is the entire corn plant consisting of the ear, leaves, and stalk, which has been artificially dried and ground. (Adopted 1958.)

IFN 1-02-768 Maize aerial part dehydrated

**48.21 Ground Corn Cob** is the product resulting from grinding the entire cob. If it is designated as "Fine Ground", the entire grind must pass through a number 10 sieve and 33% of the total material must pass through a number 20 sieve. If it is designated "Coarse Ground", the entire grind must pass through a number four sieve and 50% must pass through a number 10 sieve. If it is designated as "Dehydrated", it must contain not more than 10% moisture. (Adopted 1958.)

IFN 1-02-780 Maize cobs dehydrated coarse ground

IFN 1-02-781 Maize cobs dehydrated fine ground

IFN 1-02-782 Maize cobs ground

**48.22 Corn Germ Meal (Dry Milled)** is ground corn germ which consists of corn germ with other parts of the corn kernel from which part of the oil has been removed and is the product obtained in the dry milling process of manufacture of corn meal, corn grits, hominy feed, and other corn products. (Definitions combined 1960.)

IFN 5-02-894 Maize germs meal dry milled mechanical extracted

294 **Feed Ingredient Definitions**

**48.23 Corn Germ Meal (Wet Milled)** is ground corn germ from which most of the solubles have been removed by steeping and most of the oil removed by hydraulic, expeller, or solvent extraction processes, and is obtained in the wet milling process of manufacture of corn starch, corn syrup, or other corn products. (Proposed 1960, Adopted 1961.)

IFN 5-02-897 Maize germs without extractives meal wet milled mechanical extracted

IFN 5-02-898 Maize germs without extractives meal wet milled solvent extracted

**48.24 Condensed Fermented Corn Extractives** is obtained by the partial removal of water from the liquid resulting from steeping corn in a water and sulphur dioxide solution which is allowed to ferment by the action of naturally occurring lactic acid producing microorganisms as practiced in the wet milling of corn. (Proposed 1959, Amended 1960, Adopted 1961)

IFN 4-02-890 Maize extractives fermented condensed

**48.25 Maltodextrins** is a purified concentrated aqueous solution of nutritive saccharides, or a dried product derived from said solution, derived from starch having a dextrose equivalent of less than 20. (Proposed 1971, Adopted 1973)

IFN 4-08-023 Maize starch heat hydrolyzed

**48.26 Solvent Extracted Hominy Feed** is hominy feed from which the fat has been extracted by the solvent process. (Proposed 1965, Adopted 1966)

IFN 4-08-025 Maize grits by-product solvent extracted (Hominy feed)

IFN 4-29-354 Maize grain heat processed

IFN 4-02-863 Maize grain heat processed flaked

IFN 4-02-864 Maize grain heat processed ground

IFN 4-02-865 Maize grain heat processed pelleted

**48.30 Liquified Corn Product** is the product resulting from pressure hydrolysis of corn (steam cooking) and enzymatic treatment of the corn without removing any of the component parts. It shall contain not less than 30% solid. (Proposed 1978, Amended 2002, Adopted 2004)

IFN 4-28-211 Maize grain hydrolyzed liquid

**48.31 Gelatinized Corn Flour** is obtained from endosperm of corn which has been gelatinized and reduced to a finely ground meal and must contain not more than 1% crude fiber. (Proposed 1978, Adopted 2002)

IFN 4-07-022 Maize flour gelatinized

**48.32 Corn Germ Dehydrated** consists of whole corn germ with other parts of the corn kernel from which the oil has not been removed, and is the product obtained in the dry and wet milling process of manufacture of corn meal, corn grits, hominy feed, corn starch, corn syrup or other corn products. (Proposed 2002, Adopted 2004)

**48.88 Corn Refinery Concentrate** is the concentration of sweetwaters, by filtration and evaporation, which are by-products in the production of corn syrup. The total sugars expressed as invert and the moisture level shall be guaranteed. (Proposed 1993, Adopted 2005)

## 51. MARINE PRODUCTS

Investigator and Section Editor--Teresa Crenshaw, DE

### Official

**51.14 Fish Meal** is the clean, dried, ground tissue of undecomposed whole fish or fish cuttings, either or both, with or without the extraction of part of the oil. If it contains more than 3% salt (NaCl), the amount of salt must constitute a part of the

product name, provided that in no case must the salt content of this product exceed 7%. The label shall include guarantees for minimum crude protein, minimum crude fat, maximum crude fiber, minimum phosphorus (P) and minimum and maximum calcium (Ca). If it bears a name descriptive of its kind, it must correspond thereto. (Adopted 1933, Amended 1984, Amended 2003, 2004)

IFN 5-01-977 Fish meal mechanical extracted

**51.24 Fish Residue Meal** is the clean, dried, undecomposed residue from the manufacture of glue from non-oily fish. If it contains more than 3% salt (NaCl), the amount of salt must constitute a part of the product name, provided that in no case must the salt content of this product exceed 7%. (Adopted 1933, Amended 2003)

IFN 5-01-966 Fish glue residue meal

**51.34 Fish Liver and Glandular Meal** is obtained by drying the complete viscera of the fish. At least 50% of the dry weight of the product must be derived from fish liver and must contain at least 18 milligrams of riboflavin per pound. (Adopted 1944, Amended 1945)

IFN 5-01-973 Fish viscera meal

**51.4 Crab Meal** is the undecomposed ground dried waste of the crab and contains the shell, viscera, and part or all of the flesh. It must contain not less than 25% crude protein. If it contains more than 3% salt (NaCl), the amount of salt must constitute a part of the product name, provided that in no case must the salt content of this product exceed 7%. (Adopted 1933, Amended 2003)

IFN 5-01-663 Crab process residue meal

**51.5 Shrimp Meal** is the undecomposed ground dried waste of shrimp and contains parts and/or whole shrimp. If it contains more than 3% salt (NaCl), the amount of salt must constitute a part of the product name, provided that in no case must the salt content of this product exceed 7%. (Adopted 1933, Amended 1963, Amended 2003)

IFN 5-04-226 Shrimp process residue meal

**51.6 Condensed Fish Solubles** is obtained by evaporating excess moisture from the stickwater, aqueous liquids, resulting from the wet rendering of fish into fish meal, with or without removal of part of the oil. Minimum percent of solids, minimum percent of crude protein, and minimum percent of crude fat must be guaranteed. (Proposed 1993, Adopted 1996)

**51.7 Dried Fish Solubles** is obtained by dehydrating the stickwater. It must contain not less than 60% crude protein. (Proposed 1963, Adopted 1964)

IFN 5-01-971 Fish solubles dehydrated

**51.8 Fish Oil** is the oil from rendering whole fish or cannery waste. (Proposed 1963, Adopted 1964)

IFN 7-01-965 Fish oil

**51.9 Fish Protein Concentrate—Feed Grade** is prepared from clean, undecomposed whole fish or fish cuttings using the solvent extraction process developed for the production of edible whole fish protein concentrate. It must contain not less than 70% protein and not more than 10% moisture. If the degree of fineness is stated, it must conform thereto. Solvent residues are not to exceed those established in Food Additive Regulations. (Proposed 1969, Adopted 1970, Amended 1971) Reg. 573.440

IFN 5-09-334 Fish protein concentrate solvent extracted

**51.10 Fish By-products** must consist of non-rendered, clean undecomposed portions of fish (such as, but not limited to, heads, fins, tails, ends, skin, bone and

296 **Feed Ingredient Definitions**

viscera) which result from the fish processing industry. If it bears a name descriptive of its kind, it must correspond thereto. Any single constituent used as such may be labeled according to the common or usual name of the particular portion used (such as fish heads, fish tails, etc). (Proposed 1974, Adopted 1975)

IFN 5-14-509 Fish process residue fresh

**51.11 Dried Fish Protein Digest** is the dried enzymatic digest of clean undecomposed whole fish or fish cuttings using the enzyme hydrolysis process. The product must be free of bones, scales and undigested solids with or without the extraction of part of the oil. It must contain not less than 80% protein and not more than 10% moisture. If the degree of fineness is stated, it must conform thereto. (Proposed 1978, Adopted 1979)

IFN 5-18-778 Fish Protein hydrolyzed dehydrated

**51.12 Condensed Fish Protein Digest** is the condensed enzymatic digest of clean undecomposed whole fish or fish cuttings using the enzyme hydrolysis process. The product must be free of bones, scales, and undigested solids with or without the extraction of part of the oil. It must contain not less than 30% protein. (Proposed 1978, Adopted 1979)

IFN 5-17-779 Fish Protein hydrolyzed condensed

**51.13 Fish Digest Residue** is the clean, dried, undecomposed residue (bones-scales-undigested solids) of the enzymatic digest resulting from the enzyme hydrolysis process of producing fish protein digest. It must be designated according to its protein, calcium and phosphorus content. (Proposed 1978, Adopted 1979)

IFN 5-27-467 Fish Protein Residue hydrolyzed dehydrated

**51.15 Fish Stock/Broth** is obtained by cooking fish and/or other marine animal products, including bones, shells, parts, and/or muscle, but not including fish solubles. The crude protein content of the stock/broth base material must be no less than 90% on a dry matter basis. In order for the stock/broth to be labeled as such, the moisture-to-crude protein ration must not exceed 135:1 (135 parts water to 1 part crude protein). If the product bears a name descriptive of its kind, composition or origin, it must correspond thereto; **and may be called either stock or broth.** (Proposed 1999, Amended 2001, Adopted 2002)

**51.16 Dried Shellfish Digest** is the dried enzymatic digest of clean undecomposed shellfish (crustaceans and/or mollusks), using the enzyme hydrolysis process. The product may contain shells, viscera, and part or all of the flesh, and must be free of undigested solids with or without the extraction of part of the oil. It must contain not less than 50% crude protein with not more than 10% moisture. If the degree of fineness is stated, it must conform thereto. If the product bears a name descriptive of its kind, composition or origin, it must correspond thereto. (Proposed 2001, Adopted 2002)

#### 54. MILK PRODUCTS

Investigator and Section Editor--Richard Uncles, NH.

##### Official

**54.1 Dried Buttermilk, Feed Grade** is the residue obtained by drying buttermilk. It contains 8% maximum moisture, 13% maximum ash, and 5% minimum milk fat (Roese-Gottlieb method).\* (Adopted 1932, Amended 1964.)

IFN 5-01-160 Cattle buttermilk dehydrated

**54.2 Condensed Buttermilk** is the residue obtained by evaporating buttermilk. It contains 27% minimum total solids, 0.055% minimum milk fat for each % of total

solids, and 0.14% maximum ash for each % of total solids. (Adopted prior to 1928, Amended 1944, 1964)

IFN 5-01-159 Cattle buttermilk condensed

**54.3 Dried Skimmed Milk, Feed Grade**, is the residue obtained by drying defatted milk. It contains 8% maximum moisture.\* (Adopted 1930, Amended 1964.)

IFN 5-01-175 Cattle skim milk dehydrated

**54.4 Condensed Skimmed Milk** is the residue obtained by evaporating defatted milk. It contains 27% minimum total solids. (Adopted 1930, Amended 1964)

IFN 5-01-172 Cattle skim milk condensed

**54.5 Dried Cultured Skim Milk** is the residue obtained by drying lactic acid bacteria cultured defatted milk. It contains 8% maximum moisture. (Adopted 1932, Amended 1964)

IFN 5-01-174 Cattle skimmilk cultured dehydrated

**54.6 Condensed Cultured Skim Milk** is the residue obtained by evaporating lactic acid bacteria cultured defatted milk. It contains 27% minimum total solids. (Adopted 1932, Amended 1964)

IFN 5-01-173 Cattle skimmilk cultured condensed

**54.7 Dried (Dry) Whey** is the product obtained by removing water from whey. It contains not less than 11 percent protein nor less than 61 percent lactose. (Adopted 1934, Amended 1948, 1950, 1951, 1964, 1981)

IFN 4-01-182 Cattle whey dehydrated

**54.8 Condensed Whey** is the product obtained by partially removing water from whey. Minimum percent solids must be prominently declared on the label. (Adopted 1944, Amended 1951, 1963, 1964, 1982)

IFN 4-01-180 Cattle whey condensed

**54.9 Dried (Dry) Whey Solubles** is obtained by drying the whey residue after removal of whey protein, with or without partial removal of lactose. Minimum percent of crude protein and lactose and maximum percent ash must be prominently declared on the label. (Adopted 1944, Amended 1964, 1982)

IFN 4-01-189 Cattle whey solubles dehydrated

**54.10 Condensed Whey Solubles** is the product obtained by concentrating the whey residue after removal of whey protein, with or without partial removal of lactose. Minimum percent of solids, crude protein and lactose and maximum percent ash must be prominently declared on the label. (Adopted 1944, Amended 1964, 1982)

IFN 4-01-188 Cattle whey solubles condensed

**54.11 Dried Hydrolyzed Whey** is the residue obtained by drying lactase enzyme hydrolyzed whey. It contains 30% minimum total glucose and galactose. (Adopted 1955, Amended 1964)

IFN 4-01-184 Cattle whey hydrolyzed dehydrated

**54.12 Condensed Hydrolyzed Whey** is the residue obtained by evaporating lactase enzyme hydrolyzed whey. It contains 50% minimum total solids and 0.3% minimum total glucose and galactose for each percent total solids. (Adopted 1955, Amended 1964)

IFN 4-01-183 Cattle whey hydrolyzed condensed

**54.13 Condensed Whey Product** is the product obtained by partially removing water from whey from which a portion of the lactose, protein and/or minerals have been removed. The minimum percent of solids, crude protein, and lactose and the maximum percent ash must be prominently declared on the label. May also be

## 298 Feed Ingredient Definitions

labeled "condensed reduced minerals whey" or "condensed reduced lactose whey", if appropriate. (Adopted 1948, Amended 1964, 1982)

IFN 4-01-185 Cattle whey low lactose condensed

**54.14 Dried (Dry) Whey Product** is the product obtained by drying whey from which a portion of the lactose, protein and/or minerals have been removed. The minimum percent of crude protein and lactose and maximum percent ash must be prominently declared on the label. May also be labeled as "dried reduced minerals whey" or "dried reduced lactose whey" if appropriate. (Adopted 1951, Amended 1952, 1964, 1982)

IFN 4-01-186 Cattle whey low lactose dehydrated

**54.15 Condensed Cultured Whey** is the product obtained by partially removing water from whey which has been cultured. The minimum percent of solids must be prominently declared on the label. (Adopted 1949, Amended 1964)

IFN 4-01-181 Cattle whey cultured condensed

**54.16 Casein** is the solid residue obtained by acid or rennet coagulation of defatted milk. It contains 80% minimum crude protein. (Adopted 1946, Amended 1964)

IFN 5-01-162 Casein acid precipitated dehydrated

**54.17 Cheese Rind** is obtained by cooking cheese trimming devoid of fat other than milk fat. (Adopted 1935, Amended 1964)

IFN 5-01-163 Cattle cheese rind

**54.18 Dried Lactalbumin** is the dried coagulated protein residue from whey. It contains 80% minimum crude protein on a moisture free basis. (Adopted 1952, Amended 1964, 1989)

IFN 5-01-177 Cattle whey albumin

**54.19 Dried Milk, Feed Grade** is the residue obtained by drying whole milk or milk of intermediate fat levels other than defatted milk. If the product qualifies as dried whole milk by containing a minimum of 26% milk fat, that term may be used as the ingredient name. The label must contain a guarantee for minimum crude protein and for minimum crude fat (Roese-Gottlieb method)\* (Adopted 1952, Amended 1964, 1995)

**54.20 Dried Milk Protein** is obtained by drying the coagulated protein residue resulting from the controlled co-precipitation of casein, lactalbumin, and minor milk proteins from defatted milk. (Proposed 1965, Adopted 1966)

IFN 5-08-044 Cattle milk protein dehydrated

**54.21 Dried Hydrolyzed Casein** is the residue obtained by drying the water-soluble product resulting from the enzymatic digestion of casein. It contains 74% minimum crude protein. (Proposed 1966, Adopted 1967)

IFN 5-08-055 Casein hydrolyzed dehydrated

**54.22 Dairy Food By-Products** are the products resulting from the collection of solids contained in the wash water from the normal processing and packaging of various foods manufacturing plants. Dairy products are the primary source but non-dairy products may occasionally constitute a minor amount of the total volume. No sanitary sewer wastes may be included. This product is to be fed at levels less than 25% of the animal's total dry matter intake. Minimum percent of solids, crude protein and crude fat and maximum percent ash must be prominently declared on the label. (Adopted 1982)

IFN 5-30-260 Cattle milk process residue

**54.23 Condensed Modified Whey Solubles** is the product obtained by concentrating the whey residue after removal of whey protein and partial removal of lactose, and modifying the sugar content so that there is a minimum of 0.3% nonlactose carbohydrate for each percent solids. The minimum percent of solids and the maximum percent ash must be prominently declared on the label. (Adopted 1982)

IFN 4-01-188 Cattle whey solubles condensed

**54.24 Whey** is the product obtained as a fluid by separating the coagulum from milk, cream, or skimmed milk and from which a portion of the milk fat may have been removed. (Adopted 1982)

IFN 4-08-134 Cattle whey fresh

**54.25 Dried (Dry) Whey Protein Concentrate** is the product obtained by removal or separation of water, lactose and/or minerals from whey by ultrafiltration, dehydration or other process. It shall contain 25% minimum crude protein. The minimum percent of crude protein and lactose and the maximum percent ash must be prominently declared on the label. (Adopted 1982)

IFN 5-06-836 Cattle whey protein dehydrated

**54.26 Dried Cultured Whey Product** is that product obtained by drying whey from which a portion of the lactose, protein and/or minerals has been removed and which has been cultured. (Proposed 1988, Adopted 1989)

IFN 5-30-43 Cattle whey low lactose cultured dehydrated

**54.27 Dried Cultured Whey** is the product obtained by drying whey which has been cultured. The label shall include a guarantee for the minimum amount of lysine and methionine.

NOTE: This is the dried version of 54.15 condensed, cultured whey. AOAC HPLC methods are recommended to be used to quantitate the amino acids. (Proposed 1992, Adopted 1993)

**54.28 Dried Chocolate Milk** is the residue obtained by drying chocolate milk originally intended for human consumption. (Proposed 1992, Adopted 1993)

**54.31 Dried Cheese** is the product obtained by dehydrating cheeses as defined in 21 CFR, Part 133. No more than 10% of the fat may be other than milk fat. (Proposed 1992, Adopted 1999)

**54.32 Dried Cheese Product** is the product obtained by processing various cheese products from the food industry, including dried cheese, cheese rind, processed cheese foods, and cheese-flavored powders. The product shall have characteristic cheese color and aroma. The crude protein, crude fat, and crude fiber shall be guaranteed. (Proposed 2001, Adopted 2003)

*\* The words "feed grade" are not required when listed as an ingredient in a manufactured feed.*

#### NOTES

## 300 Feed Ingredient Definitions

**57. MINERAL PRODUCTS**

Investigator and Section Editor--VACANT

(See Official Guidelines for Contaminant Levels Permitted in Mineral Feed Ingredients immediately following this section.)

\*Use of this ingredient, from mammalian origins, is restricted to non-ruminant feeds unless specifically exempted by 21 CFR 589.2000. Feeds containing prohibited material must bear the following label statement: "**Do not feed to cattle or other ruminants**".

**Official**

**57.27 Ammonium Sulfate** is the product resulting from the neutralization of sulfuric acid with ammonia. It shall contain not less than 21% nitrogen (N) and not less than 24% sulfur (S). It shall contain not more than 75 ppm arsenic (As) and 30 ppm heavy metals reported as lead. This does not include ammonium sulfate made from by-product ammonia recovered from coke-oven gas. It shall be used only in ruminant feeds as a source of sulfur and nitrogen in an amount that supplies not more than 2% of equivalent crude protein in the total daily ration. If a premix, concentrate, or supplement contains more than 2% of equivalent crude protein from ammonium sulfate, the label shall have adequate directions for use and a prominent statement, "Caution--This feed shall be used only in accordance with directions furnished on the label." (Proposed 1969, Adopted 1972) Reg. 582.1143,

IFN 6-09-339 Ammonium sulfate

**57.154 Basic Copper Chloride** is the copper salt of hydrochloric acid and hydrated form of copper oxide generally expressed as  $\text{Cu}_2(\text{OH})_3\text{Cl}$  and its hydrated forms. Minimum copper (Cu) must be specified. (Proposed 1995, Adopted 1997)

**57.1 Bone Ash** is the ash obtained by burning bones with free access to air, and containing a minimum of 15.3% phosphorus (P). The label must show a guarantee for calcium (Ca) and phosphorus (P). (Adopted 1935, Amended 1952)

IFN 6-00-401 Animal bone ash.

**57.2 Bone Charcoal** is obtained by charring bones in closed retorts. It must contain a minimum of 14% phosphorus (P). It must be labeled with guarantees for calcium (Ca) and phosphorus (P). (This product is sometimes referred to as "Bone Black", however, bone charcoal must be used in all labeling.) (Adopted 1938, Amended 1952, 1963)

IFN 6-00-402 Animal bone charcoal

**57.17 Bone Charcoal, Spent**, is the product resulting from the repeated charring of bone charcoal after use in clarifying sugar solutions. It must contain a minimum of 11.5% phosphorus (P). It must be labeled with guarantees for phosphorus (P) and calcium (Ca). (This product is sometimes referred to as "Spent Bone Black", however, spent bone charcoal must be used in all labeling.) (Adopted 1938, Amended 1952, 1963)

IFN 6-00-404 Animal bone charcoal spent.

**\*57.141 Bone Meal, Cooked**, is the dried and ground sterilized product resulting from wet cooking without steam pressure of undecomposed bones. Fat, gelatin, and meat fiber may or may not be removed. When labeled as a commercial feed ingredient, it shall carry guarantees for protein, phosphorus (P), and calcium (Ca). Cooked bone meal shall be used in all labeling. (Proposed 1984)

IFN 6-17-171 Animal bone meal boiled.

**\*57.18 Bone Meal, Steamed**, is the dried and ground product sterilized by cooking undecomposed bones with steam under pressure. Grease, gelatin, and meat fiber may or may not be removed. It must be labeled with guarantees for phosphorus



(P) and calcium (Ca). Steamed bone meal must be used in all labeling. (Proposed 1957, Adopted 1962, Amended 1964)

IFN 6-00-400 Animal bone meal steamed

**57.14 Bone Phosphate.** Bone phosphate is the residue of bones that have been treated first in a hydrochloric acid solution and thereafter precipitated with lime and dried. It must contain a minimum of 17% phosphorus (P). It must be labeled with guarantees for calcium (Ca) and phosphorus (P). (Proposed 1952, Amended 1963, Amended 1997)

IFN 6-00-406, Animal bone phosphate

**57.3 Calcite** is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% calcium (Ca). (Adopted 1952)

IFN 6-01-067 Calcite ground

**57.10 Calcium Carbonate** is a product true to name which contains a minimum of 38% calcium (Ca). (Adopted 1946, Amended 1963) Reg. 582.5191.

IFN 6-01-069 Calcium carbonate

**57.7 Calcium Carbonate, Precipitated,** is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% calcium (Ca). Precipitated calcium carbonate must be used in all labeling. (Adopted 1952)

IFN 6-01-071 Calcium carbonate, precipitated  $\text{CaCO}_3$

**57.51 Calcium Chloride** is the calcium salt of hydrochloric acid generally expressed as  $\text{CaCl}_2$  and its hydrated forms. Minimum calcium (Ca) and chlorine (Cl) must be specified. (Adopted 1975)

IFN 6-20-774, Calcium chloride  $\text{CaCl}_2$

**57.52 Calcium Gluconate** is the calcium salt of gluconic acid generally expressed as  $\text{Ca}(\text{C}_6\text{H}_{11}\text{O}_7)_2$  and its hydrated forms. Minimum Calcium (Ca) must be specified. (Adopted 1975)

IFN 6-01-073 Calcium gluconate monohydrate  $\text{Ca}(\text{C}_6\text{H}_{11}\text{O}_7)_2 \text{H}_2\text{O}$

**57.53 Calcium Hydroxide** is the hydrated form of calcium oxide generally expressed as  $\text{Ca}(\text{OH})_2$ . Minimum calcium (Ca) must be specified. (Adopted 1975)

IFN 6-14-014 Calcium hydroxide  $\text{Ca}(\text{OH})_2$

**57.54 Calcium Iodate** is the calcium salt of iodic acid generally expressed as  $\text{Ca}(\text{IO}_3)_2$  and the monohydrate form. Minimum calcium (Ca) and iodine (I) must be specified. (Adopted 1975)

IFN 6-01-075 Calcium iodate  $\text{Ca}(\text{IO}_3)_2 \cdot 6\text{H}_2\text{O}$

IFN 6-16-610 Calcium iodate monohydrate  $\text{Ca}(\text{IO}_3)_2 \cdot \text{H}_2\text{O}$

**57.55 Calcium Iodobehenate** is the calcium salt of iodobehenic acid generally expressed as  $\text{Ca}(\text{C}_{21}\text{H}_{42}\text{IO}_2)_2$  and its hydrated forms. Minimum calcium (Ca) and minimum iodine (I) must be specified. (Adopted 1975)

IFN 6-01-077, Calcium iodobehenate  $\text{Ca}(\text{C}_{21}\text{H}_{42}\text{IO}_2)_2$

**57.56 Calcium Oxide** is the oxide form of calcium generally expressed as  $\text{CaO}$  (commonly called quicklime). The product of calcining limestone. A strong alkali requiring caution in its use. Minimum calcium (Ca) must be specified. (Adopted 1975)

IFN 6-14-003 Calcium oxide  $\text{CaO}$

**57.25 Calcium Periodate** is an acceptable source of iodine. It is produced by reacting calcium iodate with calcium hydroxide or calcium oxide to form a substance consisting of not less than 60% by weight of penta calcium orthoperiodate containing 28 to 31% by weight of iodine. It is used or intended for use in salt for livestock as a source of iodine. Reg. 573.240 (Proposed 1969, Adopted 1971)

IFN 6-09-355 Calcium periodate  $\text{Ca}_5(\text{IO}_6)_2$

## 302 Feed Ingredient Definitions

**57.57 Calcium Sulfate** is the calcium salt of sulfuric acid generally expressed as  $\text{CaSO}_4$  and its hydrated forms. Minimum calcium (Ca) and minimum sulfur (S) must be specified. (Adopted 1975)

IFN 6-01-087 Calcium sulfate anhydrous  $\text{CaSO}_4$

IFN 6-01-090 Calcium sulfate dihydrate  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

**57.8 Chalk, Precipitated**, is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% calcium (Ca). Precipitated chalk must be used in all labeling. (Adopted 1952)

IFN 6-01-201, Chalk precipitated

**57.6 Chalk Rock** is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% of calcium (Ca). (Adopted 1952)

IFN 6-01-202 Chalk rock ground

**57.155 Chromium Tripicolinate**. Chromium tripicolinate is the product resulting from reaction of chromium chloride with picolinic acid. It is to be used as a source of supplemental chromium in swine diets, not to supply more than 200 ppb of chromium to the diet. Minimum chromium from chromium tripicolinate must be specified. (Proposed 1996, Adopted 2000)

**57.131 Clam Shells, Ground**, is an acceptable source of calcium carbonate. It must be true to name and contain not less than 35% calcium (Ca). (Proposed 1979, Adopted 1981)

IFN 6-01-259 Clam shells ground

**57.58 Cobalt Acetate** is the cobalt salt of acetic acid generally expressed as  $\text{Co}(\text{C}_2\text{H}_3\text{O}_2)_2$ , and its hydrated forms. Minimum cobalt (Co) must be specified. (Adopted 1975)

IFN 6-01-554 Cobalt acetate  $\text{Co}(\text{C}_2\text{H}_3\text{O}_2)_2$

**57.59 Cobalt Carbonate** is the cobalt salt of carbonic acid generally expressed as  $\text{CoCO}_3$  and its hydrated forms. Minimum cobalt (Co) must be specified. (Adopted 1975)

IFN 6-01-566 Cobalt carbonate  $\text{CoCO}_3$

**57.60 Cobalt Chloride** is the cobalt salt of hydrochloric acid generally expressed as  $\text{CoCl}_2$ , and its hydrated forms. Minimum cobalt (Co) must be specified. (Adopted 1975)

IFN 6-01-556 Cobaltous chloride anhydrous  $\text{CoCl}_2$

**57. 123 Cobalt Choline Citrate Complex** is the product resulting from the complexing of the soluble cobalt salt with choline dihydrogen citrate. Minimum cobalt (Co) must be specified. When used as a commercial feed ingredient, it must be declared as "cobalt choline citrate". (Proposed 1976)

IFN 6-20-869 Cobalt choline citrate complex.

**57.148 Cobalt Glucoheptonate** is the cobalt salt of glucoheptonic acid generally expressed as  $\text{C}_{14}\text{H}_{26}\text{O}_{16}\text{Co} \cdot \text{H}_2\text{O}$ . Minimum cobalt (Co) must be specified. (Proposed 1988, Adopted 1989)

IFN 6-19-211 Cobalt glucoheptonate

**57.147 Cobalt Gluconate** is the cobalt salt of gluconic acid, generally expressed as  $\text{Co}(\text{C}_6\text{H}_{11}\text{O}_7)_2$ , and its hydrated forms. Minimum cobalt (Co) must be specified. (Proposed 1988, Adopted 1989)

IFN 6-19-210 Cobalt gluconate

**57.61 Cobalt Oxide** is the oxide form of cobalt generally expressed as  $\text{CoO}$ . Minimum cobalt (Co) must be specified. (Adopted 1975)

IFN 6-01-560 Cobalt Oxide

**57.62 Cobalt Sulfate** is the cobalt salt of sulfuric acid generally expressed as  $\text{CoSO}_4$  and its hydrated forms. Minimum cobalt (Co) must be specified. (Adopted 1975)

IFN 6-01-562 Cobalt sulfate monohydrate  $\text{CoSO}_4 \cdot \text{H}_2\text{O}$ .

IFN 6-01-564 Cobalt sulfate heptahydrate  $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$

**57.153 Copper Acetate Monohydrate** is the copper salt of acetic acid generally expressed as  $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$  and its hydrated forms. Minimum copper must be specified. (Proposed 1993, Adopted 2000)

**57.63 Copper Carbonate** is the copper salt of carbonic acid generally expressed as  $\text{CuCO}_3$ . Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-01-703 Cupric carbonate  $\text{CuCO}_3$

**57.64 Copper Chloride** is the copper salt of hydrochloric acid generally expressed as  $\text{CuCl}$  or  $\text{CuCl}_2$  and their hydrated forms. Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-07-135 Cuprous chloride  $\text{CuCl}_2$ .

IFN 6-01-705 Cupric chloride dihydrate.  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$

**57.122 Copper Choline Citrate Complex** is the product resulting from the complexing of the soluble copper salt with choline dihydrogen citrate. Minimum copper (Cu) must be specified. When used as a commercial feed ingredient, it must be declared as "copper choline citrate". (Proposed 1976, Adopted 1977)

IFN 6-20-868 Copper choline citrate complex

**57.158 Copper Citrate** is the copper salt of citric acid generally expressed as  $\text{C}_6\text{H}_4\text{Cu}_2\text{O}_7$ . It is to be used as a source of copper in broiler feeds at levels not exceeding 185 ppm of total dietary copper. Minimum copper (Cu) must be specified. (Proposed 1997, Adopted 2000)

**57.65 Copper Gluconate** is the copper salt of gluconic acid generally expressed as  $\text{Cu}(\text{C}_6\text{H}_{11}\text{C}_7)_2$  and its hydrated forms. Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-01-707 Cupric gluconate  $\text{Cu}(\text{C}_6\text{H}_{11}\text{C}_7)_2$

**57.66 Copper Hydroxide** is the hydrated form of copper oxide generally expressed as  $\text{Cu}(\text{OH})_2$ . Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-01-709 Cupric hydroxide  $\text{Cu}(\text{OH})_2$

**57.67 Copper Orthophosphate** is the copper salt of phosphoric acid generally expressed as  $\text{Cu}_3(\text{PO}_4)_2$  and its hydrated forms. Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-01-713 Cupric orthophosphate  $\text{Cu}_3(\text{PO}_4)_2$

**57.68 Copper Oxide** is the oxide form of copper generally expressed as  $\text{CuO}$  or  $\text{Cu}_2\text{O}$ . Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-28-224 Cuprous oxide  $\text{Cu}_2\text{O}$ .

IFN 6-01-711 Cupric oxide  $\text{CuO}$

**57.69 Copper Sulfate** is the copper salt of sulfuric acid generally expressed as  $\text{CuSO}_4$  and its hydrated forms. Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-01-717 Cupric sulfate anhydrous  $\text{CuSO}_4$ .

IFN 6-01-719 Cupric sulfate pentahydrate  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

**57.70 Cuprous Iodide** is the copper salt of hydriodic acid generally expressed as  $\text{CuI}$ . Minimum copper (Cu) must be specified. (Adopted 1975)

IFN 6-01-721 Cuprous iodide  $\text{CuI}$

**57.72 Diiodosalicylic Acid** is an iodine compound of salicylic acid generally expressed as  $\text{C}_7\text{H}_4\text{I}_2\text{O}_3$ . Minimum iodine (I) must be specified. (Adopted 1975)

## 304 Feed Ingredient Definitions

IFN 6-01-787 Diiodosalicylic acid  $C_7H_4I_2O_3$

**57.75 Ethylenediamine Dihydriodide** is an organic compound of iodine generally expressed as  $C_2H_8N_2 \cdot 2HI$ . Minimum iodine (I) must be specified. (Adopted 1975)

IFN 6-01-842 Ethylenediamine dihydriodide  $C_2H_4NH_2 \cdot 2HI$

**57.76 Ferric Ammonium Citrate** is an ammoniacally complexed iron salt of citric acid of indefinite composition sometimes expressed as  $Fe(NH_4)C_6H_5O_7$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-857 Ferric ammonium citrate

**57.78 Ferric Chloride** is the iron salt of hydrochloric acid generally expressed as  $FeCl_3$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-865 Ferric chloride  $FeCl_3$

**57.121 Ferric Choline Citrate Complex** is the product resulting from the complexing of the soluble iron salt with choline dihydrogen citrate. Minimum iron (Fe) must be specified. When used as a commercial feed ingredient it must be declared as "ferric choline citrate". (Adopted 1977)

IFN 6-20-867 Ferric choline citrate complex

**57.127 Ferric Formate** is an iron salt of formic acid generally expressed as  $Fe(HCO_2)_3$ . (Adopted 1980)

IFN 6-630-089 Ferric formate  $Fe(HCO_2)_3 \cdot H_2O$

**57.81 Ferric Phosphate** is the iron salt of phosphoric acid generally expressed as  $FePO_4$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-859 Ferric phosphate  $FePO_4$

**57.82 Ferric Pyrophosphate** is the iron salt of pyrophosphoric acid generally expressed as  $Fe_4(P_2O_7)_3$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-861 Ferric pyrophosphate  $Fe_4(P_2O_7)_3$

**57.129 Ferric Sulfate** is the iron salt of sulfuric acid generally expressed as  $Fe_2(SO_4)_3$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1980)

IFN 6-30-086 Ferric sulfate  $Fe_2(SO_4)_3$

**57.77 Ferrous Carbonate** is the iron salt of carbonic acid generally expressed as  $FeCO_3$ . Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-863 Ferrous carbonate  $FeCO_3$

**57.128 Ferrous Chloride** is the iron salt of hydrochloric acid generally expressed as  $FeCl_2$  and its hydrated forms. Minimum iron (Fe) must be specified. (Proposed 1979, Adopted 1981)

IFN 6-30-090 Ferrous chloride  $FeCl_2$

**57.75 Ferrous Fumarate** is an iron salt of fumaric acid generally expressed as  $FeC_4H_2O_4$ . Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-08-097 Ferrous fumarate  $FeC_4H_2O_4$

**57.79 Ferrous Gluconate** is the iron salt of gluconic acid generally expressed as  $Fe(C_6H_{11}O_7)_2$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-867 Ferrous gluconate dihydrate  $Fe(C_6H_{11}O_7)_2 \cdot 2H_2O$

**57.139 Ferrous Glycine Complex** is the reaction product of one molecular equivalent of ferrous iron salt and two or more molecular equivalents of glycine, generally expressed as  $FeC_4N_2H_8O_4$ . Minimum iron (Fe) must be specified. When

used as a commercial feed ingredient it must be declared as Ferrous Glycine. (Proposed 1984)

IFN 6-17-227 Ferrous glycine complex  $\text{FeC}_4\text{N}_2\text{H}_8\text{O}_4$

**57.83 Ferrous Sulfate** is the iron salt of sulfuric acid generally expressed as  $\text{FeSO}_4$  and its hydrated forms. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-01-869 Ferrous sulfate monohydrate  $\text{FeSO}_4 \cdot \text{H}_2\text{O}$ .

IFN 6-20-734 Ferrous sulfate heptahydrate  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

**57.30 Gypsiferrous Shale** is a natural occurring shale type rock containing native calcium sulfate ( $\text{CaSO}_4$ ). It must carry guarantees of calcium (Ca) and sulfur (S). (Proposed 1977, Adopted 1981)

IFN 6-14-505 Shale gypsiferrous

**57.80 Iron Oxide** is the oxide form of iron occurring both naturally and synthetically in various chemical valence compositions and colors -- sometimes expressed as  $\text{Fe}_2\text{O}_3$ . Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-02-431 Ferric oxide  $\text{Fe}_2\text{O}_3$

**57.84 Iron, Reduced**, is a metallic form of iron obtained by reducing ferric oxide with hydrogen. Minimum iron (Fe) must be specified. (Adopted 1975)

IFN 6-02-429 Iron Reduced

**57.9 Limestone, Ground**, is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% calcium (Ca). Ground limestone must be used in all labeling. (Adopted 1952)

IFN 6-02-632 Limestone ground

**57.11 Limestone, Magnesium or Dolomitic**, is an acceptable source of magnesium and calcium carbonate. The terms are synonymous and designate a native mineral composed of mixtures of magnesium carbonate ( $\text{MgCO}_3$ ), and calcium carbonate ( $\text{CaCO}_3$ ). It must contain not less than 10% magnesium (Mg) and must be declared as an ingredient as magnesium limestone or dolomitic limestone. (Adopted 1946, Amended 1952, 1965)

IFN 6-02-633 Limestone dolomitic ground.

IFN 6-06-934 Limestone magnesium ground

**57.85 Magnesium Carbonate** is a magnesium salt of carbonic acid generally expressed as  $\text{MgCO}_3$ ,  $\text{Mg}(\text{OH})_2$  and its hydrated forms. Minimum magnesium (Mg) must be specified. (Adopted 1975)

IFN 6-02-754 Magnesium carbonate  $\text{MgCO}_3$ ,  $\text{Mg}(\text{OH})_2$

IFN 6-08-797 Magnesium carbonate trihydrate  $\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$

IFN 6-29-798 Magnesium carbonate pentahydrate  $\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 5\text{H}_2\text{O}$

**57.126 Magnesium Chloride** is the magnesium salt of hydrochloric acid generally expressed as  $\text{MgCl}_2$  and its hydrated forms. Minimum magnesium (Mg) must be specified. (Proposed 1976, Adopted 1977)

IFN 6-20-872 Magnesium chloride  $\text{MgCl}_2$

**57.161 Magnesium Gluconate** is the magnesium salt of gluconic acid generally expressed as  $\text{Mg}(\text{C}_6\text{H}_{11}\text{O}_7)_2$  and its hydrated forms. Minimum magnesium (Mg) must be specified. For use in animal feeds, excluding aquatic species. (Proposed 2000, Adopted 2002)

**57.86 Magnesium Hydroxide** is the hydrated form of magnesium generally expressed as  $\text{Mg}(\text{OH})_2$ . Minimum magnesium (Mg) must be specified. (Adopted 1975)

IFN 6-26-012 Magnesium hydroxide  $\text{Mg}(\text{OH})_2$

## 306 Feed Ingredient Definitions

**57.140 Magnesium Phosphate** is the magnesium salt of phosphoric acid, generally expressed as  $MgHPO_4$  and its hydrated forms. Minimum magnesium (Mg) and phosphorus (P) and maximum fluorine (F) must be specified. It must contain not more than one part fluorine (F) to 100 parts phosphorus. (Proposed 1984)

IFN 6-23-294 Magnesium phosphate  $MgHPO_4$

**57.87 Magnesium Oxide** is the oxide of magnesium generally expressed as  $MgO$ . Minimum magnesium (Mg) must be specified. (Adopted 1975)

IFN 6-02-756 Magnesium oxide  $MgO$

**57.24 Magnesium-Mica** is a natural occurring magnesium, iron, and potassium layer silicate. It must be labeled with guarantees for magnesium (Mg), iron (Fe), and potassium (K). (Proposed 1968, Adopted 1971, Amended 1987)

IFN 6-08-999 Magnesium-Mica

**57.88 Magnesium Sulfate** is the magnesium salt of sulfuric acid generally expressed as  $MgSO_4$  and its hydrated forms. Minimum magnesium (Mg) must be specified. (Adopted 1975)

IFN 6-26-134 Magnesium sulfate  $MgSO_4$ .

IFN 6-12-209 Magnesium sulfate monohydrate  $MgSO_4 \cdot H_2O$ .

IFN 6-02-758 Magnesium sulfate heptahydrate  $MgSO_4 \cdot 7H_2O$

**57.89 Manganese Acetate** is the manganese salt of acetic acid generally expressed as  $Mn(C_2H_3O_2)_2$  and its hydrated forms. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-034 Manganese acetate tetrahydrate  $Mn(C_2H_3O_2)_2 \cdot 4H_2O$

**57.90 Manganese Carbonate**, is the manganese salt of carbonic acid generally expressed as  $MnCO_3$  and its hydrated forms. Minimum Manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-036 Manganous carbonate  $MnCO_3$

**57.91 Manganese Chloride** is the manganese salt of hydrochloric acid generally expressed as  $MnCl_2$  and its hydrated forms. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-038 Manganous chloride tetrahydrate  $MnCl_2 \cdot 4H_2O$

**57.92 Manganese Citrate (Soluble)** is the manganese salt of citric acid generally expressed as  $Mn_3(C_6H_5O_7)_2$  and its hydrated forms. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-040 Manganous citrate soluble  $Mn_3(C_6H_5O_7)_2$

**57.93 Manganese Gluconate** is the manganese salt of gluconic acid generally expressed as  $Mn(C_6H_{11}O_7)_2$ . Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-044 Manganous gluconate  $Mn(C_6H_{11}O_7)_2$

**57.94 Manganese Orthophosphate** is the manganese salt of phosphoric acid generally expressed as  $Mn_3(PO_4)_2$  and its hydrated forms. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-047 Manganese orthophosphate trihydrate  $Mn_3(PO_4)_2 \cdot 3H_2O$

**57.95 Manganese Phosphate (dibasic)** is the manganese salt of phosphoric acid generally expressed as  $MnHPO_4$  and its hydrated forms. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-048 Manganese phosphate dibasic  $MnHPO_4$

**57.96 Manganese Sulfate** is the manganese salt of sulfuric acid generally expressed as  $MnSO_4$  and its hydrated forms. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-050, Manganous sulfate tetrahydrate  $MnSO_4 \cdot 4H_2O$

**57.97 Manganous Oxide** is an oxide form of manganese generally expressed as MnO. Minimum manganese (Mn) must be specified. (Adopted 1975)

IFN 6-03-054 Manganous oxide MnO

**57.150 Metal Amino Acid Complex** is the product resulting from complexing of a soluble metal salt (such as potassium or manganese) with an amino acid(s). Minimum metal content must be declared. When used as a commercial feed ingredient, it must be declared as a specific metal amino acid complex, i.e., potassium amino acid complex; copper, amino acid complex; zinc, amino acid complex; magnesium, amino acid complex; iron, amino acid complex; cobalt, amino acid complex; calcium, amino acid complex; and manganese, amino acid complex. (Adopted 1990)

IFN 6-32-053 Copper, amino acid complex

IFN 6-32-054 Zinc, amino acid complex

IFN 6-32-055 Magnesium, amino acid complex

IFN 6-32-056 Iron, amino acid complex

IFN 6-32-057 Cobalt, amino acid complex

IFN 6-32-058 Calcium, amino acid complex

IFN 6-32-059 Potassium, amino acid complex

IFN 6-32-060 Manganese, amino acid complex

**57.151 Metal (specific amino acid) Complex** is the product resulting from complexing a soluble metal salt with a specific amino acid. Minimum metal content must be declared. When used as a commercial feed ingredient, it must be declared as a specific metal, specific amino acid, i.e., copper lysine complex, zinc lysine complex, ferric methionine complex, manganese methionine complex and zinc methionine complex (Proposed 1991, Adopted 1992).

IFN Copper lysine complex

IFN Zinc lysine complex

IFN 6-16-294 Ferric methionine complex

IFN 6-19-212 Manganese methionine complex

IFN 6-16-293 Zinc methionine complex.

**57.142 Metal Amino Acid Chelate** is the product resulting from the reaction of a metal ion from a soluble metal salt with amino acids with a mole ratio of one mole of metal to one to three (preferably two) moles of amino acids to form coordinate covalent bonds. The average weight of the hydrolyzed amino acids must be approximately 150 and the resulting molecular weight of the chelate must not exceed 800. The minimum metal content must be declared. When used as a commercial feed ingredient it must be declared as a specific metal amino acid chelate; i.e., Calcium Amino Acid Chelate, Cobalt Amino Acid Chelate, Copper Amino Acid Chelate, Iron Amino Acid Chelate, Magnesium Amino Acid Chelate, Manganese Amino Acid Chelate or Zinc Amino Acid Chelate. (Proposed 1986, Adopted 1988)

IFN 6-20-981 Calcium amino acid chelate

IFN 6-20-982 Cobalt amino acid chelate

IFN 6-20-983 Copper amino acid chelate

IFN 6-20-984 Iron amino acid chelate

IFN 6-20-985 Magnesium amino acid chelate

IFN 6-20-986 Manganese amino acid chelate

IFN 6-20-987 Zinc amino acid chelate

**57.29 Metal Polysaccharide Complex** is the product resulting from complexing of a soluble salt with a polysaccharide solution declared as an ingredient as the specific metal complex i.e., copper polysaccharide complex, zinc polysaccharide

## 308 Feed Ingredient Definitions

complex, iron polysaccharide complex, cobalt polysaccharide complex and manganese polysaccharide complex (Proposed 1971, Adopted 1973)

IFN 8-09-822, Copper polysaccharide complex.

IFN 8-09-898 Iron polysaccharide complex.

IFN 8-09-899 Zinc polysaccharide complex

**57.160 Metal Propionate** is the product resulting from reaction of a metal salt with propionic acid. The metal propionates are prepared with an excess of propionic acid, at an appropriate stoichiometric ratio. It must be declared as an ingredient of the specific metal propionate, i.e. zinc propionate, chromium propionate. Chromium propionate is to be used in swine diets not exceeding 200 ppb chromium in the diet. Minimum metal content must be declared. (Proposed 1999, Adopted 2001, Amended 2002)

**57.23 Metal Protein** is the product resulting from the chelation of a soluble salt with amino acids and/or partially hydrolyzed protein. It must be declared as an ingredient as the specific metal protein: i.e. Copper Protein, Zinc Protein, Magnesium Protein, Iron Protein, Cobalt Protein, Manganese Protein or Calcium Protein. (Proposed 1967, Adopted 1970, Amended 1977, Amended 1987)

IFN 6-09-896 Copper protein.

IFN 6-09-897 Zinc protein.

IFN 6-26-149 Magnesium protein.

IFN 6-26-150 Iron protein.

IFN 6-26-151 Cobalt protein.

IFN 6-16-834 Manganese protein.

IFN 6-16-833 Calcium protein.

**57.4 Oyster Shell Flour** is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% calcium (Ca). (Adopted 1952)

IFN 6-03-481 Oyster shells fine ground (Oyster shell flour).

**57.22 Ammonium Polyphosphate Solution** is the product resulting from the neutralization of superphosphoric acid. It must contain not less than 9% nitrogen (N) and 13% phosphorus (P). It must contain not more than one (1) part fluorine (F) to 100 parts phosphorus (P), 75 ppm of arsenic (As), and 30 ppm of heavy metals reported as lead.

It may be used in ruminant feeds as a source of both phosphorus and nitrogen in an amount that supplies not more than 2% of equivalent crude protein in the total daily ration.

It may be used in non-ruminant feeds as a source of phosphorus only. The maximum equivalent crude protein from this source shall not exceed 1.25% of the total daily ration.

When incorporated into a feed for non-ruminants the label will carry a statement that the equivalent crude protein is nutritionally unavailable to the non-ruminant. It shall be labeled as follows:

(example)           BLUE BIRD HOG FINISHER  
                           Crude Protein (Minimum)....16%  
                           (This includes not more than \_\_\_\_\_%  
                           equivalent crude protein which is not  
                           nutritionally available to swine.)

If a premix, concentrate or supplement for ruminants contains more than 2% equivalent crude protein from ammonium polyphosphate or if a premix concentrate or supplement for non-ruminants contains more than 1.25% equivalent crude protein from equivalent crude protein from ammonium polyphosphate, then the label must



contain adequate directions for use, and a prominent statement: "**Warning** -- This feed must be used only in accordance with directions furnished on the label." (Proposed 1966, Adopted 1967, Amended 1981)

IFN 6-08-42 Ammonium polyphosphate solution

**57.134 Calcium Phosphate** is a calcium phosphate product either calcined, fused, precipitated or reacted. It must contain not more than one part fluorine (F) to 100 parts of phosphorus (P). The minimum percent of calcium (Ca) and phosphorus (P) and maximum percent of fluorine (F) must be stated on the label. (Proposed 1980, Adopted 1981)

IFN 6-12-311 Calcium phosphate

**57.16 Diammonium Phosphate** is the product resulting from neutralization of phosphoric acid, feed grade, or defluorinated wet-process phosphoric acid which contains not less than 17% nitrogen (N) and 20% phosphorus (P). It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P), 75 ppm of arsenic (As), and 30 ppm of heavy metals reported as lead. This does not include diammonium phosphate made from by-product ammonia absorbed from coke-oven gas.

It may be used in ruminant feeds as a source of both phosphorus and nitrogen in an amount that supplies not more than 2% of equivalent crude protein in the total daily ration.

It may be used in non-ruminant feeds as a source of phosphorus only. The maximum equivalent crude protein from diammonium phosphate must be guaranteed and the equivalent crude protein from this source shall not exceed 1.25% of the total daily ration.

When incorporated into a feed for non-ruminants, the label will carry a statement that the equivalent crude protein is nutritionally unavailable to the non-ruminant. It shall be labeled as follows:

(example) BLUE BIRD HOG FINISHER  
Crude protein (minimum).....16%  
(This includes not more than \_\_\_\_\_%  
equivalent crude protein which is not  
nutritionally available to swine.)

If a premix, concentrate or supplement for ruminants contains more than 2% equivalent crude protein from diammonium phosphate or if a premix concentrate or supplement for non-ruminants contains more than 1.25% equivalent crude protein from diammonium phosphate, then the label must contain adequate directions for use, and a prominent statement: "**Warning** -- This feed must be used only in accordance with directions furnished on the label." (Proposed 1961, Amended 1967, 1981)

IFN 6-00-370 Ammonium phosphate dibasic  $(\text{NH}_4)_2\text{HPO}_4$

**57.71 Dicalcium Phosphate** is a calcium salt of phosphoric acid generally expressed as  $\text{CaHPO}_4$  and its hydrated forms. Minimum phosphorus (P), minimum calcium (Ca) and maximum fluorine (F) must be specified. It must not contain more than 1 part of fluorine (F) to 100 parts phosphorus (P). (Adopted 1975)

IFN 6-01-080 Calcium phosphate dibasic from defluorinated phosphoric acid.

IFN 6-26-335 Calcium phosphate dibasic from furnaced phosphoric acid (Dicalcium phosphate).

**57.32 Disodium Phosphate** is a sodium salt of phosphoric acid generally expressed as  $\text{Na}_2\text{HPO}_4$  and its hydrated forms. Minimum phosphorus (P), minimum sodium (Na) and maximum fluorine (F) must be specified. It must not contain more than 1 part fluorine (F) to 100 parts phosphorus (P). (Adopted 1975)

IFN 6-04-286 Sodium phosphate dibasic  $\text{Na}_2\text{HPO}_4$

## 310 Feed Ingredient Definitions

**57.33 Mono ammonium phosphate** is the product resulting from the neutralization of phosphoric acid, feed grade, or defluorinated wet-process phosphoric acid which contains not less than 9% nitrogen (N) and 23% phosphorus (P). It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P), 75 ppm of arsenic (As) and 30 ppm of heavy metals reported as lead (Pb).

It may be used in ruminant feeds as a source of both phosphorus and nitrogen in an amount that supplies not more than 2% of equivalent crude protein in the total daily ration.

It may be used in non-ruminant feeds as a source of phosphorus only. The maximum equivalent crude protein from mono-ammonium phosphate must be guaranteed and the equivalent crude protein from this source shall not exceed 1.25% of the total daily ration.

When incorporated into a feed for non-ruminants the label will carry a statement that the equivalent crude protein is nutritionally unavailable to the non-ruminant. It shall be labeled as follows:

(example) BLUE BIRD HOG FINISHER  
 Crude Protein (Minimum).....16%  
 (This includes not more than \_\_\_\_\_%  
 equivalent crude protein which is not  
 nutritionally available to swine.)

If a premix, concentrate or supplement for ruminants contains more than 3% equivalent crude protein from mono-ammonium phosphate or if a premix concentrate or supplement for non-ruminants contains more than 1.25% equivalent crude protein from mono-ammonium phosphate, then the label must contain adequate directions for use, and a prominent statement: "**Warning**--This feed must be used only in accordance with directions furnished on the label." (Proposed 1973, Adopted 1976) Reg. 582.1141

IFN 6-09-338 Ammonium phosphate monobasic  $(\text{NH}_4)\text{H}_2\text{PO}_4$

**57.98 Monocalcium Phosphate** is a calcium salt of phosphoric acid generally expressed as  $\text{CaH}_4(\text{PO}_4)_2$  and its hydrated forms. Minimum phosphorus (P), minimum calcium (Ca) and maximum fluorine (F) must be specified. It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P). (Adopted 1975)

IFN 6-01-082 Calcium phosphate, monobasic, from defluorinated phosphoric acid.

IFN 6-26-334 Calcium phosphate, monobasic, from furnaced phosphoric acid (monocalcium phosphate).

**57.99 Monosodium Phosphate** is a sodium salt of phosphoric acid generally expressed as  $\text{NaH}_2\text{PO}_4$  and its hydrated forms. Minimum phosphorus (P), minimum sodium (Na) and maximum fluorine (F) must be specified. It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P). (Adopted 1975,)

IFN 6-04-288 Sodium phosphate monobasic monohydrate  $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$

**57.19 Phosphoric Acid**, \_\_\_\_\_%, is a solution of phosphoric acid in water generally expressed as  $\text{H}_3\text{PO}_4$ . Minimum phosphorus (P) must be specified. It must not contain more than 100 parts per million fluorine (F) and 3.2 parts per million Arsenic (As) for each percentage of phosphorus present. When this ingredient is used as a constituent in mixed feeds, it must be indicated in the ingredient list as "phosphoric acid." (Proposed 1957, Adopted 1962, Amended 1967, 1968, 1975, 1976)

IFN 6-03-707 Phosphoric acid  $\text{H}_3\text{PO}_4$

**57.12 Phosphate, Defluorinated**, includes either calcined, fused, precipitated or reacted calcium phosphate. It must contain not more than one part of fluorine (F) to

100 parts of phosphorus (P). The minimum percent of calcium (Ca) and phosphorus (P) and the maximum percent of fluorine (F) must be stated on the label. The term "defluorinated" must not be used as a part of the name of any product containing more than one part of fluorine (F) to 100 parts of phosphorus (P). The term "defluorinated phosphate" must be used, where appropriate, in labeling ingredient listings. (Adopted 1952, Amended 1965)

IFN 6-01-780 Phosphate defluorinated.

IFN 6-12-330 Phosphate defluorinated 18.5% phosphorus.

IFN 6-12-324 Phosphate defluorinated 18% phosphorus.

IFN 6-12-331 Phosphate defluorinated 21% phosphorus.

**57.15 Rock Phosphate, Soft**, is the very finely divided by-product (washings) obtained from mining Florida rock phosphate by the hydraulic process. It must contain a minimum of 9% phosphorus (P) and 15% calcium (Ca), and not more than 30% clay and 1.5% fluorine (F). The term soft rock phosphate must be used in all labeling. (Proposed 1961, Adopted 1963, Amended 1965)

IFN 6-03-947 Rock phosphate soft

**57.20 Rock Phosphate, Ground**, is ground phosphate rock. It must be labeled with guarantees for calcium (Ca) and phosphorus (P) and a maximum guarantee for fluorine (F). Ground rock phosphate must be used in all labeling. (Proposed 1963, Adopted 1964)

IFN 6-03-945 Rock phosphate ground

**57.21 Rock Phosphate, Ground, Low Fluorine** is ground phosphate rock that contains not more than 0.5% fluorine (F). Low fluorine ground rock phosphate must be used in all labeling. It must be labeled with guarantees for minimum percentages of calcium (Ca) and phosphorus (P) and for a maximum percentage of fluorine (F). (Proposed 1963, Adopted 1964)

IFN 6-03-946 Rock phosphate ground low fluorine

**57.132 Sodium Hexametaphosphate** is the sodium salt of Phosphoric Acid generally expressed as  $(\text{NaPO}_3)_x \cdot \text{H}_2\text{O}$  ( $x=6-20$ ) Minimum sodium and maximum fluorine must be specified. It must not contain more than one part fluorine (F) to 100 parts phosphorus (P), 75 parts per million of arsenic (As) and 30 parts per million of heavy metals reported as lead. (Proposed 1980, Adopted 1981)

IFN 6-12-315 Sodium hexametaphosphate  $(\text{NaPO}_3)_x \cdot \text{H}_2\text{O}$  ( $x=6-20$ )

**57.110 Sodium Tripolyphosphate**, is a sodium salt of phosphoric acid generally expressed as  $\text{Na}_5\text{P}_3\text{O}_{10}$ . Minimum sodium (Na) and maximum fluorine (F) must be specified. It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P). (Adopted 1975)

IFN 6-08-076, Sodium tripolyphosphate  $\text{Na}_5\text{P}_3\text{O}_{10}$

**57.125 Tribasic Sodium Phosphate** is the sodium salt of phosphoric acid generally expressed as  $\text{Na}_3\text{PO}_4$  and its hydrated forms. Minimum phosphorus (P), minimum sodium (Na) and maximum fluorine (F) must be specified. It must contain not more than 1 part fluorine (F) to 100 parts of phosphorus (P). (Proposed 1976, Adopted 1977)

IFN 6-20-871 Sodium phosphate tribasic  $\text{Na}_3\text{PO}_4$

**57.113 Tricalcium Phosphate** is a calcium salt of phosphoric acid generally expressed as  $\text{Ca}_3(\text{PO}_4)_2$ . Minimum phosphorus (P), minimum calcium (Ca) and maximum fluorine (F) must be specified. It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P). (Adopted 1975)

IFN 6-01-084 Calcium phosphate tribasic

## 312 Feed Ingredient Definitions

**57.100 Potassium Bicarbonate** is a potassium salt of carbonic acid generally expressed as  $\text{KHCO}_3$ . Minimum potassium (K) must be specified. (Adopted 1975)

IFN 6-09-337 Potassium bicarbonate  $\text{KHCO}_3$

**57.101 Potassium Carbonate** is a potassium salt of carbonic acid generally expressed as  $\text{K}_2\text{CO}_3$ . Minimum potassium (K) must be specified. (Adopted 1975)

IFN 6-09-336 Potassium carbonate  $\text{K}_2\text{CO}_3$

**57.130 Potassium Citrate** is a potassium salt of citric acid generally expressed as  $\text{K}_3\text{C}_6\text{H}_5\text{O}_7 \cdot \text{H}_2\text{O}$  and its hydrated forms. Minimum potassium (K) must be specified. (Adopted 1980)

IFN 6-30-087 Potassium citrate  $\text{K}_3\text{C}_6\text{H}_5\text{O}_7 \cdot \text{H}_2\text{O}$

**57.102 Potassium Chloride**, is the potassium salt of hydrochloric acid generally expressed as KCl. Minimum potassium (K) must be specified. (Adopted 1975)

IFN 6-03-755 Potassium chloride KCl.

**57.162 Potassium Gluconate** is the potassium salt of gluconic acid generally expressed as  $\text{KC}_6\text{H}_{11}\text{O}_7$  and its hydrated forms. Minimum potassium must be specified. For use in animal feeds, excluding aquatic species. (Proposed 2000, Adopted 2002)

**57.124 Potassium Hydroxide** is the hydroxyl form of potassium generally expressed as KOH. Minimum potassium (K) must be specified. (Proposed 1976, Adopted; 1977) Reg. 582-1631.

IFN 6-20-870 Potassium hydroxide KOH

**57.103 Potassium Iodate** is the potassium salt of iodic acid generally expressed as  $\text{KIO}_3$ . Minimum potassium (K) and minimum iodine (I) must be specified. (Adopted 1975)

IFN 6-08-072 Potassium iodate  $\text{KIO}_3$

**57.104 Potassium Iodide** is the potassium salt of hydriodic acid generally expressed as KI. Minimum potassium (K) and iodine (I) must be specified. (Adopted 1975)

IFN 6-03-759 Potassium iodide KI

**57.105 Potassium Sulfate** is the potassium salt of sulfuric acid generally expressed as  $\text{K}_2\text{SO}_4$ . Minimum potassium (K) and sulfur (S) must be specified. (Adopted 1975)

IFN 6-08-098 Potassium sulfate  $\text{K}_2\text{SO}_4$

**57.31 Salt** is an acceptable source of sodium chloride. It must be true to name and contain not less than 95% sodium chloride. (Proposed 1973, Adopted 1975)

IFN 6-04-152 Salt NaCl

**57.13 Iodized Salt**, is a common salt (NaCl) containing not less than 0.007% iodine, uniformly distributed. (Adopted 1942)

IFN 6-04-151 Salt iodine added 0.007% iodine

**57.5 Shell Flour** is an acceptable source of calcium carbonate. It must be true to name and contain not less than 33% calcium (Ca). (Adopted 1952)

IFN 6-05-688 Mollusks shells fine ground

**57.137 Sodium Acid Pyrophosphate** is the disodium salt of pyrophosphoric acid, generally expressed as  $\text{Na}_2\text{HP}_2\text{O}_7 \cdot 6\text{H}_2\text{O}$  and other hydrated forms. Minimum phosphorus; (P), minimum sodium (Na), and maximum fluorine (F), must be specified. It must contain not more than 1 part fluorine (F) to 100 parts phosphorus (P). (Adopted 1984)

IFN 6-16-830 Sodium, Pyrophosphate, Hexahydrate

**57.106 Sodium Bicarbonate** is the sodium salt of carbonic acid generally expressed as  $\text{NaHCO}_3$ . Minimum sodium (Na) must be specified. (Proposed 1988, Adopted 1989)

IFN 6-04-272 Sodium bicarbonate  $\text{NaHCO}_3$ .

**57.133 Sodium Carbonate** is the sodium salt of carbonic acid generally expressed as  $\text{Na}_2\text{CO}_3$  and its hydrated forms. Minimum sodium (Na) must be specified. (Proposed 1980, Adopted 1981)

IFN 6-12-316 Sodium carbonate  $\text{Na}_2\text{CO}_3$

**57.107 Sodium Iodate** is the sodium salt of iodic acid generally expressed as  $\text{NaIO}_3$ . Minimum iodine (I) must be specified. (Adopted 1975)

IFN 6-04-277 Sodium iodate  $\text{NaIO}_3$

**57.108 Sodium Iodide** is the sodium salt of hydriodic acid generally expressed as  $\text{NaI}$ . Minimum sodium (Na) and minimum iodine (I) must be specified. (Adopted 1975)

IFN 6-04-279 Sodium iodide  $\text{NaI}$ .

**57.145 Sodium Molybdate** is the sodium salt of molybdenum, generally expressed as  $\text{Na}_2\text{MoO}_4$ , and its hydrated forms. Minimum molybdenum must be specified (Proposed 1987, Adopted 1988)

IFN 6-19-30 Sodium molybdate

**57.120 Sodium Selenate** is a sodium salt of selenic acid generally expressed as  $\text{Na}_2\text{SeO}_4$  and its hydrated forms. Minimum selenium (Se) must be specified. All premixes shall bear adequate directions and cautions for use including this statement "Caution. Follow label directions. The addition to feed of higher levels of this premix containing selenium is not permitted." (Adopted 1975) Reg. 573.920

IFN 6-26-014 Sodium selenate  $\text{Na}_2\text{SeO}_4$

**57.119 Sodium Selenite** is a sodium salt of selenious acid generally expressed as  $\text{Na}_2\text{SeO}_3$  and its hydrated forms. Minimum selenium (Se) must be specified. All premixes shall bear adequate directions and cautions for use including this statement "Caution. Follow label directions. The addition to feed of higher levels of this premix containing selenium is not permitted." (Adopted 1975) Reg. 573.920

IFN 6-26-013 Sodium selenite  $\text{Na}_2\text{SeO}_3$

**57.138 Sodium Sesquicarbonate** is the mixed sodium salt of carbonic acid, generally expressed as  $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$ , providing not less than 90% of the hydrated double salt with 42% minimum sodium carbonate, 33% minimum sodium bicarbonate, and providing not less than 27.5% sodium. (Proposed 1988, Adopted 1989.

IFN 6-17-895 Sodium sesquicarbonate

**57.109 Sodium Sulfate** is the sodium salt of sulfuric acid generally expressed as  $\text{Na}_2\text{SO}_4$  and its hydrated forms. The minimum sodium (Na) and minimum sulfur (S) must be specified. (Adopted 1975)

IFN 6-04-291, Sodium sulfate decahydrate  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$

**57.111 Sulfur** is elemental sulfur generally expressed as sulfur (S). Minimum sulfur (S) must be specified. (Adopted 1975)

IFN 6-04-705 Sulfur

**57.112 Thymol Iodide** is a mixture of iodine derivatives of thymol generally expressed as  $\text{C}_{20}\text{H}_{24}\text{I}_2\text{O}_2$ . Minimum iodine (I) must be specified. (Adopted 1975)

IFN 6-04-857 Thymol iodide  $\text{C}_{20}\text{H}_{24}\text{I}_2\text{O}_2$

**57.114 Zinc Acetate**, is the zinc salt of acetic acid generally expressed as  $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2$  and its hydrated forms. Minimum zinc (Zn) must be specified. (Adopted 1975)

## 314 Feed Ingredient Definitions

IFN 6-05-547, Zinc acetate dihydrate  $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$

**57.115 Zinc Carbonate** is the zinc salt of carbonic acid generally expressed as  $\text{ZnCO}_3$  and its hydrated forms. Minimum zinc (Zn) must be specified. (Adopted 1975)

IFN 6-05-549 Zinc carbonate  $\text{ZnCO}_3$

**57.116 Zinc Chloride** is the zinc salt of hydrochloric acid generally expressed as  $\text{ZnCl}_2$  and its hydrated forms. Minimum zinc (Zn) must be specified. (Adopted 1975)

IFN 6-05-551 Zinc chloride  $\text{ZnCl}_2$

**57.143 Zinc Chloride Diammine Complex** is the product resulting from the complexing of zinc with ammonium chloride and is generally expressed as  $[\text{Zn}(\text{NH}_3)_2]\text{Cl}_2$ . Minimum zinc (Zn) must be specified. (Proposed 1986, Adopted 1987)

IFN 6-20-988 Zinc chloride diammine complex

**57.117 Zinc Oxide** is the oxide form of zinc generally expressed as  $\text{ZnO}$ . Minimum zinc (Zn) must be specified. (Adopted 1975)

IFN 6-05-553 Zinc oxide  $\text{ZnO}$

**57.118 Zinc Sulfate** is the zinc salt of sulfuric acid generally expressed as  $\text{ZnSO}_4$  and its hydrated forms. Minimum zinc (Zn) must be specified. (Adopted 1975)

IFN 6-05-555 Zinc sulfate monohydrate  $\text{ZnSO}_4 \cdot \text{H}_2\text{O}$ .

IFN 6-20-729 Zinc sulfate heptahydrate  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$

#### Tentative

**T57.163 Selenium Yeast** is a dried non-viable yeast, *Saccharomyces cerevisiae*, cultivated in a fed-batch fermentation which provides incremental amounts of cane molasses and selenium salts in a manner which minimizes the detrimental effects of selenium salts on the growth rate of the yeast and allows for optimal incorporation of inorganic selenium into cellular organic material. Residual inorganic selenium is eliminated in a rigorous washing process and must not exceed 2% of the total selenium content in the final selenium yeast product. Guaranteed organic selenium content must be declared on the product label. The additive selenium yeast is added in complete feed for chickens, turkeys, swine, beef cattle and dairy cattle at a level not to exceed 0.3 part per million of selenium. Selenium yeast shall be incorporated into each ton of complete feed by adding no less than 1 pound of a premix containing no more than 272.4 milligrams of added selenium per pound. 21 CFR 573.920. (Proposed 2002, Amended 2003, 2004)

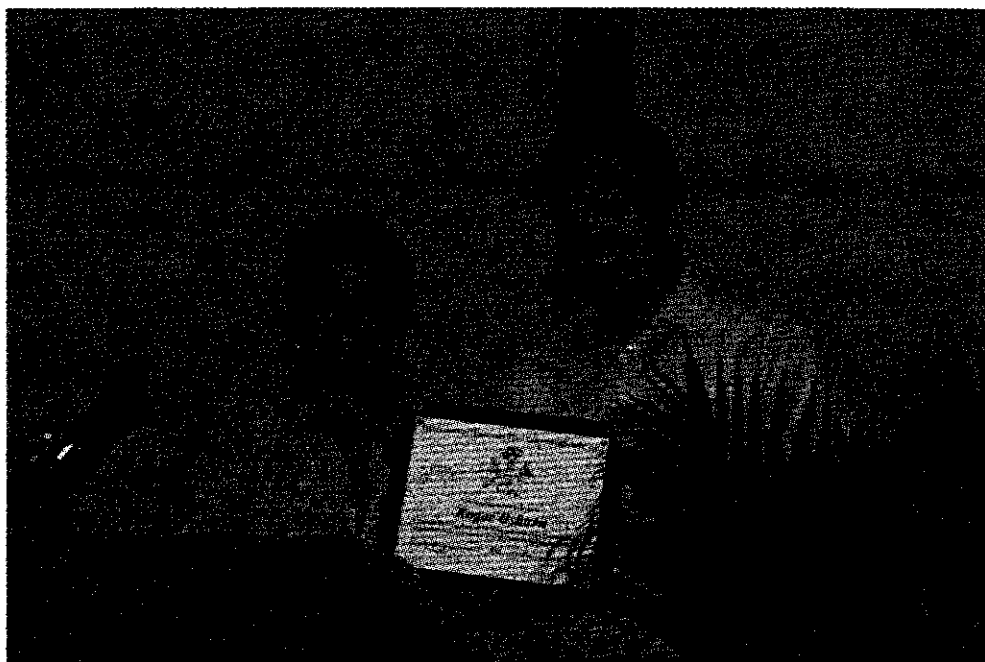
**T57.164 Chromium L-Methionine Complex** is the stable, water-soluble monohydrochloride complex containing one molar equivalent of chromium (III) and three molar equivalents of L-methionine generally expressed as  $(\text{C}_5\text{H}_{10}\text{NO}_2\text{S})_3\text{Cr}(\text{III})\text{HCl}$ . It is to be used as a supplemental source of chromium in swine diets not to supply more than 400 ppb of chromium to the diet. Minimum chromium content from chromium L-methionine complex must be specified. (Proposed 2004)

#### Descriptions of Salts, Complexes and Chelates

*Metal (Mineral) Salt* - an ionic substance containing a metal cation and either an inorganic or an organic anion. The water soluble portion of a Metal (Mineral) Salt dissociates in water to give the hydrated metal cation and the free anion (or its hydrolysis product) in solution.

*Metal (Mineral) Complex - a substance in which a metal cation (electron pair acceptor) accepts an electron pair from one or more anionic or neutral bonding partners (ligands, electron pair donors) to form chemical bonds. The water soluble portion of the complex remains as the intact complex in aqueous solution.*

*Metal (Mineral) Chelate - a metal complex (see preceding term) in which at least one ligand (electron pair donor) forms two or more bonds to the central metal ion through different atoms of the ligand. A distinctive feature of a metal chelate is the presence of a heterocyclic ring(s) in which the metal is a member of the ring. In the water soluble portion of the chelate, the heterocyclic ring(s) remains intact.*



Roger Osburn receives The Distinguished Service award.

## 316 Feed Ingredient Definitions

**Official Guidelines for  
Contaminant Levels Permitted in Mineral Feed Ingredients**  
Investigator and Section Editor--Jim Balthrop, TX

The Committee considered the matter of contaminants in mineral feed ingredients for several years before adopting an approach to the problem as reported in the 1978 Official Publication. The selected approach was combined with the 1980 National Academy of Sciences "Mineral Tolerances of Domestic Animals" toxicity data to produce these guidelines.

The mineral section of the 1982 AAFCO Official Publication contains 114 mineral ingredient definitions for sources of 12 elements plus salt to consider in drafting guidelines to limit contaminants. Some of the variables, among others, used in guideline development are:

- (1) Differing nutrient requirements between species and also within species, e.g., young vs. mature, lactating vs. non-lactating, and layers vs. broilers.
- (2) Similarly, the toxicity of a contaminant varies between and within species.
- (3) The concentration of a nutrient varies between several ingredient sources, e.g., magnesium oxide (MgO) contains 6 times the magnesium (Mg) contained in magnesium sulfate heptahydrate ( $MgSO_4 \cdot 7H_2O$ ) and thus could contain 6 times the contaminant level since only one-sixth as much would be needed to meet the nutrient requirement.
- (4) The range between a nutrient requirement and toxicity for a given element varies greatly. Selenium, for example, is required at approximately 0.1 ppm but should not be fed above 2 ppm. Manganese, on the other hand, is required at about 50 ppm but levels as high as 1,000-2,000 ppm can be tolerated.
- (5) Knowledge of nutrient requirements and toxicities is incomplete and/or imprecise in many cases.

If the variables are acknowledged it becomes apparent that precise contaminant limits, fixed at the very brink of toxicity, are impractical. Rather, we must work in much more general terms, using scientific data to the limit possible but not excluding some subjective decisions based upon common sense. Safety factors, for example, would be included in the latter category.

With the above factors in mind, the following approach was used in developing the overall schedule for handling contaminants in mineral feed ingredients proposed in this report.

- (1) Determine the all-species average requirement for each of the 12 elements and salt included in the AAFCO mineral definitions. These values (Table 1) were adapted from the National Academy of Science-Nutrition Research Council recommendations.
- (2) Determine the all-sources average content for each element.
- (3) Calculate, from the data in 1 and 2 above, the dilution factor needed to meet NRC recommended levels for each element (Table 3). Example: If the average calcium content from all AAFCO sources is 25% and the NRC recommendation is 1%, the dilution factor is 25. In other words, the calcium source will be diluted by a factor of 25 on total ration basis.
- (4) Determine a safety factor, 2.5 is used in this report.
- (5) Group contaminants according to toxicity following the general guidelines proposed in the 1978 report of this committee. Four groups are recommended: Highly Toxic, Toxic, Moderately Toxic, and Slightly Toxic (Table 2).
- (6) Set limits within each group as follows:



- a. Contaminant levels below which no declaration or labeling for the contaminant is required or deemed appropriate.
  - b. A range of contaminant levels permitted in feed ingredients if, but only if, the product is labeled as to the contaminant level. "Labeling" here and elsewhere is considered in the broader sense, i.e., "Typical Analysis Specification Sheet" or similar information supplied by the manufacturer to customers.
  - c. Contaminant levels above which the product's use as a feed ingredient is prohibited.
- (7) Select a dilution factor (see item 3 above) to be used in setting the maximum contaminant level permitted in a feed ingredient without labeling the amount present. A dilution factor of 25 is recommended and was used in arriving at the values in Table 2. This is the lowest value in Table 3 (for calcium) and thus provides the greatest margin of safety.
- (8) Calculate maximum level permitted in ingredients, without labeling, for each of the 4 groups, using the following equation:

$$MLP = \frac{CFL \times DF}{SF}$$

where--

MLP = Maximum level permitted without labeling (on "Typical Composition Specification Sheets" for example)

CFL = NAS recommended maximum continuous feeding level for the most toxic element in the group

DF = Dilution Factor

SF = Safety Factor

Example:

In the Highly Toxic group (Table 2) of cadmium, mercury and selenium, cadmium has the lowest continuous feeding level at 0.5 ppm. Therefore, if

DF = 25 and SF = 2.5,  $MLP = \frac{0.5 \text{ ppm} \times 25}{2.5} = 5 \text{ ppm}$ . Thus, ingredients

containing 5 ppm or less of the Highly Toxic group contaminants will not raise the level in the total ration above the continuous feeding level maximum for any of them.

The MLP values for the other 3 groups were determined similarly.

(9) Determine range of contaminant levels permitted, by group, if levels are stated in the labeling. This is a judgment decision.

(10) Determine contaminant levels, by group, above which an ingredient would be excluded from use in a feed. This is also a judgment decision.

The procedure recommended above provides a systematic approach to establishing contaminant limits in feed ingredients based upon toxicity data in "Mineral Tolerance of Domestic Animals." The equation used to set the limits is designed to handle worst case situations, since it is based upon the most toxic element in each group and assumes the lowest dilution of the ingredient (dilution factor of 25). Thus, an additional margin of safety is provided automatically for all but the highest toxicity contaminants in each group and for the highest nutrient requirements.

Fluorine is not included in Table 2. It is closely associated with phosphate ingredients and has been handled successfully for many years by requiring the phosphorus: fluorine ration to be not less than 100:1. It is recommended this policy continue unchanged.

318 Feed Ingredient Definitions

Table 1. Approximate Trace Mineral Requirements (total diet basis)<sup>1</sup>

	% ppm												
	Calcium	Phosphorus	Potassium	Salt	Sulfur	Cobalt	Copper	Iron	Iodine	Magnesium	Manganese	Selenium <sup>2</sup>	Zinc
Swine	0.6	0.4	0.3	0.2	--	--	10	80	0.04	400	40	0.3	50
Dairy	0.5	0.4	0.7	0.25	0.2	0.1	10	100	0.10	600	20	0.3	40
Beef	0.4	0.3	-	0.5	-	0.1	6	-	-	-	10	0.3	-
Poultry	3.0	0.7	0.4	0.2	-	-	4	80	0.35	500	55	0.3	50
Sheep	0.4	0.3	-	0.5	0.1	0.07	5	-	0.39	600	-	0.3	100
All-Species Average	1.0	0.4	0.5	0.4	0.2	0.1	7	90	0.20	600	30	0.3	60

<sup>1</sup> Adapted from NAS-NRC recommendations. The purpose of this Table is to estimate dilution factors for heavy metals present in minerals used for animal nutrition in feeds.

<sup>2</sup> FDA approved levels.

**Table 2. Official Guidelines Suggested for Contaminants  
in Individual Mineral Feed Ingredients\***

Category	Maximum Tol. Lev. in Complete Feed (PPM) <sup>(1)</sup>	Typical Analysis Not Sug. Below Label (PPM)	Typical Analysis Suggested Between (PPM)	Prohi- bited Above (PPM)
1. HIGHLY TOXIC	1-9	5	5-500	500
Cadmium	0.5			
Mercury	2			
Selenium	2			
2. TOXIC	10-40	100	100-1000	1000
Cobalt	10			
Molybdenum	10 <sup>(4)</sup>			
Vanadium	10			
Barium	20			
Tungsten	20			
Copper	25 <sup>(3)</sup>			
Lead	30			
3. MODERATELY TOXIC	41-100	500	500-2000	2000
Arsenic	50			
Nickel	50			
Iodine	50			
Antimony	70			
4. SLIGHTLY TOXIC	101-1000	2000	>2000	None
Boron	150			
Aluminum	200 <sup>(2)</sup>			
Bromine	200			
Zinc	300			
Bismuth	400			
Manganese	400			
Chromium	1000			

<sup>(1)</sup> Dietary Level that, for a limited period, will not impair animal performance and should not produce unsafe residues in human food derived from that animal. Values cited are those for the most sensitive animal species in "Mineral Tolerance of Domestic Animals," National Academy of Sciences/National Research Council, Washington, D.C. (1980).

<sup>(2)</sup> NAS/NRC publication reference above; as soluble salts of high bioavailability. Higher levels of less-soluble forms found in natural substances can be tolerated. Specie for this level is poultry; swine, horse, and rabbit are estimated to be similar by interspecific extrapolation; cattle & sheep 1,000 ppm.

<sup>(3)</sup> Some animal species such as sheep may be particularly sensitive to high levels of copper.

<sup>(4)</sup> It is generally recognized that molybdenum may be included in sheep feed at 1-3 ppm as an added nutrient.

320 Feed Ingredient Definitions

**Table 3. Approximate Dilution Factors and Typical Contaminant Levels of AAFCO Defined Mineral Feed Ingredients**  
 Recommended level NAS/NRC(%) Approx. dil. to meet rec. level <sup>1</sup>Typical Contaminant Levels (PPM)

	Recommended level NAS/NRC(%)	Approx. dil. to meet rec. level	Arsenic	Lead	Mercury	Cadmium	Nickel	Antimony
Calcium	1.0	$2.5 \times 10^1$	2-5	5-30	0.05	5-10	-	-
Phosphorus	0.4	$5 \times 10^1$	2-5	5-30	0.05	5-10	-	-
Potassium	0.5	$9 \times 10^1$	1	1	1	-	-	-
Salt	0.4	$2.5 \times 10^2$	-	-	-	-	-	-
Sulfur	0.2	$7 \times 10^1$	1	1	1	-	-	-
<b>(PPM)</b>								
Cobalt	0.1	$3 \times 10^6$	2-20	1-100	1-20	2-200	800	-
Copper	7	$7 \times 10^4$	3-100	9-600	1	2-100	100	0-20
Iron	90	$3 \times 10^3$	1-50	1-90	1	-	-	-
Iodine	0.2	$4 \times 10^6$	2	3	2	1	-	-
Manganese	30	$1.2 \times 10^4$	2-100	1-90	-	1-20	-	70-200
Magnesium	600	$3 \times 10^2$	1-10	1-20	0.1-5	-	-	-
Selenium	0.1	$4 \times 10^6$	-	-	10-1000	1-5	1-5	-
Zinc	60	$8 \times 10^3$	10-800	100-2000	1	80-500	-	10

<sup>1</sup> Adapted from "NFIA Mineral Ingredients Handbook," National Feed Ingredients Association, 1979 edition, and from "AFIA Feed Ingredient Guide," American Feed Industry Association, Inc.

**60. MISCELLANEOUS PRODUCTS**

Investigator and Section Editor--Shannon Jordre, FDA

\*Use of this ingredient, from mammalian origins, is restricted to non-ruminant feeds unless specifically exempted by 21 CFR 589.2000. Feeds containing prohibited material must bear the following label statement: "**Do not feed to cattle or other ruminants**".

**Official**

**60.1 Dried Apple Pomace** is the sound, dried residue obtained by the removal of cider from apples. (Adopted 1929)

IFN 4-00-423 Apple pomace dehydrated

**60.2 Dried Apple Pectin Pulp** is the sound, dried residue obtained by the removal of pectin from apple products. (Adopted 1929)

IFN 4-00-425 Apple pomace without pectin dehydrated

**60.7 Almond Hulls**--are obtained by drying the pericarp which surrounds the nut. Almond hulls shall contain not more than 13 percent moisture, 15 percent crude fiber and 9 percent ash. Total soluble sugars expressed as invert shall not be less than 18 percent. Almond hulls shall be processed in accordance with good manufacturing practices and be reasonably free of foreign material. (Proposed 1984, Adopted 1985)

IFN 4-00-358 Almond hulls ground

**60.72 Almond Hulls with Almond Shells**--Almond hulls with almond shells must not contain more than 29 percent crude fiber, 9 percent ash and 13 percent moisture. They shall be processed in accordance with good manufacturing practices and be reasonably free of foreign material. (Proposed 1984, Adopted 1985)

IFN 1-27-475 Almond hulls with shells

**60.42 Ground Almond Shells** is obtained by drying and grinding that portion of the almond fruit which surrounds the nut. It must be reasonably free of the nut shell and other foreign material. (Adopted 1953)

IFN 4-00-358 Almond hulls ground

**60.44 Ground Whole Aspen and/or Parts** is generally recognized as a feed ingredient in cattle diets when used in accordance with good nutritional practices. Ground whole aspen (*Populus tremuloides Michx* and *Populus gradidentata*) is composed of the entire tree including leaves, branches, trunk, and bark. Ground aspen parts may also include leaves, branches, trunk, and bark. Roots and stumps are excluded to avoid contamination of dirt and rocks in the product. The particle size of the product shall not exceed 3/8 inches. (Proposed 1979, Adopted 1980)

IFN 1-30-183 Aspen quaking/Aspen large toothed aerial part ground

IFN 1-12-241 Aspen aerial part ground

**60.43 Aspirated Grain Fractions**-- are obtained during the normal aspiration of cereal grains and/or oil seeds for the purpose of environmental control and safety within a grain handling facility. It shall consist primarily of seed parts and may not contain more than 15% ash. It shall not contain aspirations from medicated feeds. (Proposed 1979, Amended 1980, Adopted 1980)

IFN 4-12-208 Cereals-oil seeds grain and seed fractions aspirated

**60.15 Dried Bakery Product** is a mixture of bread, cookies, cake, crackers, flours, and doughs which has been mechanically separated from non-edible material, artificially dried and ground. If the product contains more than 3.5% salt, the maximum percentage of salt must be a part of the name; i.e. Dried Bakery Product with \_\_\_\_\_ % Salt. (Proposed 1962, Adopted 1967)

IFN 4-00-466 Bakery waste dehydrated

## 322 Feed Ingredient Definitions

**60.34 Dried beans** are the residue of the normal packaging and processing of \_\_\_\_\_ dried beans for human consumption. This residue shall consist of the broken, small, shriveled, and cull \_\_\_\_\_ beans. They shall be identified by variety such as navy, Northern, pinto, kidney, et al. Where further processing, such as grinding, roasting, etc., has occurred, ground, roasted, or other acceptable description may be part of the name, i.e., ground roasted \_\_\_\_\_ dried beans. (Proposed 1976, Adopted 1977)

IFN 5-00-594 Bean seeds

IFN 5-00-600 Bean kidney seeds

IFN 5-00-623 Bean navy seeds

IFN 5-00-624 Bean pinto seeds

**60.27 Coastal Bermudagrass Hay** is the dried aerial portion of the perennial hybrid grass, Coastal bermuda (*Cynodon dactylon*) (L.)a (Pers.), reasonably free of other crop plants, weeds and mold, which has been cultivated as a crop and harvested during an period of active growth. If it is fully ground, it must be designated as "Coastal Bermudagrass Meal." If it is dried by thermal means, it should be designated as "Dehydrated Coastal Bermudagrass Hay" or "Dehydrated Coastal Bermudagrass Meal." (Proposed 1971, Adopted 1972)

IFN 1-10-609 Bermudagrass coastal dehydrated

IFN 1-00-716 Bermudagrass coastal hay

**60.17 Buckwheat Hulls** is the product consisting primarily of the outer covering of the buckwheat obtained in the milling of buckwheat flour. (Proposed 1963, Adopted 1968)

IFN 1-12-238 Buckwheat hulls

**60.6 Buckwheat Middlings** is that portion of the buckwheat grain immediately under the hull after separation of the flour. It must contain no more hulls than is obtained in the usual process of buckwheat milling, and must contain not more than 10% crude fiber. (Adopted 1944)

IFN 5-12-237 Buckwheat flour by-product without hulls

**60.14 Cereal Food Fines** consists of particles of breakfast cereals obtained as a by-product of their processing. (Adopted 1957)

IFN 5-01-199 Cereals food fines

**60.29 Gelatin By-Products** is the dried residue from the various process streams from the manufacture of edible gelatin. The total crude protein content will contain a minimum of 85% digestible protein as determined by the AOAC pepsin method 22.025-22.031. A 25% maximum of diatomaceous earth will not be exceeded. This product is for use in poultry feeds not to exceed 5% of the total rations. (Proposed 1972, Adopted 1973)

IFN 5-14-503 Gelatin process residue

**60.11 Ground Grass** is obtained by drying and grinding grass which has been cut before formation of the seed. If a specie name is used, the produce must correspond thereto. (Adopted 1949, Amended 1964)

IFN 1-02-215 Grass hay sun-cured ground

**60.18 Guar Meal** is obtained from whole guar beans after removal of most of the endosperm. If the product is heat treated, it may be designated as "heat treated" or "toasted". (Proposed 1966, Adopted 1968)

IFN 5-05-687 Guar seeds without endosperm ground

**60.19 Dried Kelp** is dried seaweed of the families Laminariaceae and Fucaeeae. The maximum percentage of salt (NaCl) and the minimum percentage of potassium (K) must be declared. If the kelp is sold as a source of iodine (I), the minimum

percentage of iodine must be declared. If the product is prepared by artificial drying, it may be called "Dehydrated Kelp." (Proposed 1966, Adopted 1968)

IFN 1-08-073 Seaweed kelp whole dehydrated

**60.24 Paunch Product, Dehydrated** is a product composed of the contents of the rumen of slaughtered cattle, dehydrated at temperatures over 100° centigrade to a moisture content of 12% or less, such dehydration designed to destroy any pathogenic bacteria. It shall be dehydrated promptly after removal from the rumen to prevent decomposition. (Proposed 1969, Adopted 1970)

IFN 1-09-327 Animal rumen contents dehydrated

**60.28 Dried Potato Products** is the dried residue of potato pieces, peeling, culls, etc., obtained from the manufacture of processed potato products for human consumption. The residue may contain up to 3% hydrate of lime which may be added to aid in processing. (Proposed 1972, Adopted 1973)

IFN 4-03-775 Potato process residue dehydrated

**60. Dehydrated Silage (ensilage) Pellets** are pellets made from wholesome silage (ensilage) which has been dried by thermal means and formed into pellets by compacting and forcing through die openings by a mechanical process. The product should bear a name descriptive of the type of silage (ensilage) pelleted, such as "Dehydrated Alfalfa Silage (ensilage) Pellets," etc. (Proposed 1967, Adopted 1968.)

IFN 3-08-812 Alfalfa silage dehydrated pelleted

**60.10 Ground Straw** is the ground product remaining after separation of the seed from mature forage plants. The source of the material shall constitute a part of the name of the product; i.e., "Ground Blue Grass Straw", "Ground Alfalfa Straw". (Adopted 1948, Amended 1964)

IFN 1-04-682 Cereals straw ground

IFN 1-12-232 Alfalfa straw ground

IFN 1-12-233 Bluegrass straw ground

**60.35 Sugar Foods By-Product** is the product resulting from the grinding and mixing of the inedible portions derived from the preparation and packaging of sugar based food products such as candy, dry packaged drinks, dried gelatin mixes, and similar food products which are largely sugar. It shall contain not less than 80% total sugar expressed as invert. It shall be free from foreign materials harmful to animals. (Proposed 1976, Adopted 1977)

IFN 4-20-865 Sugar foods process residue

**60.8 Dried Tomato Pomace** is the dried mixture of tomato skins, pulp, and crushed seeds. If the pomace contains spices used in the production of the tomato product, this must be shown in the name as "Dried Spiced Tomato Pomace." (Adopted 1953, Amended 1964)

IFN 5-05-041 Tomato pomace dehydrated

**60.9 Yeast Dried Grains** is the properly dried residue from the mixture of cereals, malt, and malt sprouts (sometimes cottonseed meal) obtained in the manufacture of yeast or vinegar, and consists of corn or corn and rye from which most of the starch has been extracted, together with malt added during the manufacturing process to change the starch to sugar, and malt sprouts (sometimes cottonseed meal) added during the manufacturing process to aid in filtering the residue from the wort and to serve as a source of food supply for the yeast. If residue is from manufacture of vinegar, may also be listed as "Vinegar Dried Grains." (Adopted prior to 1928)

IFN 5-02-158 Cereals vinegar fermentation grains dehydrated

IFN 5-02-159 Cereals yeast fermentation grains dehydrated

## 324 Feed Ingredient Definitions

**60.73 Salts of Volatile Fatty Acids** is a blend containing the ammonium or calcium salt of isobutyric acid and the ammonium or calcium salts of a mixture of 5-carbon acids/isovaleric, 2-methylbutyric, and n-valeric. The contained ammonium or calcium salts of volatile fatty acids shall conform to the specifications in 21 CFR 573.914. It is used as a source of energy in dairy cattle feed. The label of the product shall bear adequate directions for use including statements expressing maximum use levels: For ammonium salts of volatile fatty acids--not to exceed 120 grams per head per day thoroughly mixed in dairy cattle feed as a source of energy; For calcium salts of volatile fatty acids--not to exceed 135 grams per head per day thoroughly mixed in dairy cattle feed as a source of energy. (Proposed 1985, Adopted 1986) Reg. 21CFR 573.914

**60.74 Tapioca/Manioca and Cassava Root** is the whole root chipped mechanically into small pieces and sun dried on concrete surfaces for 2 to 3 days and then

the chips are pelleted. (Adopted 1993)

IFN 4-18-896 Cassava Tubers, Sun-cured Pelleted

**60.75 Ethyl Alcohol Containing Ethyl Acetate** is a product containing not less than 92.5% ethyl alcohol, each 100 gallons having had added the equivalent of 4.25 gallons of 100% ethyl acetate. It is used in ruminant feed supplements as a source of added energy. (Proposed 1986, Adopted 1990) Reg. 21CFR 584.200

IFN 4-18-895 Ethyl Alcohol-Ethyl Acetate

**60.76 Dried Seaweed Meal** is the product resulting from drying and grinding non-toxic macroscopic marine algae (marine plants) of the following botanical divisions: Division RHODOPHYTA (Red Algae); Division PHAEOPHYTA (Brown Algae); Division CHLOROPHYTA (Green Algae). The maximum percentage of salt (NaCl) (determined by sodium content), the minimum percentage of potassium (K), and the percentage of iodine (I) shall be guaranteed. If the product is prepared by artificial drying it must be labeled as: Dehydrated Seaweed Meal. The family(ies) shall be identified on the label.

Note: The following families are accepted for use under the definition, Dried Seaweed Meal: RHODOPHYTA (Red Algae): Gelidiaceae, Endocladaceae, Gigartinaceae, Gracilariaceae, Phylloporaceae, Solieriaceae, Hypneaceae, Palmariaceae, Bangiaceae; PHAEOPHYTA (Brown Algae): Chordaceae, Laminariaceae, Lessoniaceae, Alariaceae, Fucaceae, Sargassaceae, Durvillaeaceae; CHLOROPHYTA (Green Algae): Monostromataceae, Ulvaceae. (Proposed 1986, Adopted 1991, Amended 1994)

IFN 5-18-897 Algae Whole Meal

**60.78 Sweet Lupin Meal** is the product resulting from the grinding of the entire seed of the species of *Lupinus albus* (white), *L. augustifolius* (blue), or *L. luteus* (yellow) which contain less than 0.03% alkaloids. (Proposed 1993, Adopted 1996)

**60.79 Sweet Lupin Meal Dehulled** is the product resulting from the grinding of seeds after mechanical removal of the hulls from the species of *Lupinus albus* (white), *L. augustifolius* (blue), or *L. luteus* (yellow) which contain less than 0.03% alkaloids. (Proposed 1993, Adopted 1996)

**60.80 Sweet Lupin Meal Solvent Extracted** is the product obtained by grinding of the flakes after the removal of most of the oil by a solvent extraction process from the seeds of the species of *Lupinus albus* (white), *L. augustifolius* (blue), or *L. luteus* (yellow) which contain less than 0.03% alkaloids. It must contain not more than 7% crude fiber. (Proposed 1993, Adopted 1996)

Note: The sweet lupin species defined above are of Mediterranean origin and are quite distinct from the Lupine's of North America. The two differ evolutionarily and



genetically in their origin and thus the sweet lupin cannot be 'contaminated' by outcrossing with the North American lupine.

**60.84 Psyllium Seed Husk** is the cleaned, dried seed coat separated by winnowing and thrashing of psyllium seeds. It is to be used as a source of dietary fiber and the crude fiber level must be declared on the label. (Proposed 1991, Adopted 1993)

IFN 1-32-187 Plantago seed husk

**60.86 1, 3-Butylene Glycol (1, 3-Butanediol)** is a viscous, colorless liquid of 99% purity, with a specific gravity at 20 degrees centigrade:1.004 to 1.006, and has a distillation range of 200-215 degrees centigrade. It is to be used as a source of energy in swine feed at a level not to exceed 9% of the dry matter of the total ration. It should be thoroughly mixed in feed, not less than 5 minutes after its addition, with equipment adapted for the addition of liquids. (Reference 21 CFR 573.225 and 21 CFR 173.220. (Proposed 1992, Adopted 1996)

**60.93 Pasta Product** is a mixture of dry, whole and broken particles of noodles, macaroni, spaghetti, etc., or a mixture of these resulting from the manufacturing and packaging of edible pasta products and which has been mechanically separated from any non-edible materials. (Proposed 1995, Adopted 1996)

**60.94 Potato Protein.** Potato Protein is derived from de-starched potato juice from which the proteinaceous fraction has been precipitated by thermal coagulation followed by dehydration. (Proposed 1996, Adopted 2000)

**\*60.96 Food Processing Waste** is composed of any and all animal and vegetable products from basic food processing. This may include manufacturing or processing waste, cannery residue, production over-run, and otherwise un-saleable material. The guaranteed analysis shall include the maximum moisture, unless the product is dried by artificial means to less than 12% moisture and designated as "Dehydrated Food Processing Waste." If part of the grease and fat is removed, it must be designated as "Degreased". (Proposed 1998, Adopted 2000)

**\*60.97 Restaurant Food Waste** is composed of edible food waste collected from restaurants, cafeterias, and other institutes of food preparation. Processing and/or handling must remove any and all undesirable constituents including crockery, glass, metal, string, and similar materials. The guaranteed analysis shall include maximum moisture, unless the product is dried by artificial means to less than 12% moisture and designated as "Dehydrated Restaurant Food Waste". If part of the grease and fat is removed it must be designated as "Degreased". (Proposed 1998, Adopted 2000)

**\*\*The words "Mechanical Extracted" or "Solvent Extracted" are not required when listed as an ingredient in a manufactured feed.**

**60.98 L-Carnitine** is a nutritional supplement with a minimum content of 97.0% L-Carnitine and a maximum of 0.5% D-isomer. L-Carnitine is for use in swine feeds at levels not to exceed 0.1% (1000 ppm) of complete feed, for use in chicken and turkey feeds at levels not to exceed 0.02% (200 ppm) of complete feed, for use in fish feed at levels not to exceed 0.25% (2500 ppm) of complete feed, for use in dog feeds at levels not to exceed 0.075% (750 ppm) of complete feed on a dry matter basis, and for use in cat foods (intended for adult maintenance only) at levels not to exceed 0.10% (1000 ppm) of complete feed on a dry matter basis. (Proposed 1997, Amended 1999, Amended 2002, Adopted 2004)

**60.99 Chia Seed** consists of cleaned, sound, dry, whole seed of the chia plant (*Salvia hispanica*). Typically it contains 18% crude protein, 32% crude fat and 32% crude fiber. (Proposed 1998, Adopted 2006)

## 326 Feed Ingredient Definitions

**60.104 Dried Chicory Root** is the dried, non-roasted root *Cichorium intybus L.*, intended as a source of inulin, a soluble, fermentable fiber. It shall contain no less than 50% inulin and no more than 13% moisture. (Proposed 2002, Adopted 2006)

**60.105 Fructooligosaccharide** is a carbohydrate product composed of short chain fructose units bound by B-(2-1) linkages attached to a terminal glucose unit. The final product must contain a minimum of 80% fructooligosaccharide on a dry weight basis. (Proposed 2003, Adopted 2005)

**60.107 Mixed Feed Nuts** are the residue of the normal packaging and processing for human consumption of shelled tree nut and peanut products. This residue shall consist of broken, small, shriveled and cull edible tree nuts or peanuts of two or more kinds and shall be suitable for animal consumption. If salt has been added during processing, a guarantee must be made for maximum sodium. (Proposed 2004, Adopted 2006)

## Tentative

**T60.95 Lablab** (*Lablab purpureus* or *Dolichos lablab*) also known as hyacinth bean, is an annual legume that produces forage as either hay or pasture for ruminants. Leaves and/or stems can be used as a feed ingredient if it is free of mature seed. (Proposed 1997)

**T60.101 Hydrolyzed Roughage** is the residue from the acid hydrolysis and steam stripping of roughage products. The product will contain a minimum of 50% acid detergent fiber and a maximum of 5% ash. The product is used as a carrier for oils, fats, and molasses and as a source of acid detergent fiber for ruminants. (Proposed 2000)

**T60.106 Inulin** is a polysaccharide product obtained from plant sources such as chicory (*Cichorium intybus L.*), agave (*Agave azul tequilana*), and Jerusalem artichoke (*Helianthus tuberosus*) by hot water extraction. It is intended as a source of soluble, fermentable fiber. It must contain not less than 90% inulin. It may contain products of partially hydrolyzed inulin. (Proposed 2004)

**\*T60.108 Salvage Pet Food** is a product resulting from pet food manufacturing. This product may consist of, but is not limited to, start-up and over-run product, unfinished pet food, pet food fines and other product not suitable for packaging for retail sale. If it contains, or may contain, any material identified by 21 CFR 589.2000 as prohibited from use in the feed of ruminant animals, or if it is no longer accompanied by a detailed label listing all of the ingredients in the salvage pet food, the label must contain the precautionary statement "Do not feed to cattle or other ruminants". It shall be free of foreign materials harmful to animals, suitable for the purpose for which it is being marketed, and properly labeled for its intended use. (\*The asterisk indicates that this ingredient may be subject to 21 CFR 589.2000). (Proposed 2004, Amended 2006)

**\*T60.109 Distressed Pet Food** is a product resulting from pet food distribution, but which is no longer available for retail sale. This product may be pet food in, but not limited to, dented cans, torn bags, product past its sell-by date, or returned product that is suitable for use in feed. It may consist of a single formula, still in the original packaging, or a variety of formulas commingled into one bulk container and containing none of the original packaging or labeling. It if contains, or may contain, any material identified by 21 CFR 589.2000 as prohibited from use in the feed of ruminant animals, or if it is no longer accompanied by a detailed label listing all of the ingredients in the distressed product, the label must contain the precautionary statement "Do no feed to cattle or other ruminants". It shall be free of foreign

materials harmful to animals, suitable for the purpose for which it is being marketed, and properly labeled for its intended use. (*\*The asterisk indicates that this ingredient may be subject to 21 CFR 589.2000.*) (Proposed 2004, Amended 2006)

### 63. MOLASSES AND MOLASSES PRODUCTS

Investigator and Section Editor--Steve Martin, MI

#### Official

**63.1 Beet Molasses** is a by-product of the manufacture of sucrose from sugar beets. It must contain not less than 48% total sugars expressed as invert and its density determined by double dilution must not be less than 79.5 Brix. (Adopted 1941, Amended 1960)

IFN 4-30-289 Beet sugar molasses

**63.3 Citrus Molasses** is the partially dehydrated juices obtained from the manufacture of dried citrus pulp. It must contain not less than 45% total sugars expressed as invert and its density determined by double dilution must not be less than 17.0 Brix. (Adopted 1952, Amended 1960)

IFN 5-01-241 Citrus syrup

**63.5 Hemicellulose Extract** is a by-product of the manufacture of pressed wood. It is the concentrated soluble material obtained from the treatment of wood at elevated temperature and pressure without use of acids, alkalis, or salts. It contains pentose and hexose sugars, and has a total carbohydrate content of not less than 55%. (Proposed 1965, Adopted 1966) Reg. 573.520

IFN 4-08-030 Hemicellulose extract

**63.6 Starch Molasses** is a by-product of the manufacture of dextrose from starch derived from corn or grain sorghums in which the starch is hydrolized by use of enzymes and/or acid. It must contain not less than 43% reducing sugars expressed as dextrose and not less than 50% total sugars expressed as dextrose. It shall contain not less than 73% total solids. (Proposed 1967, Adopted 1968)

IFN 4-08-037 Maize-sorghum grain starch molasses

**63.7 Cane Molasses** is a by-product of the manufacture of sucrose from sugar cane. It must contain not less than 43% total sugars expressed as invert. If its moisture content exceeds 27%, its density determined by double dilution must not be less than 79.5 Brix. (Proposed 1973, Adopted 1987)

IFN 4-13-251 Sugarcane molasses

**63.26 Bagasse** is that portion of the stalk of sugar cane, after removal of leaves and tops, remaining after extraction of the juice. (Proposed 1971, Adopted 1972)

IFN 1-04-686 Sugarcane bagasse dehydrated

**63.36 Beet pulp, dried, plain**, is the dried residue from sugar beets which has been cleaned and freed from crowns, leaves, and sand, and which has been extracted in the process of manufacturing sugar. (Proposed 1976, Adopted 1977)

IFN 4-00-669 Beet sugar pulp dehydrated

**63.37 Beet Pulp, dried, molasses**, is the dried residue from sugar beets which has been cleaned and freed from crowns, leaves, and sand, and which has been extracted in the process of manufacturing sugar to which has been added (beet) molasses obtained in the extraction of sugar. (Proposed 1976, Adopted 1977)

IFN 4-00-672 Beet sugar pulp with molasses dehydrated

**63.38 Beet pulp, dried product CSF, RNS**, is the dried residue from sugar beets which has been cleaned and freed from crowns, leaves, and sand, and which has been extracted in the process of manufacturing sugar to which has been added the concentrated Steffen's filtrate obtained in the extraction of the sugar from the beets. (Proposed 1976, Adopted 1977)

### 328 Feed Ingredient Definitions

IFN 4-00-675 Beet sugar pulp with steffens filtrate dehydrated

**63.39 Beet molasses, dried product**, is the properly dried mixture of molasses and molasses dried beet pulp containing not less than 45% total sugar expressed as invert. (Proposed 1976, Adopted 1977)

IFN 4-20-866 Beet sugar pulp with molasses dehydrated more than 45% invert sugar

**63.41 Concentrated Steffen Filtrate (CSF)** is obtained as a by-product of the recovery of sucrose from beet molasses by utilization of the Steffen process (precipitation with calcium oxide). (Proposed 1978, Adopted 1979)

IFN 5-00-679 Beet sugar steffens filtrate condensed

**63.81 Concentrated Separator By-Product (CSB)** is obtained as a by-product of the recovery of sucrose from beet molasses by utilization of molecular exclusion chromatography. (Proposed 1991, Adopted 1993)

IFN 5-32-051 Beet, Sugar, separator by-product, condensed

**63.83 Beet Fiber**, dried, plain is the refined plant material derived from sugar beet pulp after sugar extraction which has been further refined by washing, drying and milling. It shall contain a total dietary fiber (crude fiber) content of not less than 80% and an ash content of not more than 3%. (Proposed 1991, Adopted 1993)

IFN 1-32-188 Beet, Sugar-Fiber, Dehydrated

## 66. NON-PROTEIN NITROGEN

Investigator and Section Editor--Sharon Benz, FDA

### Official

**66.1 Urea** is predominantly urea but may contain other non-toxic nitrogenous compounds which are present as by-products from the commercial synthesis and processing of Urea. It must contain not less than 45% nitrogen (equivalent to 281.25% crude protein). If it contains less than 45% N but 41% or more N, it must be designated as "Urea and Conditioner(s)". If the name of the conditioner(s) does not appear in the product name, the ingredient listing must contain the specific name of the conditioner(s).

If the Urea and Conditioner(s) contribute more than 0.5% conditioner(s) to the mixed feed, the conditioner(s) must be named in the mixed ingredient list. (Proposed 1958, Amended 1962, 1963, 1964, Adopted 1968)

IFN 5-05-070 Urea 45% nitrogen 281% protein equivalent

**66.2 Feed Grade Biuret** is predominantly composed of biuret (55% minimum) together with related non-toxic nitrogenous compounds resulting from the controlled pyrolysis of urea and subsequent processing. It must contain not less than 35% nitrogen (equivalent to 218.7% crude protein) with not more than 15% nitrogen (equivalent to 93.75% crude protein) being from urea. It shall not contain more than 0.5% mineral oil.

The label of the additive and of any feed additive supplement, feed additive concentrate, feed additive premix, or complete feed prepared therefrom, must contain the following information in addition to any other required information:

- (1) The name of the additives
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for use to provide:
  - (a) The diet be balanced to provide adequate nutrients when equivalent crude protein from all forms of non-protein nitrogen exceed one-third of the total crude protein in the total daily ration.

(b) Use only in mixed feeds for ruminants (cattle, sheep and goats.)

- (4) This feed should be used only in accordance with directions furnished on the label. (Proposed 1972, Adopted 1974, Amended 1975, 2004.) Reg. 573.220 IFN 5-09-824 Biuret

**66.3 Gelatinized Starch-Urea Product** is obtained by processing a mixture of finely ground grains or other carbohydrate containing materials with urea under regulated conditions of temperature (250 to 250° F), moisture (15 to 30%) and pressure (400 to 500 p.s.i.). It is to be used in the feed of ruminants as a source of protein and/or as the sole source of non-protein nitrogen in an amount not to exceed twenty-five percent of the total ration.

The label of the additive and of any feed additive supplement, feed additive concentrate, or feed additive premix prepared therefrom, must contain the following information in addition to any other required information:

- (1) The name of the additive
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for use to provide not more than twenty-five percent of the additive in the total ration and a prominent statement:

"Warning--This feed should be used in accordance with the directions furnished on the label." (Proposed 1972, Adopted 1975)

IFN 5-14-506 Starch-urea product gelatinized

**66.4 Liquid Starch-Controlled Urea Product** is obtained by processing a slurry of finely ground grains or other carbohydrate-containing materials with urea in a hydroheater under regulated conditions of temperature (250° to 350° F), moisture (50 to 70%) and pressure (15 to 150 p.s.i.). It is to be used in the feed of ruminants as a source of protein and/or as the sole source of non-protein nitrogen in an amount not to exceed twenty-five percent of the total ration.

The label of the additive and of any feed additive supplement, feed additive concentrate or feed additive premix prepared therefrom, must contain the following information in addition to any other required information:

- (1) The name of the additive.
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for use to provide not more than twenty-five percent of the additive in the total ration and a prominent statement: "WARNING--This feed should be used only in accordance with the directions furnished on the label." (Proposed 1978, Adopted 1980.)

IFN 5-30-264 Starch-urea product liquid

**66.5 Fermented Ammoniated Condensed Whey** is the product produced by the *Lactobacillus bulgaricus* fermentation of whey with the addition of ammonia. It must contain 35% to 55% crude protein and not more than 42% equivalent crude protein from non-protein nitrogen. It is to be used as a source of crude protein and non-protein nitrogen for cattle.

The label of the additive and of any feed additive supplement, feed additive concentrate or feed additive premix prepared therefrom must contain the following information in addition to any other required information:

- (1) The name of the additive.
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for storage and use:

330 **Feed Ingredient Definitions**

- (a) Store in closed vented tank equipped for agitation. Agitate five (5) minutes before using. Do not store at temperatures above 110° F (43° C).
  - (b) Mix with grain, roughage, or grain and roughage prior to feeding or as a component of free choice liquid feeds, used to supplement the diets of cattle fed other sources of nutrients. Fermented ammoniated condensed whey shall not exceed 80% of free choice liquid feed.
  - (c) The maximum equivalent crude protein from fermented ammoniated condensed whey and equivalent crude protein from all other added forms of non-protein nitrogen shall not exceed 30% of the dietary crude protein.
- (4) A prominent statement: "CAUTION--This feed should be used only in accordance with the directions furnished on the label." (Proposed 1979, Amended 1980, Adopted 1981, Amended 1983.) Reg. 573.450  
IFN 5-28-223 Cattle whey fermented ammoniated condensed

**66.6 Ammonium Chloride** is the product resulting from the neutralization of hydrochloric acid with ammonia generally expressed as  $\text{NH}_4\text{Cl}$ . It must contain not less than 25.6% nitrogen (equivalent to 160% crude protein). It must contain not more than 0.1% moisture, 0.4% salt (NaCl), 15 ppm iron (Fe), 3 ppm arsenic (As), and 10 ppm heavy metals reported as lead. It may be treated with not more than 1.0% tricalcium phosphate to prevent caking. It shall not be made from by-product ammonia recovered from coke oven gas. It is to be used only in feeds for cattle, sheep and goats as a source of non-protein nitrogen at a level not to exceed 1.0% ammonium chloride in the total daily ration to provide not more than 1.6% equivalent crude protein. Labels for feed containing ammonium chloride include premixes, concentrates and supplements shall contain adequate directions for use and the following prominent statements: "CAUTION: Use only as directed. For ruminants (cattle, sheep and goats) only." (Adopted 1984, Amended 2001, Adopted 2003))

IFN 8-08-814 Ammonium Chloride

**NOTES****Diammonium Phosphate**

See Definition 57.16 in Mineral Products Section; Diammonium Phosphate as source of Non-Protein Nitrogen.

**Ammonium Polyphosphate Solution**

See Definition 57.22 in Mineral Products Section; Ammonium Polyphosphate Solution as source of Non-Protein Nitrogen.

**Ammoniated Rice Hulls**

See Definition 87.7 in Special Purpose Products Section; Ammoniated Rice Hulls as a source of Non-Protein Nitrogen.

**Ammoniated Cottonseed Meal**

See Definition 87.9 in Special Purpose Products Section; Ammoniated Cottonseed Meal as source of Non-Protein Nitrogen.

**Ammonium Sulfate**

See Definition 57.27 in Mineral Products Section; Ammonium Sulfate as source of Non-Protein Nitrogen.

**Anhydrous Ammonia**

See Definition 87.11 in Special Purpose Products Section; Anhydrous ammonia as source of Non-Protein Nitrogen.

**Monoammonium Phosphate**

See Definition 57.33, in Mineral Products Section Mono-Ammonium Phosphate as source of Non-Protein Nitrogen.

## 69. OAT PRODUCTS

Investigator and Section Editor—Ali Kahani, WA

### Official

**69.1 Oat Groats** are cleaned oats with the hulls removed. (Adopted 1931, Amended 1963)

IFN 4-03-331 Oats groats

**69.2 Oat Hulls** consists primarily of the outer covering of oats, obtained in the milling of table cereals or in the groating of oats from clean oats. (Adopted prior to 1928, Amended 1963)

IFN 1-03-281 Oats hulls

**69.3 Feeding Oat Meal** is obtained in the manufacture of rolled oat groats or rolled oats and consists of broken oat groats, oat groat chips, and floury portions of the oat groats, with only such quantity of finely ground oat hulls as is unavoidable in the usual process of commercial milling. It must not contain more than 4% crude fiber. (Adopted 1938)

IFN 4-03-303 Oats cereal by-product less than 4% fiber

### 69.4 Clipped Oat By-Product

is obtained in the manufacture of clipped oats. It may contain the light chaffy material broken from the end of the hulls, empty hulls, light immature oats, and dust. It must not contain an excessive amount of oat hulls. (Adopted prior to 1928)

IFN 1-03-269 Oats grain clipped by-product

**69.6 Mixed Feed Oats** consists of a mixture of grain containing at least 30% of cultivated oats provided that the mixture consists of either (a) not less than 65% of cultivated and wild oats combined or (b) not less than 65% of wild oats. It must contain more than 25% of other grains, not more than 6% heat damaged kernels of oats, wild oats, and other grains, and not more than 10% foreign material which may include 4% fine seeds. (Adopted 1958, Amended 1964)

IFN 4-08-026 Oats wild--oats grain

NOTE: Foreign material must be all matter except wild oats and grains for which standards have been established under the United States Grain Standards Act.

**69.7 Oat Mill By-Product** is the by-product obtained in the manufacture of oat groats, consisting of oat hulls, and particles of the groat, and containing not more than 25% crude fiber. (Proposed 1963, Adopted 1964)

IFN 1-03-332 Oats groats by-product less than 22% fiber

## 71. OTHER OILSEED PRODUCTS

Investigator and Section Editors—Ricky Schroeder, TX

### Official

**71.77 Canola Meal** low erucic acid low glucosinolate consists of the meal obtained after the removal of most of the oil, by a direct solvent or prepress solvent extraction process, from the whole seeds of the species *Brassica napus*, *Brassica campestris* or *Brassica juncea*. The oil component of which seed contains less than two percent erucic acid and the solid component of which seed contains less than 5 micromoles of allyl glucosinolate and less than 30 micromoles of any mixture of 3-butenyl glucosinolate, 4-pentenyl glucosinolate, 2-hydroxy-3-butenyl glucosinolate and 2-hydroxy-4-pentenyl glucosinolate, and ally glucosinolate per gram of air dry, oil free solid. It must contain a maximum of 12% crude fiber and a maximum of 30 micromoles of glucosinolates per gram.

332 **Feed Ingredient Definitions**

Note: A method of analysis for glucosinolates is contained in the publication by J.K. Daun and D.I. McGregor, December 15, 1981, Glucosinolate Analysis of Rapeseed (Canola). Method of the Canadian Grain Commission, Grain Research Laboratory. (The method is on file with the Feed Methods Clearinghouse, Division of Animal Feeds, Center for Veterinary Medicine, Food and Drug Administration.

(Proposed 1987, Adopted 1991, Amended 1995, Adopted 1998)

IFN 5-05-145 Canola Meal Prepress Solvent Extracted, Low Erucic Acid, Low Glucosinolate

IFN 5-05-146 Canola Meal Solvent Extracted, Low Erucic Acid, Low Glucosinolate

**71.60 Coconut Meal, Mechanical Extracted,\*\*** is the ground residue which remains after removal of most of the oil from dried meat of coconuts by a mechanical extraction process. May also be called "Copra Meal." (Adopted 1955, Amended 1963, 1968)

IFN 5-01-572 Coconut kernels with coats meal mechanical extracted

**71.61 Coconut Meal, Solvent Extracted,\*\*** is the ground residue which remains after removal of most of the oil from dried meat of coconuts by a solvent extraction process. May also be called "Copra Meal". (Adopted 1955, Amended 1963, 1968)

IFN 5-01-573 Coconut kernels with coats meal solvent extracted

**71.62 Crambe Meal, Heat Toasted** is the seed meal of *Crambe abyssinica* after the removal of oil from the seed and hull by pre-press solvent extraction or by solvent extraction alone. The resulting seed meal is heat toasted. It shall conform to the restriction of glucosinolate, goitrin, and nitrogen soluble as set forth in 21 CFR 573, Section 310. It shall have a crude protein, crude fat, and a crude fiber guarantee. Myrosinase enzyme activity shall be absent. It is used or intended for use in the feed of feedlot cattle as a source of protein in an amount not to exceed 4.2 percent of the total ration. (Proposed 1982, Adopted 1983) Reg. 21CFR 573.310

IFN 5-16-280 Crambe abyssinian seeds meal solvent extracted toasted

**71.1 Linseed Meal, Mechanical Extracted,\*\*** is the product obtained by grinding the cake or chips which remain after removal of most of the oil from flaxseed by a mechanical extraction process. It must contain no more than 10% fiber. (Adopted 1943, Amended 1947, 1949, 1960, 1961, 1964, 1968)

IFN 5-30-287 Flax seeds meal mechanical extracted

**71.11 Linseed Meal, Solvent Extracted,\*\*** is the product obtained by grinding the flakes which remain after removal of most of the oil from flaxseed by a solvent extraction process. It must contain no more than 10% fiber. (Adopted 1943, Amended 1947, 1949, 1960, 1961, 1964, 1968)

IFN 5-30-288 Flax seeds meal solvent extracted

**71. Flaxseed Screenings Meal, Solvent Extracted,\*\*** is the ground product obtained after solvent extraction of part of the oil from the smaller imperfect flaxseeds, weed seeds, other oilseeds and other foreign material having feeding value, separated in cleaning flaxseed. (Adopted 1943, Amended 1962, 1964, 1968)

IFN 5-12-228 Flax seed screenings meal solvent extracted

**71.3 Flax Plant Product** is that portion of the flax plant having feeding value remaining after harvesting the seed and separation of the base fibers and flax shives. It consists of the leaves, corticle tissues, flax seed bolls, broken and immature flax seeds. It must contain a minimum of 9% crude protein and a maximum of 35% crude fiber. (Adopted 1957)

IFN 1-12-230 Flax fiber process residue dehydrated



**71.4 Flax Straw By-Product** is the ground product remaining after the removal of the longer fiber material from flax straw by mechanical processing. It must contain not less than 2% crude protein and not more than 70% crude fiber. (Proposed 1964, Adopted 1968)

IFN 1-12-229 Flax straw fiber process residue ground

**71.30 Mustard Meal, Solvent Extracted\*\*** is the product obtained by grinding the cake which remains after removal of some of the oil by mechanical extraction, and removing most of the remaining oil by solvent extraction. Obtained from the seed of cultivated mustard plants (*Brassica* sp.) (Proposed 1972, Adopted 1973)

IFN 5-12-149 Mustard seeds meal solvent extracted

Rations should be restricted to cattle and sheep and not contain more than 10% for cattle and 10% for sheep. It should not be fed to lactating dairy cows if milk production is for human consumption because of objectionable taste and/or odor.

**71.21 Peanut Skins** is the outer covering of the peanut kernel, exclusive of hulls, as obtained in ordinary commercial processing. The product may contain broken peanut kernels. (Adopted 1946, Amended 1964)

IFN 1-03-631 Peanut seed coats

**71.6 Peanut Hulls** consists of the outer hull of the peanut shell. (Proposed 1965, Adopted 1966)

IFN 1-08-028 Peanut pods (hulls)

**71.7 Peanut Meal and Hulls, Mechanical Extracted and Solvent Extracted\*\*** is a product of shelled peanuts, composed principally of the kernels and hulls, with such portion of the oil, as may be left in the ordinary course of manufacture. (Adopted 1978)

IFN 5-03-655 Peanut pods with seeds meal mechanical extracted

IFN 5-03-656 Peanut pods with seeds meal solvent extracted

**71.8 Ground Peanut Hay** is composed of ground peanut leaves and stems from which the peanuts have been removed. (Proposed 1976)

IFN 1-03-627 Peanut hay sun-cured ground

**71.9 Peanut Meal, Mechanical Extracted and Solvent Extracted\*\*** is a ground product of the shelled peanuts, composed principally of the kernels, with such portion of the hull, or fiber, and oil as may be left in the ordinary course of manufacture. It must contain no more than 7% crude fiber. (Adopted 1978)

IFN 5-03-649 Peanut seeds without coats meal mechanical extracted

IFN 5-03-650 Peanut seeds without coats meal solvent extracted

**71.25 Rapeseed Meal, Mechanical Extracted.\*\*** Rapeseed meal, mechanical extracted, obtained by grinding the cake which remains after removal of most of the oil by mechanical extraction of the seed from the rapeseed plant (*Brassica*). It must contain a minimum of 32% protein and a maximum of 12% crude fiber. (Proposed 1970, Adopted 1971)

IFN 5-03-870 Rape seeds meal mechanical extracted

**71.130 Safflower Meal, Mechanical Extracted,\*\*** is the ground residue obtained after extracting the oil from whole safflower seed by a mechanical extraction process. (Adopted 1954, Amended 1964, 1968)

IFN 5-04-109 Safflower seeds meal mechanical extracted

**71.131 Safflower Meal, Solvent Extracted,\*\*** is the ground residue obtained after extracting the oil from whole safflower seed by a solvent extraction process. (Adopted 1954, Amended 1964, 1968)

IFN 5-04-110 Safflower seeds meal solvent extracted

### 334 Feed Ingredient Definitions

**71.23 Sunflower Hulls** consists of the outer covering of sunflower seed. (Proposed 1967, Adopted 1968)

IFN 1-04-720 Sunflower hulls

**71.210 Sunflower Meal, Dehulled, Mechanical Extracted,\*\*** is obtained by grinding the residue remaining after the extraction process. (Proposed 1967, Adopted 1969)

IFN 5-30-033 Sunflower seeds without hulls meal mechanical extracted

**71.211 Sunflower Meal, Dehulled, Solvent Extracted,\*\*** is obtained by grinding the residue remaining after extraction of most of the oil from dehulled sunflower seed by a solvent extraction process. (Proposed 1967, Adopted 1969)

IFN 5-30-034 Sunflower seeds without hulls meal solvent extracted

**71.220 Sunflower Meal, Mechanical Extracted,\*\*** is obtained by grinding the residue remaining after extraction of the oil from whole sunflower seed by a mechanical extraction process. (Proposed 1967, Adopted 1969)

IFN 5-27-477 Sunflower seeds meal mechanical extracted

**71.221 Sunflower Meal, Solvent Extracted,\*\*** is obtained by grinding the residue remaining after extraction of most of the oil from whole sunflower seed by a solvent extraction process. (Proposed 1967, Adopted 1969)

IFN 5-30-032 Sunflower seeds meal solvent extracted

\*\*The words "Mechanical Extracted" or "Solvent Extracted" are not required when listed as an ingredient in a manufactured feed.

## 74. RECYCLED ANIMAL WASTE PRODUCTS

Investigator and Section Editor—Eric Nelson, WI

Any person seeking or receiving registration of any processed animal waste product shall test, by representative sampling and assaying of such samples, and keep accurate records thereof, the processed animal waste product for which the registration is sought or received. The sample shall be of sufficient size so as to provide meaningful data, statistically reliable in carrying out the purpose of such sampling and analysis.

The registrant, manufacturer, or producer of any such processed animal waste product ingredient shall conform to the following sample and assay requirements, in addition to quality standards, testing on the same production run of lots:

- a. Drugs suspected or known to be used in the feed or as a therapeutic treatment of source animals.
- b. Pesticides used on the source animal, facility, and wastes for pest control.
- c. Pathogenic organisms, at least to include Salmonella and E. Coli.
- d. Heavy metals: arsenic, cadmium, copper, lead, mercury and selenium, at least.
- e. Parasitic larva or ova.
- f. Mycotoxins, such as aflatoxins.

Periodic analyses shall be conducted on production runs no less than one per calendar quarter, except that less frequent testing may be allowed where analytical results show continued uniformity and a consistent margin of compliance. Any processed animal waste product that does not meet the quality standards for the product shall be further processed until standards are met, or shall be diverted to non-feed uses or destroyed.

If a product contains drug residues, then the label shall contain the following statement in bold face type: **"WARNING: THIS PRODUCT CONTAINS DRUG RESIDUES. DO NOT USE WITHIN 15 DAYS OF SLAUGHTER AND DO NOT USE 15 DAYS PRIOR TO OR DURING THE FOOD PRODUCTION PERIOD OF DAIRY ANIMALS AND LAYING HENS."**

If the product contains 25 ppm or greater of copper, a maximum guarantee of copper and the following statement in bold face type is required: "**WARNING: CONTAINS HIGH LEVELS OF COPPER: DO NOT FEED TO SHEEP.**"

Any person seeking or receiving registration of any processed animal waste product shall keep for a period of two years, accurate records of:

- a. All sources of raw materials and date acquired, including information on drug and pesticide usage.
- b. All production output, including a code or other method to identify the date of production.
- c. All sales and distribution, including the name and address of the purchaser or to whom distributed, date, quantity and product code.
- d. Sample and assay records of testing specified above.

Product definitions--Processed animal waste products as a class, offered for sale or distributed for sale, shall not contain extraneous materials such as, but not limited to, metal, glass, nails or other harmful matter. They shall be free of harmful pathogenic organisms, pesticide residues, parasites, or drug residues, above levels permitted by State or Federal statute or regulation, which could be harmful to animals or could result in residues in human food products or by-products of animals at levels in excess or those allowed by State or Federal statute or regulation.

**74.1 Dried Poultry Waste--(DPW)** means a processed animal waste product composed primarily of feces from commercial poultry, which has been thermally dehydrated to a moisture content not in excess of 15.0%. It shall contain not less than 18.0% crude protein, and not more than 15.0% crude fiber, 30.0% ash, and 1.0% feathers. (Adopted 1982)

IFN 4-07-255 Poultry manure non-protein nitrogen extracted dehydrated

**74.2 Dried Poultry Waste--NPN Extracted** means a processed animal waste product composed primarily of feces from commercial poultry which has been processed to remove part or all of the equivalent crude protein, NPN as urea and/or uric acid and which has been thermally dehydrated to a moisture content not in excess of 15.0%. It shall contain not less than 11.0% crude protein, and not more than 15.0% crude fiber, 30.0% ash, and 1.0% feathers. (Adopted 1982)

IFN 4-07-255 Poultry manure non-protein nitrogen extracted dehydrated

**74.3 Dried Poultry Litter--(DPL)** means a processed animal waste product composed of a processed combination of feces from commercial poultry together with litter that was present in the floor production of poultry, which has been artificially dehydrated to a moisture content not in excess of 15.0%. It shall contain not less than 18.0% crude protein, and not more than 25.0% crude fiber, 20.0% ash, and 4.0% feathers. (Adopted 1982)

IFN 5-05-587 Poultry manure and litter dehydrated

**74.4 Dried Ruminant Waste--(DRW)** means a processed animal waste product composed primarily of processed ruminant excreta which has been artificially dehydrated to a moisture content not in excess of 15.0%. It shall contain not less than 12.0% crude protein, and not more than 40.0% crude fiber, including straw, woodshavings, etc., and not more than 30.0% ash. (Adopted 1982)

IFN 1-07-526 Animal manure dehydrated

**74.5 Dried Swine Waste--(DSW)** means a processed animal waste product composed primarily of swine excreta which has been artificially dehydrated to a moisture content not in excess of 15.0%. It shall contain not less than 20.0% crude protein, not more than 35.0% crude fiber, including other material such as straw, woodshavings, or acceptable other bedding materials, and not more than 20.0% ash. (Adopted 1982)

336 Feed Ingredient Definitions

IFN 5-02-790 Swine manure dehydrated

**74.6 Undried Processed Animal Waste Products**--means a processed animal waste product composed of excreta, with or without litter, from poultry, ruminants or any other animal except humans, which may or may not include other feed ingredients, and which contains in excess of 15.0% feed ingredients, and which contains in excess of 15.0% moisture. It shall contain no more than 30% combined wood, woodshavings, litter, dirt, sand, rocks, and similar extraneous materials. The specific name of each component material in the product must be declared on the label. (Adopted 1982)

IFN 2-07-258 Animal-poultry manure and litter processed wet

**74.7 Processed Animal Waste Derivative**--means a product resulting from the chemical, physical or microbiological alteration of an animal waste. Examples of processed animal waste derivatives are composts, yeasts, algae or other organisms produced from non-human animal wastes, or wastes treated with ammonia, formaldehyde, or other chemicals. The specific name of each such animal waste derivative product must be descriptive, and efficacy and safety data must be submitted and approved before the product is registered or offered for sale. (Adopted 1982)

IFN 1-07-307 Animal waste processed derivative

**75. RICE PRODUCTS**

Investigator and Section Editor--Jamey Johnson, AR

**Official**

**75.1 Rice Polishings** is a by-product of rice obtained in the milling operation of brushing the grain to polish the kernel. (Adopted 1938)

IFN 4-03-943 Rice polishings

**75.2 Ground Rough Rice or Ground Paddy** is the entire product obtained in grinding the whole rice grain including the hulls. (Adopted prior to 1928, Amended 1959)

IFN 4-03-938 Rice grain ground

**75.3 Rice Bran, Solvent Extracted** is obtained by removing part of the oil from rice bran by the use of solvents and must contain not less than 14% crude protein and not more than 14% crude fiber. (Adopted 1951, Amended 1959)

IFN 4-03-930 Rice bran with germ meal solvent extracted

**75.4 Chipped Rice, Broken Rice, or Brewers Rice** is the small fragments of rice kernels that have been separated from the larger kernels of milled rice. (Proposed 1959, Adopted 1960)

IFN 4-03-932 Rice groats polished broken

**75.5 Ground Brown Rice** is the entire product obtained in grinding the rice kernels after the hulls have been removed. (Proposed 1959, Adopted 1960)

IFN 4-03-935 Rice groats ground

**75.6 Rice Hulls** consists primarily of the outer covering of the rice. (Proposed 1959, Adopted 1960)

IFN 1-08-075 Rice hulls

**75.7 Rice Bran** is the pericarp or bran layer and germ of the rice, with only such quantity of hull fragments, chipped, broken, or brewers' rice, and calcium carbonate as is unavoidable in the regular milling of edible rice. It must contain not more than 13% crude fiber. When the calcium carbonate exceeds 3% (Ca.-1.2%), the percentage must be declared in the brand name; i.e., Rice Bran with Calcium Carbonate not exceeding \_\_\_\_%. (Proposed 1963, Adopted 1964)

IFN 4-03-928 Rice bran with germs

**75.8 Rice Mill By-Product** is the total offal obtained in the milling of rice. It consists of rice hulls, rice bran, rice polishings and broken rice grains. Its crude fiber content must not exceed 32%. (Proposed 1961, Adopted 1965)

IFN 1-03-941 Rice mill run NOTE: See also 87.6 and 87.7

**75.9 Parboiled Rice Bran** is about 5 to 7% by weight of Parboiled Rough Rice and is a mixture made up of a combination of several botanical tissues: pericarp, seed coat, nucleus, and the outermost portion of the endosperm (the aleurone layer). It may contain hull fragments, broken grains and traces of added calcium carbonate as is unavoidable in the milling of parboiled rice. (Proposed 1992, Adopted 1996)

**75.10 Stabilized Rice Bran** is rice bran which has been treated soon after milling by heat or other means that will substantially reduce the lipase activity. Free fatty acid content of the crude fat extracted shall not exceed four percent. (AOAC 940.28) (Proposed 1995, Adopted 1996)

## 78. RYE PRODUCTS

Investigator and Section Editor--Ken Jackson, NE

### Official

**78.1 Rye Mill Run** is obtained in the usual process of the milling of rye flour from cleaned and scoured rye, consisting principally of the mill-run of the outer covering of the rye kernel and the rye germ with small quantities of rye flour and aleurone, and must not contain more than 9.5% crude fiber. (Adopted 1946)

IFN 4-04-034 Rye mill run less than 9.5% fiber

**78.2 Rye Middlings** consist of rye feed and rye red dog combined in the proportions obtained in the usual process of milling rye flour, and must not contain more than 8.5% crude fiber. (Adopted 1946)

IFN 4-04-031 Rye flour by-product less than 8.5% fiber

## 81.SCREENINGS

Investigator and Section Editor--Michael Cooper, ID

### Official

**Screenings** are obtained in the cleaning of grains which are included in the United States Grain Standard Act and other agricultural seeds. It may include light and broken grains and agricultural seeds, weed seeds, hulls, chaff, joints, straw, elevator or mill dust, sand, and dirt. It must be designated as Grain Screenings, Mixed Screenings and Chaff and/or Dust.

No grade of screenings may contain any seeds or other material in amount that is either injurious to animals or will impart an objectionable odor or flavor to their milk or flesh. The screenings must contain not more than four whole prohibited noxious weed seeds per pound and must contain not more than 100 whole restricted noxious weed seeds per pound. The prohibited and restricted noxious weed seeds must be those named as such by the seed control law of the state in which the screenings is sold or used.

EPA allows a "Non-Food/Non-Feed" status for some crops on a state-by-state basis. This allows the producer a wider range of pesticides to use in the production of a seed crop. This is especially important for minor seed crops. In some states alfalfa, clover, carrot and cabbage seed may be designated non-food/non-feed in their state pesticide laws. When so designated there are special labeling, record keeping, and by-product disposal requirements. Most cereal grains and large seeds like bean, pea, and corn have never been allowed a non-food/non-feed status due to their propensity to enter food channels. If you are using seed screenings in the manufacture of a feed, you should check with your state pesticide regulatory authority as to the non-food/non-feed status of that commodity.

## 338 Feed Ingredient Definitions

All grades of screenings must bear minimum guarantees of crude protein and crude fat and maximum guarantees of crude fiber and ash. (Adopted 1953, Amended 1959, 1960)

**81.1 Grain Screenings** are those screenings containing 70% or more grains, including light and broken grains. It may contain wild buckwheat and wild oats. The term "Grain Screenings" may be used for unspecified kinds of grain, or the predominating kind of grain (if in excess of 50%) may be declared as the first word or words in the name. It may contain no more than 6.5% ash. (Proposed 1989, Adopted 1992)

IFN 4-00-542 Barley screenings

IFN 4-20-687 Maize screenings

IFN 4-03-329 Oats screenings

IFN 4-08-085 Rice screenings

IFN 4-27-721 Sorghum screenings

IFN 4-05-216 Wheat screenings

**81.2 Mixed Screenings** are screenings excluded from the preceding definition. It must contain not more than 27% crude fiber and not more than 15% ash. (Adopted 1953, Amended 1954, 1960)

IFN 4-02-157 Cereals mixed grain screenings

**81.3 Chaff and/or Dust** is material that is separated from grains or seeds in the usual commercial cleaning processes. It may include hulls, joints, straw, mill or elevator dust, sweepings, sand, dirt, grains, seeds. It must be labeled, "chaff and/or dust". If it contains more than 15% ash the words "sand" and "dirt" must appear on the label. (Adopted 1953)

IFN 4-02-149 Cereals--legumes chaff and/or dust

## 84. SOYBEAN PRODUCTS

Investigator and Section Editor - Bob Geiger, IN

### Official

**84.1 Ground Soybeans** is obtained by grinding whole soybeans without cooking or removing any of the oil. (Adopted 1933)

IFN 5-04-596 Soybean seeds ground

**84.2 Ground Soybean Hay** is the ground soybean plant including the leaves and beans. It must be reasonably free of other crop plants and weeds and must contain not more than 33% crude fiber. (Adopted 1944, Amended 1964)

IFN 1-04-559 Soybean hay sun-cured ground

**84.3 Soybean Hulls** consist primarily of the outer covering of the soybean. (Adopted 1948)

IFN 1-04-560 Soybean seed coats (hulls)

**\*84.4 Soybean Feed, Solvent Extracted**, is the product remaining after the partial removal of protein and nitrogen free extract from dehulled solvent extracted soybean flakes. The words "Solvent Extracted" are not required when listing as an ingredient in a manufactured feed. (Adopted 1948, Amended 1960, 1964)

IFN 5-04-613 Soybean seeds low protein low carbohydrates meal solvent extracted

**84.8 Soybean Mill Feed** is composed of soybean hulls and the offal from the tail of the mill which results from the manufacture of soy grits or flour. It must contain not less than 13% crude protein and not more than 32% crude fiber. (Proposed 1960, Adopted 1961, Amended 1964)

IFN 4-04-594 Soybean flour by-product

**84.9 Soybean Mill Run** is composed of soybean hulls and such bean meats that adhere to the hulls which result from normal milling operations in the production of dehulled soybean meal. It must contain not less than 11% crude protein and not more than 35% crude fiber. (Proposed 1960, Adopted 1961, Amended 1964)

IFN 4-04-595 Soybean mill run

**84.10 Soy Phosphate or Soy Lecithin** is the mixed phosphatide product obtained from soybean oil by a degumming process. It contains lecithin, cephalin, and inositol phosphatides, together with glycerides of soybean oil and traces of tocopherols, glucosides, and pigments. It must be designated and sold according to conventional descriptive grades with respect to consistency and bleaching. (Proposed 1958, Adopted 1961)

IFN 4-04-562 Soybean lecithin

**84.11 Heat Processed Soybeans** is the product resulting from heating whole soybeans without removing any of the component parts. It may be ground, pelleted, flaked, or powdered. The maximum pH rise using standard urease testing procedure should not exceed 0.10 pH units. It must be sold according to its crude protein, crude fat and crude fiber content. (Proposed 1960, Adopted 1964, Amended 1991, Adopted 1992)

IFN 5-04-597 Soybean seeds heat processed

**84.12 Soy Protein Concentrate** is prepared from high quality sound, clean, dehulled soybean seeds by removing most of the oil and water soluble non-protein constituents and must contain not less than 65% protein on a moisture-free basis. (Proposed 1988, Adopted 1990)

IFN 5-32-183 Soybean protein concentrate

**84.13 Kibbled Soybean Meal** is the product obtained by cooking ground solvent extracted soybean meal, under pressure and extruding from an expeller or other mechanical pressure device. It must be designated and sold according to its protein content and shall contain not more than 7% crude fiber. (Proposed 1969, Adopted 1971)

IFN 5-09-343 Soybean seeds kibbled solvent extracted

**84.14 Soybean Solubles, Condensed**, is the product resulting from the washing of soy flour or soybean flakes with water and acid; water, alkali and acid; or water and alcohol. The wash water is then concentrated to a solids content of not less than 50%. (Proposed 1983, Adopted 1990)

IFN 5-09-344 Soybean solubles condensed

**84.15 Ground Extruded Whole Soybeans** is the meal product resulting from extrusion by friction heat and/or steam, whole soybeans without removing any of the component parts. It must be sold according to its crude protein, fat, and fiber content. (Proposed 1974, Adopted 1975)

IFN 5-14-005 Soybean seeds extruded ground

IFN 5-26-010 Soybean protein product chemically modified

**84.17 Soybean Solubles, Dried**, is the product resulting from the washing of soy flour or soybean flakes with water and acid; water, alkali and acid; or water and alcohol. The wash water is then dried. (Proposed 1983, Adopted 1990)

IFN 5-16-733 Soybean Solubles dehydrated

**84.5 Soy Grits** is the granular material resulting from the screened and graded product after removal of most of the oil from selected, sound, clean and dehulled soybeans by a mechanical or solvent extraction process. It must contain not more than 4.0% crude fiber. (Proposed 1978, Adopted 1980)

IFN 5-12-176 Soybean grits mechanical extracted

340 **Feed Ingredient Definitions**

IFN 5-04-592 Soybean grits solvent extracted

**84.7 Soybean Meal, Dehulled, Solvent Extracted** is obtained by grinding the flakes remaining after removal of most of the oil from dehulled soybeans by a solvent extraction process. It must contain not more than 3.5% crude fiber. It may contain calcium carbonate or an anti-caking agent not to exceed 0.5% as defined in section 87 (Special Purpose Products) to reduce caking and improve flowability. The name of the conditioning agent must be shown as an added ingredient. When listed as an ingredient in a manufactured feed it may be identified as "Dehulled Soybean Meal." The words "Solvent Extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1989, Adopted 1992)

IFN 5-04-612 Soybean seeds without hulls meal solvent extracted.

**84.51 Soy Flour** is the finely powdered material resulting from the screened and graded product after removal of most of the oil from selected, sound, cleaned and dehulled soybeans by a mechanical or solvent extraction process. It must contain not more than 4.0% crude fiber. (Proposed 1978, Adopted 1980)

IFN 5-12-177 Soybean flour mechanical extracted

IFN 5-04-593 Soybean flour solvent extracted

**84.60 Soybean Meal, Mechanical Extracted** is the product obtained by grinding the cake or chips which remain after removal of most of the oil from soybeans by a mechanical extraction process. It must contain not more than 7.0% crude fiber. It may contain calcium carbonate or an anti-caking agent not to exceed 0.5% as defined in section 87 (Special Purpose Products) to reduce caking and improve flowability. The name of the conditioning agent must be shown as an added ingredient. The words "Mechanical Extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1989, Adopted 1992)

IFN 5-04-600 Soybean seeds meal mechanical extracted.

**84.61 Soybean Meal, Solvent Extracted** is the product obtained by grinding the flakes which remain after removal of most of the oil from soybeans by a solvent extraction process. It must contain not more than 7.0% crude fiber. It may contain calcium carbonate or an anti-caking agent not to exceed 0.5% as defined in section 87 (Special Purpose Products) to reduce caking and improve flowability. The name of the conditioning agent must be shown as an added ingredient. The words "Solvent Extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 1989, Adopted 1992)

IFN 5-04-604 Soybean seeds meal solvent extracted.

**84.62 Soy Protein Isolate** is the major proteinaceous fraction of soybeans prepared from dehulled soybeans by removing the majority of non-protein components and must contain not less than 90% protein on a moisture-free basis. (Proposed 1988, Adopted 1990)

IFN 5-24-811 Soy Protein Isolate

**84.63 Hydrolyzed Soy Protein** is made from soybean flours, concentrates or isolates, treated with an acid or a base or an enzyme and then dried. (Proposed 1993, Adopted 1994)

**84.64 Textured Soy Protein Product** is made from defatted soy flour mixed with water and/or steam, extruded and then dried. (Proposed 1993, Adopted 1994)

#### Tentative

**T84.16 \_\_\_\_\_ Protein Modified** is a Soybean Product that has been processed to primarily modify the natural protein structure by utilizing heat or elevated temperatures, acids, alkalies or other chemicals and without removing significant



amounts of any nutrient constituent. The defined name under Section 84 of the applicable soybean product so modified shall be declared in the product name. (Proposed 1982, Adopted 1983, Amended 2000)

**T84.71 Soybean Meal, Dehulled, Mechanical Extracted** is the product obtained by grinding of cakes that remain after removal of most of the oil from dehulled soybean seeds by mechanical extractin process. It must contain not less than 46.5% crude protein. It may contain calcium carbonate or an anti-caking agent no to exceed 0.5% as defined in section 87 (Special Purpose Products) to reduce caking and improve flowability. The name of the conditioning agent must be shown as an added ingredient. When listed as an ingredient in a manufactured feed it may be identified as "Dehulled Soybean Meal". The words "Mechanical Extracted" are not required when listing as an ingredient in a manufactured feed. (Proposed 2004)

### 87. SPECIAL PURPOSE PRODUCTS

Investigator and Section Editor--Shannon Jordre, FDA

(Anti-caking agents, color additives, condiments, grinding agents, pelleting agents, pigmentation, stabilizing agents, etc.)

It is impracticable to list all special purpose feed ingredients, together with the status, classification, tolerance, and limitations or restrictions, in the Official Publication.

The Association of American Feed Control Officials regard such common special purpose feed ingredients as salt, sugar, and pepper as safe for their intended use, when used in accordance with good manufacturing practice.

The less common special purpose feed ingredients, together with the status, classification, tolerance, and limitations or restrictions, are listed in the Official Publication.

The least common special purpose feed ingredients, together with the status, classification, tolerance, and limitations or restrictions, are listed in the Code of Federal Regulations; Title 21, Food and Drugs; Chapter 1--Food and Drug Administration, Department of Health and Human Services; Sub-Chapter A--General; Part 73--Color Additives, or Part 74--Color Certification, or Sub-Chapter E--Animal Drugs, Feeds, and Related Products; Part 573--Food Additives Permitted in Feed and Drinking Water of Animals or Part 582--Substances Generally Recognized as Safe or Part 584--Food Substances Affirmed as Generally Recognized as Safe in Feed and Drinking Water of Animals.

A number of ingredients have been approved by the FDA Informal Review Process (I.R.P.) (see AAFCO Official Publication 1982--page 223).

#### Official

**87.1 Algae Meal**, a color additive is a dried mixture of algae cells (genus *sponococum* separated from its culture broth), molasses, corn steep liquor, and a maximum of 0.3% ethoxyquin. (Reg. 73.275, Subpart D, Color Additives.) (Proposed 1962, Amended 1963, Adopted 1964, Amended 1975)

IFN 5-00-357 Algae whole meal

**87.2 Lignin Sulfonate** is either one, or a combination of, the ammonium, calcium, magnesium, or sodium salts of the extract of spent sulfite liquor derived from the sulfite digestion of wood or of abaca (*Musa textilis*) or of Sisal (*Agave sisalana*) in either a liquid form (moisture not to exceed 50 percent by weight) or dry form (moisture not to exceed 6 percent by weight). It may be used in animal feed in amounts calculated on a dry weight basis, as: (1) A pelleting aid, in the liquid or dry form, in an amount not to exceed 4 percent of the finished pellets. (2) A binding aid, in the liquid form, in the flaking of feed grains in an amount not to exceed 4 percent

## 342 Feed Ingredient Definitions

of the flaked grain. (3) A surfactant in molasses used in feeds, as liquid lignin sulfonate, in an amount not to exceed 11 percent of the molasses. (4) A source of metabolizable energy, in the liquid or dry form, in an amount not to exceed 4 percent of the finished feed. Reg. 573.600. (Proposed 1963, Adopted 1964, Amended 1970, 1971 and 1973)

IFN 8-02-627 Lignin sulfonate dehydrated

IFN 8-29-786 Lignin sulfonate condensed

**87.3 Silicon Dioxide** is manufactured by vapor phase hydrolysis or by other means whereby the particle size is such as to accomplish the intended effect. It is used in the following feeds or feed components as an anti-caking agent, and/or grinding aid as follows: (Reg. 573.940) (Proposed 1964, Adopted 1965.)

IFN 8-08-034 Silicon dioxide SiO<sub>2</sub>

<i>Feed or Feed Component</i>	<i>Limitation Percent</i>
BHT (Butylated Hydroxy Toluene)	2
Finished Feed	2
Methionine Hydroxy Analog and its Calcium Salts	1
Sodium Propionate	1
Urea	1
Vitamins	3

**87.4 Verxite** (exfoliated hydrobiotite), an additive, is a magnesium-aluminum-iron silicate conforming to one of the following:

**Verxite Granules** contain a minimum of 98% Hydrobiotite, is thermally expanded and has a bulk density of 5 to 9 pounds per cubic foot.

IFN 8-08-993 Verxite granules

It is used or intended for use in poultry feed at a level not to exceed 5% of the weight of the finished feed as a non-nutritive bulking agent for restricting calorie intake in pullet replacement feeds, or as anticaking or blending agent, pelleting aid, or non-nutritive carrier for the incorporation of nutrients in poultry, swine, dog, or ruminant feeds, in an amount not to exceed that necessary to accomplish its intended effect and in no case to exceed 1.5% of the dog feed or 5% of the final feed for other animals.

**Verxite Flakes** contain a minimum of 98% Hydrobiotite and has a bulk density of 20 to 30 pounds per cubic foot.

IFN 8-08-994 Verxite flakes It is used or intended for use as an anticaking or blending agent in ruminant feeds in an amount not to exceed that necessary to accomplish its intended effect and in no case to exceed 1% by weight of the final feed for ruminants.

**Verxite Grits** contains a minimum of 80% Hydrobiotite. It has a bulk density of from 40 to 50 pounds per cubic foot.

IFN 8-09-350 Verxite grits

It is used or intended for use as a partial roughage replacement in ruminant feeds in an amount not to exceed that necessary to accomplish its intended effect and is in no case to exceed one percent by weight of the final feed.

To assure safe use of the additive, the label of any feed additive supplement, feed additive concentrate, feed additive premix, or complete feed prepared therefrom shall bear, in addition to the other information required by the act, the name of the additive (verxite granules or verxite flakes or verxite grits) and when the additive is present in excess of 1%, a statement of the quantity of the additive contained therein and the term "non-nutritive" in juxtaposition therewith. (Reg. 573.1000) (Proposed 1961, Adopted 1964, Amended 1968 and 1969)

## 87.5 Additional Special Purpose Products:

Name	FDA Regulation	Classification Under Food Additives Amendment	Limitations or Restrictions
Aloe Vera Gel Concentrate		Flavoring agent	Not to exceed 125 ppm (0.0125%) in finished feed
Aluminum Sulfate IFN 8-20-861	Reg. 582.1125	Anti-gelling agent for molasses, dewater of beet pulp	**None
Anise Seed IFN 8-00-416	Reg. 582.10	Spices seasonings, essential oils, oleo resins, and natural extractives	**None
Astaxanthin	21 CFR 73.35	Tissue pigmentor	Salmonid feed only
Attapulgite Clay IFN 8-14-008	Reg. 582.1 (in non-medicated feeds)	Anti-caking agent and pelleting aid	***Not to exceed 2% in finished feed
Ball Clay		Suspension aid in liquid feed supplement	***Not to exceed 2.5% in supplement
Calcium Silicate IFN 8-08-043	Reg. 573.260	Anti-caking agent	Not accepted for use as a feed ingredient
Calcium Aluminates		Pellet binder	Not to exceed 2%
Calcium Stearate IFN 8-09-345	Reg. 573.280 (Feed Grade)	Anti-caking agent	Maximum of 2% in poultry, swine and rodent feeds, and a maximum 1% in feed for all other species.
Canthaxanthin	21 CFR 73.75	Broiler chicken skin pigmentor	In accordance with good manufacturing practice
Carrageenan	21 CFR 172.620	Emulsifier, stabilizer or thickener for pet foods.	Not to exceed 4 grams/ton of the complete feed
Capsicum; Red Pepper IFN 8-03-685	Reg. 582.10	Spices, seasonings, etc.	To be refined only from those red seaweed sources listed in 21CFR 172.620
Chondrus extract IFN 8-07-247	Reg. 582.7255	Stabilizer	**None
Diacetyl tartaric acid esters of mono and diglycerides of edible fats or oils, or edible fat-forming fatty acids. IFN 8-07-248	Reg. 582.4101	Emulsifying Agent	None
Diatomaceous Earth IFN 8-09-363	Reg. 573.340	Inert Carrier and Anti-caking agent	Not to exceed 2% of total ration
Disodium EDTA IFN 8-05-689	Reg. 573.360	To solubilize trace minerals in aqueous solutions.	Not to exceed 0.024% (240 ppm) in finished feed
Ethyl Cellulose IFN 4-08-045	Reg. 573.420	Binder or filler in dry vitamin preparations	
Ethoxylated mono and diglycerides	Reg. 172.834	Emulsifier	Not to exceed 0.5% in dry milk replacers
Fennel IFN 8-01-855	Reg. 582.10	Spices, seasonings, essential oils, etc.	**None
Fenugreek Seed IFN 8-01-856	Reg. 582.10	Spices, seasonings, essential oils, etc.	**None
Fumaric Acid		pH adjuster, preservative, or flavoring agent	Not to exceed 0.5% of the diet
Gellan Gum	21 CFR 172.665	Stabilizer and/or	Not to exceed 0.4% in

## 344 Feed Ingredient Definitions

Ginger IFN 8-02-122	Reg. 582.10	thickener in canned dog or cat food	canned dog or cat food.
Glucono-delta-lactone	21 CFR 184.1318	Spices, seasonings, essential oils, etc.	**None
Glycyrrhizin ammoniated IFN 8-08-099	Reg. 582.20	pH control agent in pet or specialty pet food only	**None
Guar gum (mucilage) IFN 4-28-796	Reg. 582.7339	Spices, seasonings, essential oils, etc.	**None
Hydrophobic Silica		Stabilizer	None
Iron Ammonium Citrate IFN 6-01-857	Reg. 573.560	Anticaking/free flow agent	Not to exceed 5% in vitamin preparations
Kaolin IFN 8-08-040	Reg. 582.1	Anti-caking agent in salt	Not to exceed 0.0025% (25 ppm) in the finished salt
Lecithin IFN 8-08-041	Reg. 582.1400	Anti-caking agent (in non-	***Not to exceed 2.5% in finished feed medicated feeds)
Locust bean gum (Carob bean gum) IFN 8-07-250	Reg. 582.7343	Stabilizer	**None
Magnesium Stearate		Stabilizer	None
Methyl Glucoside Coconut Oil Ester IFN 8-09-346	Reg. 573.660	Die lubricating and release agent in the tableting process	GMP
Mineral Oil IFN 8-03-123	Reg. 573.680	Surfactant in molasses	Not to exceed 0.032% (320 ppm) in the molasses
Mono and diglycerides of edible fats or oils, or edible fat-forming acids IFN 8-07-251	Reg. 582.4505	To reduce dustiness of feed or mineral supplements, to serve as a lubricant in the preparation of pellets, cubes, and blocks, to improve resistance to moisture of such pellets, cubes, and blocks, and to prevent segregation of trace minerals in mineralized salt	Not to exceed 3% in mineral supplements. Not to exceed 0.06% of the total ration. To serve as a diluent carrier in the manufacture of feed grade biuret.
Emulsifying Agent		Emulsifying Agent	None
Monosodium Glutamate IFN 8-09-347	Reg. 582.1	Spices, seasoning, etc.	**None
Monosodium phosphate derivatives of mono and diglycerides of edible fats or oils, or edible fat-forming fatty acids IFN 8-07-252	Reg. 582.4521	Emulsifying Agent	None
Montmorillonite	Reg. 582.1	Anti-caking aid, pelleting aid, and non-nutritive carrier	Not to exceed 2% of the finished material
Clays IFN 8-09-364	(in non-medicated feeds)	Dust control agent	Not to exceed 3% in
Paraffin			

## Feed Ingredient Definitions 345

IFN 8-02-027			mineral supplements. Not to exceed 0.06% of the total ration
Petrolatum or a combination of mineral oil and petrolatum IFN 8-05-691	Reg. 573.720	To reduce dustiness of feed or mineral supplements, to serve as a lubricant in the preparation of pellets, cubes, and blocks, to improve resistance to moisture of such pellets, cubes, and blocks	Not to exceed 3% in mineral supplements. Not to exceed 0.06% of the total ration
Petroleum Jelly IFN 8-08-029	Reg. 573.720	Dust control agent in mineral mixes	Not to exceed 3% in mineral supplements. Not to exceed 0.06% of the total ration **None
Phosphoric Acid IFN 6-03-707	Reg. 582.1073	Misc. and/or general purpose	**None
Polyethylene Glycol (400) mono and dioleate IFN 8-09-348	Reg. 573.800	Processing aid when present as a result of its additions to molasses	Not to exceed 0.025% (250 ppm) in the molasses
Polyoxyethylene Glycol (400 mono & dioleates IFN 8-08-053	Reg. 573.820	Emulsifier	Calf Milk Replacers
Polysorbate 80 IFN 8-08-031	Reg. 573.860	Emulsifier	Calf Milk Replacers
Polysorbate 60 (Polyoxy ethylene (20) sorbitan monostearate) IFN 8-08-032	Reg. 573.840	Emulsifier	Calf Milk Replacers and mineral premixes
Propylene Glycol IFN 8-03-809	Reg. 582.1666	Emulsifying agent	GRAS except in Cat Food
Pyrophyllite IFN 8-05-694	Reg. 573.900	Anti-caking aid, blending agent, pelleting aid, or carrier	Not to exceed 2% of the complete feed
Saccharin Sodium IFN 8-04-103	*GRAS	Non-nutritive sweeteners	**None
Stearic Acid	Reg. 172.860	Lubricant/binder in Tablets and pellets	Not to exceed 3% (w/w) In finished feed
Sodium Bisulfate		General Purpose feed additive	
Sodium carboxymethyl- cellulose IFN 8-08-100	Reg. 582.1745	Stabilizer	Not to exceed 2% in finished feed
Sodium silico aluminate IFN 8-08-101	Reg. 582.2727	Anti-caking agent	Not to exceed 2% in finished feed
Sodium stearoyl lactylate	Reg. 172.846	Emulsifier for dry, semi-moist and canned dog food	Not to exceed 0.35% in finished dog food
Sorbitan mono-stearate with or without Polysorbate 60 IFN 8-05-695	Reg. 573.960	Emulsifier in mineral premixes and dietary supplement for animal feed	**None
Tagetes (Astec Marigold) Meal & extract IFN 8-05-696	Reg. 73.295 (Color Additive)	To enhance the yellow color of chicken skin & eggs	Sufficiently supplemented with xanthophyll and associated carotenoids so as to accomplish the intended effect
Talc	FDA/CVM/DAF	Die Lubricant,	Not to exceed 2% in the

## 346 Feed Ingredient Definitions

IFN 8-16-378	letters of 8/5/83 and 4/6/86	Finishing Agent & Anticaking Agent	finished feed. Not to exceed 10% as a carrier in animal feed premixes
Tetra Sodium Pyrophosphate IFN 8-20-862	Reg. 582.6789	Dispersant	**None
Titanium Dioxide IFN 8-20-860	Reg. 73.575	Color Additive	Not to exceed 1% of the finished product
Urea Formaldehyde IFN 8-08-995	Reg. 582.1	Coating for feed grade urea for ruminant animal feed	Not to exceed 1% of the finished material
Xanthan Gum IFN 8-15-818	Reg. 573.1010	Stabilizer, emulsifier, thickener, suspending agent or bodying agent in Calf Milk Replacers and Liquid Feed Supplements	0.1% in Calf Milk Replacers (as fed), and 0.25% in Liquid Feed Supplements
Yellow prussiate of soda IFN 8-05-697	Reg. 573.1020	Anti-caking agent in salt	Not to exceed 0.0013% (13 ppm)
Yucca Schidigera Extract IFN 8-19-700 yucca, mohave extract	Reg. 172.510	Flavoring Agent	Minimum quantity necessary to produce intended effect

\*GRAS--Abbreviation for the phrase "Generally Recognized as Safe". A substance which is generally recognized as safe by experts qualified to evaluate the safety of the substance (for its intended use.)

\*\*None--No quantitative restrictions although use must conform to good manufacturing practices.

\*\*\*NOTE: Attapulgit Clay, Bentonite, and Kaolin are "GRAS" in non-medicated feeds as binders or pelleting aids when used in accordance with good manufacturing practices and do not exceed the limitations listed above. These special purpose products are not prohibited in medicated feeds for the same purpose and at the same level when it can be demonstrated that they do not interfere with the analysis of the drug by acceptable methods. It is the manufacturer's responsibility to determine and submit adequate data to support the conclusion that interference does not occur before using these products in a feed containing a drug. Based on current information, these products are acceptable for use in medicated feeds containing the following drugs:

Aklomide plus Sulfanitran IFN 8-12-184	Nihydrazone IFN 8-03-234
Chlortetracycline IFN 8-01-224	Nitromide IFN 8-05-560
	4 Nitrophenyl-Arsonic Acid IFN 8-05-561
	Roxarsone IFN 8-12-190
Lasalocid Sodium IFN 6-26-333	Sulfanilamide IFN 8-12-191
Lincomycin Hydrochloride IFN 8-12-192	Sulfathiazole IFN 8-04-704
Melengestrol Acetate IFN 8-08-817	Sulfaquinoxaline IFN 8-04-703
Monensin IFN 8-09-373	Tylosin IFN 8-05-069

## Feed Ingredient Definitions 347

Based on current information found in the new animal drug regulations (part 558) the following drugs are not permitted in animal feeds containing bentonite because bentonite has been shown to interfere with the analysis of the drugs by the acceptable methods:

Amprolium	558.55	
IFN 8-00-373		
Buquinolate	558.105	NOTE: International feed name and AAFCO names are identical for these 24 drugs.
IFN 8-08-103		
Carbadox	558.115	
IFN 8-20-775		
Decoquinatate	558.195	
IFN 8-09-371		
Morantel tartrate	558.360	
IFN 8-16-451		
Nequinatate	558.365	
IFN 8-09-828		
Oleandomycin	558.435	
IFN 8-03-412		
Pyrantel Tartrate	558.485	
IFN 8-14-011		
Robenidine hydrochloride	558.515	
IFN 8-14-012		
Thiabendazole	558.615	
IFN 8-04-827		

**87.6 Rice By-Products Fractions** is obtained by screening and aspirating Ground Rice Hulls. It is used primarily as a pelleting aid and is composed of such fine particles of Ground Rice Hulls, Spongy Parenchyma, and minute amounts of Rice Flour, Rice Germ, Pericarp, and Rice Starch as will pass an 80 mesh screen and contain not less than 5% crude protein, 1.5% crude fat, and not more than 25% crude fiber. (Proposed 1965, Adopted 1966, Amended 1967)

IFN 1-08-033 Rice hull fines

**87.7 Ammoniated Rice Hulls** is obtained by the treatment of ground rice hulls with monocalcium phosphate and anhydrous ammonia at a temperature of 350 F and a pressure of 175 lb. per square inch. It is to be used in beef cattle feeds at a level not to exceed 20% of the total rations as a source of crude fiber and as the sole source of non-protein nitrogen. The label of the additive and of any feed additive supplement, feed additive concentrate, or feed additive premix prepared therefrom, must contain the following information in addition to any other required information.

- (1) The name of the additive.
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for use to provide not more than 20% of the additive in the total ration and a prominent statement: "Warning--This feed should be used only in accordance with the directions furnished on the label." (Reg. 573.160.) (Proposed 1966, Adopted 1968)

IFN 1-05-698 Rice hulls ammoniated

**87.8 Polyethylene Roughage Replacement** consists of basic polymers manufactured by the catalytic polymerization of ethylene, is designed in a pellet form in a configuration presenting maximum angular surface having the following dimensions in centimeters.  $0.9 \pm 0.1 \times 0.8 \pm 0.1 \times 1.2 \pm 0.1$ . It is used as a

348 **Feed Ingredient Definitions**

replacement for roughage in feedlot rations for finishing slaughter cattle. The labels and labeling shall bear the name of the additive "Polyethylene Roughage Replacement," and adequate directions for use which shall provide for the administration of one-half pound of polyethylene pellets per day for 6 successive days. All natural roughage should be removed for a minimum of 12 hours prior to administration of polyethylene roughage replacement. Roughage replacement must be adequately mixed in the ration for uniform distribution. (Proposed 1969, Adopted 1970) Reg. 573.780

IFN 8-09-351 Polyethylene

**87.9 Ammoniated Cottonseed Meal** is obtained by the treatment of cottonseed meal with anhydrous ammonia until a pressure of 50 pounds per square inch gauge is reached. It is to be used in the feed of ruminants as a source of protein and/or as the sole source of non-protein nitrogen in an amount not to exceed 20% of the total ration.

The label of the additive and of any feed additive supplement, feed additive concentrate, or feed additive premix prepared therefrom, must contain the following information in addition to any other required information:

- (1) The name of the additive.
- (2) The maximum percentage of equivalent crude protein from non-protein nitrogen.
- (3) Directions for use to provide not more than 20% of the additive in the total ration and a prominent statement: "Warning--This feed should be used only in accordance with the directions furnished on the label."

(Reg. 573.140) (Proposed 1969, Adopted 1970)

IFN 5-09-352 Cotton seeds meal solvent extracted ammoniated

**87.10 Poloxalene** consists of polyoxypropylene-polyoxyethylene glycol non-ionic block polymer. It may be used as a surfactant for the flaking of feed grain, when added to liquid grain conditioner in an amount not to exceed 1% of the conditioner, and the conditioner is added to the feed grain at a rate of 1 quart per ton of feed grain. (Reg. 573.760) (Proposed 1970, Adopted 1971)

IFN 8-08-063 Poloxalene

**87.11 Anhydrous Ammonia** is applied to corn plant material prior to ensiling as a source of non-protein nitrogen in accordance with any one of the following methods:

- (1) As a component of an aqueous premix containing 16 to 17 percent ammonia, with molasses, minerals, and not less than 83 percent crude protein. The labeling must bear the following statements:
  - a) An expiration date of not less than 10 weeks after date of manufacture,
  - b) additional protein should not be fed to lactating dairy cows producing less than 32 pounds of milk per day or beef cattle consuming less than one percent of their body weight daily in shelled corn, and
  - c) do not use additional trace mineral supplementation with treated silage;
- (2) After being diluted to a 15 to 30 percent aqueous ammonia solution (by weight) and:
  - a) does not exceed anhydrous ammonia equivalent to 0.3 percent of the corn plant material,
  - b) the corn plant material contains 28-38 percent dry matter, and
  - c) the treated silage is fed to dairy cattle only; and
- (3) Directly, and
  - a) does not exceed anhydrous ammonia equivalent to 0.35 percent of the corn plant material,



- b) the corn plant material contains 30 to 35 percent dry matter,
- c) 75 to 85 percent of the anhydrous ammonia is liquid at ambient pressure during the direct application, and
- d) the treated material is used in dairy or beef cattle rations.

The labeling of the article must contain the following information in addition to any other required information:

- (1) The name of the article.
- (2) The concentration of ammonia.
- (3) The maximum percentage of equivalent crude protein from non-protein nitrogen
- (4) Directions for use consistent with 1) (b) and (c), 2) (c), and 3) (d) above, and
- (5) A prominent: "Warning--This feed should be used only in accordance with the directions furnished on the label. (Proposed 1974, Adopted 1975, Revised 1982, Adopted 1983.) Reg. 573.180. IFN 5-14-511 Ammonia anhydrous

**87.12 Bentonite** is a naturally occurring mineral consisting primarily of the tri-layered aluminum silicate, montmorillonite. It may contain calcium or sodium as the predominant available or exchange ion. It is used or intended for use in non-medicated animal feed as an anti-caking agent and pelleting aid in an amount not to exceed 2% in total ration. It is not prohibited in medicated animal feed for the same purposes and at the same levels when it can be demonstrated that it does not interfere with the bioavailability of the medicament to animals and the analysis of the feed for the medicament by acceptable methods. It is the manufacturer's responsibility to determine and submit adequate data to support the conclusion that interference does not occur before using it in a feed containing medicaments. Medicaments with which it may currently be used are listed in 87.5. (Proposed 1974, Adopted 1975) Reg. 582.1155

IFN 8-00-695 Bentonite

**87.13 Sodium Bentonite** is a naturally occurring mineral consisting primarily of the tri-layered hydrous aluminum silicate, montmorillonite characterized by a sodium exchange or available ion content of not less than 1% and not more than 2% of the air dried material. It is used or intended for use in non-medicated animal feed as an anti-caking agent and pelleting aid in an amount not to exceed 2% in total ration. To reduce seepage in silage, the amount added would not exceed 1% sodium bentonite. It is not prohibited in medicated animal feed for the same purposes and the same levels when it can be demonstrated that it does not interfere with the bioavailability of the medicament to animals and the analysis of the feed for the medicament by acceptable methods. It is the manufacturer's responsibility to determine and submit adequate data to support the conclusion that interference does not occur before using it in a feed containing medicaments. Medicaments with which it may currently be used are listed in 87.5. (Proposed 1974, Adopted 1975, Amended 1983) Reg. 582.1155

IFN 8-14-512 Sodium bentonite

**87.14 Powdered Cellulose** is purified, mechanically disintegrated cellulose prepared by processing alpha cellulose obtained as a pulp from fibrous plant materials. (Proposed 1975, Adopted 1976)

IFN 1-15-514 Cellulose powdered

**87.16 Chitosan** is a cationic carbohydrate polymer intended for use as a precipitating agent of proteinaceous material from food processing plants. It is chemically derived by deacetylation of the naturally occurring chitin in crab and shrimp shells. It may be used in an amount not to exceed that necessary to accomplish its intended effect. Chitosan when fed as a component of feed to

## 350 Feed Ingredient Definitions

livestock shall be present at no more than 0.1% of the feed. Proteinaceous material coagulated with chitosan must have safety and efficacy data approved before it can be registered or offered for sale. (Proposed 1984, Adopted 1985)

IFN 8-17-730 Chitosan

**87.17 Perlite** is the expanded, powdered form of a glassy volcanic rock, consisting essentially of fused sodium potassium aluminum silicate. It meets the specifications of current edition and supplements of the Food Chemicals Codex. It is used as a filter aid or pressing aid in the processing of foods and feed ingredients and also may be used as an anti-caking agent. It may not exceed 4% by weight of the product in which it is present as a processing aid. (Proposed 1977, Amended 1978, Adopted 1979)

IFN 8-26-242 Perlite

**87.19 Urea Formaldehyde Condensation Polymer** is a pelleting aid for use in animal feeds, excluding aquatic species. Restrictions: Not to exceed 0.1 ppm free formaldehyde in the finished pelleted product. (Proposed 1989, Adopted 1990)

IFN 8-30-422 Urea Formaldehyde Condensation Polymer

**87.21 Kraft Lignin** and its salts (ammonium, calcium, magnesium or sodium) is obtained from the acid precipitation of lignin from spent black liquor produced in the sulfate digestion process of wood and is dehydrated to less than 8 percent moisture by weight. It is used; (1) as an aid in recovering proteinaceous material during the rendering process, limited to 0.1 percent of the crax, (2) in the clarification of spent grease, and (3) as a coating agent for fat soluble vitamins limited to 50 percent of the vitamin premix matrix and 3 percent of the finished feed. (Proposed 1993, Amended 1994, Adopted 2003)

**87.22 Microcrystalline Cellulose** is purified, partially depolymerized cellulose prepared by processing alpha cellulose obtained as a pulp from fibrous plant material by treating with mineral acids. (Proposed 1995, Adopted 2003)

**87.23 Cassia Gum** is the purified flour from the endosperm of the seeds of *Cassia tora* or *Cassia obtusifolia*, which belong to the family Leguminosae. It is a galactomannan comprised of at least 75% polysaccharide consisting primarily of a linear chain of 1,4-B-D-mannopyranose units. The ratio of galactose to mannose is 1:5. Cassia gum is the product obtained by mechanical separation of the endosperm from the germ and husk in a heated process, with subsequent purification by sieving, pulverization, extraction, and drying. It contains not more than 10 ppm chrysophanic acid. Cassia gum is suitable for use as a stabilizer (thickening and gelling agent) in canned dog and cat food and shall be permitted at concentrations up to 4000 ppm. (Proposed 1999, Adopted 2002)

#### Tentative

**T87.15 Formaldehyde** -- formaldehyde solution may be safely used in the manufacture of animal feeds according to the following conditions: (a)(1) The additive is used, or intended for use, to improve the handling characteristics of animal fat in combination with certain oilseed meals by producing therefrom a dry, free-flowing product as follows: (i) An aqueous blend of soybean and sunflower meals in a ratio of 3:1, respectively, is mixed with animal fat such that the oilseed meals and animal fat are in a ratio of 3:2. (ii) Formaldehyde (37 percent solution) is added to the mixture at a level of 4 percent of the dry matter weight of the oilseed meals and animal fat. This mixture, upon drying, contains not more than 1 percent formaldehyde and not more than 12 percent moisture. (2) The dried mixture described in paragraph (a) of this section is used, or intended for use, as a component of dry, nonpelleted feeds for beef and nonlactating dairy cattle. (3) To assure safe

use of the additive, in addition to the other information required by the Federal Food, Drug & Cosmetic Act (the Act), the label and labeling of the dried mixture described in paragraph (a) of this section shall bear: (i) The name of the additive. (ii) Adequate directions for use providing that feed as consumed is not to contain more than 25 percent of the mixture. (b)(1) The food additive is formaldehyde (CAS No. 50-00-0; 37 percent aqueous solution). It is used at a rate of 5.4 pounds (2.5 kilograms) per ton of animal feed or feed ingredient. It is an antimicrobial agent used to maintain complete animal feeds or feed ingredients Salmonella negative for up to 21 days. (2) To assure safe use of the additive, in addition to the other information required by the Act, the label and labeling shall contain: (i) The name of the additive. (ii) A statement that formaldehyde solution which has been stored below 40 [deg] F or allowed to freeze should not be applied to complete animal feeds or feed ingredients. (iii) Adequate directions for use including a statement that formaldehyde should be uniformly sprayed on and thoroughly mixed into the complete animal feeds or feed ingredients and that the complete animal feeds or feed ingredients so treated shall be labeled as containing formaldehyde. The label must prominently display the statement: "Treated with formaldehyde to maintain feed Salmonella negative. Use within 21 days." (IV) The labeling for feed or feed ingredients to which formaldehyde has been added under the provisions of paragraph (b)(1) of this section is required to carry the following statement: "Treated with formaldehyde to maintain feed Salmonella negative. Use within 21 days." (3) To assure safe use of the additive, in addition to the other information required by the Act, the label and labeling shall contain: (i) Appropriate warning and safety precautions concerning formaldehyde. (ii) Statements identifying formaldehyde as a poison with potentials for adverse respiratory effects. (iii) Information about emergency aid in case of accidental inhalation. (iv) Statements reflecting requirements of applicable sections of the Superfund Amendments and Reauthorization Act (SARA), and the Occupational Safety and Health Administration's (OSHA) human safety guidance regulations. (v) Contact address and phone number for reporting adverse reactions or to request a copy of the Materials Safety Data Sheet (MSDS). (21 CFR 573.460) (Proposed 1977, Adopted 1978, Amended 1996, 2005)

IFN 8-26-243 Formaldehyde solution

**T87.18 Reed-Sedge Peat** is a natural, partially decomposed plant material, formed from a mixture of reeds, sedges, grasses and some hydnium mosses occurring in wetlands and containing one third to two thirds peat fibers. It should be dehydrated to a moisture content of not more than 15% and be in a state free from all harmful micro-organisms. It is intended for use in animal feed as a carrier for liquid products and premixes or as a nutritional diluent for lowered energy diets at a level not to exceed 5% of the total daily ration. (Proposed 1986)

IFN 1-18-898 Peat Whole Dehydrated

**T87.24 Hide Glue or Technical Gelatin** – is a collagen-based product manufactured only from cattle hide pieces. Maximum moisture is 13.5%, maximum ash is 4% and minimum protein is 90%. The product is used as a processing aid, pelleting aid, or feed binder, not to exceed 2% of the feed by weight. (Either term, "hide glue" or "technical gelatin", may be used in the ingredient-statement.) (Proposed 2003)

**T87.25 Neohesperidin Dihydrochalcone** is the product resulting from hydrogenation of neohesperidin, a flavonoid extracted from bitter orange (*Citrus aurantium*), under alkaline conditions in the presence of a palladium-on-charcoal catalyst. It is to be used as a flavoring agent in weanling pig diets at levels not to exceed 15 ppm of complete feed. (Proposed 2005)

## 352 Feed Ingredient Definitions

## 90. VITAMINS

Investigator and Section Editor—Ali Kashani, WA

## Official

**90.1 Cod Liver Oil** is the oil obtained from the livers of *gadus morrhuae* or other species of the family *gadidae*, either or both. It must contain not less than 385,900 International Units of vitamin A per pound (850 units per gram) and not less than 29,510 International Chick Units of vitamin D per pound (65 units per gram). (Adopted 1937, Amended 1945, 1950, 1973, 1995, 1996)

IFN 7-01-993 Fish cod liver oil

**90.2 Cod Liver Oil with Added Vitamins A and D** is the product consisting of cod liver oil to which has been added vitamins A and D. The product must contain not less than 136,000 International Chick Units of vitamin D per pound (300 per gram). (Adopted 1948, Amended 1950, 1964, 1967.)

IFN 7-08-047 Fish cod liver oil vitamins A and D added

**90.3 Vitamin A Oil** is an oil of animal or vegetable origin with or without vitamin A supplementation for which vitamin A potency is claimed. (Adopted 1944, Amended 1945, 1959, 1964, 1967.)

IFN 7-05-141 Vitamin A oil

**90.4 Vitamin D<sub>2</sub> Supplement** is a feeding material used for its vitamin D<sub>2</sub> activity. It must contain a minimum of 100,000 International Units of vitamin D<sub>2</sub> per pound. (Adopted 1956, Amended 1973, 1995, 1996)

IFN 7-05-149 Vitamin D<sub>2</sub> supplement

**90.5 Vitamin D Oil** is an oil of animal or vegetable origin with or without vitamin D supplementation for which vitamin D potency is claimed. (Adopted 1944, Amended 1945, 1959, 1964, 1967.)

IFN 7-05-147 Vitamin D oil

**90.6 Vitamin A and D Oil** is an oil of animal or vegetable origin with or without vitamins A and D supplementation for which vitamin potencies are claimed. (Adopted 1944, Amended 1945, 1950, 1959, 1964, 1967.)

IFN 7-05-145 Vitamin A and D oil

**90.7 Cholecalciferol (D-Activated Animal Sterol)** is obtained by activation of a sterol fraction of animal origin with ultra-violet light or other means. For label identification it may be followed with the parenthetical phrase (Source of Vitamin D<sub>3</sub>). (Adopted 1942, Amended 1993.)

IFN 7-00-408 Animal sterol irradiated

**90.8 Ergocalciferol (D-Activated Plant Sterol)** is obtained by activation of a sterol fraction of plant origin with ultra-violet light or other means. For label identification it may be followed with the parenthetical phrase (Source of Vitamin D<sub>2</sub>). (Adopted 1944, Amended 1993.)

IFN 7-03-728 Plant sterol irradiated

**90.11 Vitamin B<sub>12</sub> Supplement** is a feeding material used for its vitamin B<sub>12</sub> activity. It must contain a minimum vitamin B<sub>12</sub> activity of 1.5 milligrams per pound. The term must not be applied to products for which there are accepted names and definitions. (Adopted 1952.)

IFN 7-05-146 Vitamin B<sub>12</sub> supplement

**90.12 Vitamin E Supplement** is a feeding material used for its vitamin E activity. It must contain a minimum vitamin E activity equal to 10,000 International Units of vitamin E per pound. (Adopted 1953, Amended 1967.)

IFN 7-05-150 Vitamin E supplement

**90.13 Riboflavin Supplement** is a feeding material used chiefly for its riboflavin content, and must contain not less than 1,000 milligrams of riboflavin per pound. The label must bear a parenthetical statement of origin immediately following this declaration. (Adopted 1957.)

IFN 7-03-921 Riboflavin supplement

**90.14 Vitamin A Supplement** is a feeding material used for its vitamin A content. It must contain a minimum of two million International Units of vitamin A per pound. The label must bear a statement of the source of vitamin A and a minimum guarantee of International Units of vitamin A per pound with additional permissive International Units of vitamin A per gram. (Proposed 1959, Adopted 1960, Amended 1973, 1995, 1996)

IFN 7-05-144 Vitamin A supplement

**90.15 Vitamin D<sub>3</sub> Supplement** is a feeding material used for its vitamin D<sub>3</sub> activity. It must contain a minimum of 100,000 International Chick Units of vitamin D<sub>3</sub> per pound. (Proposed 1966.)

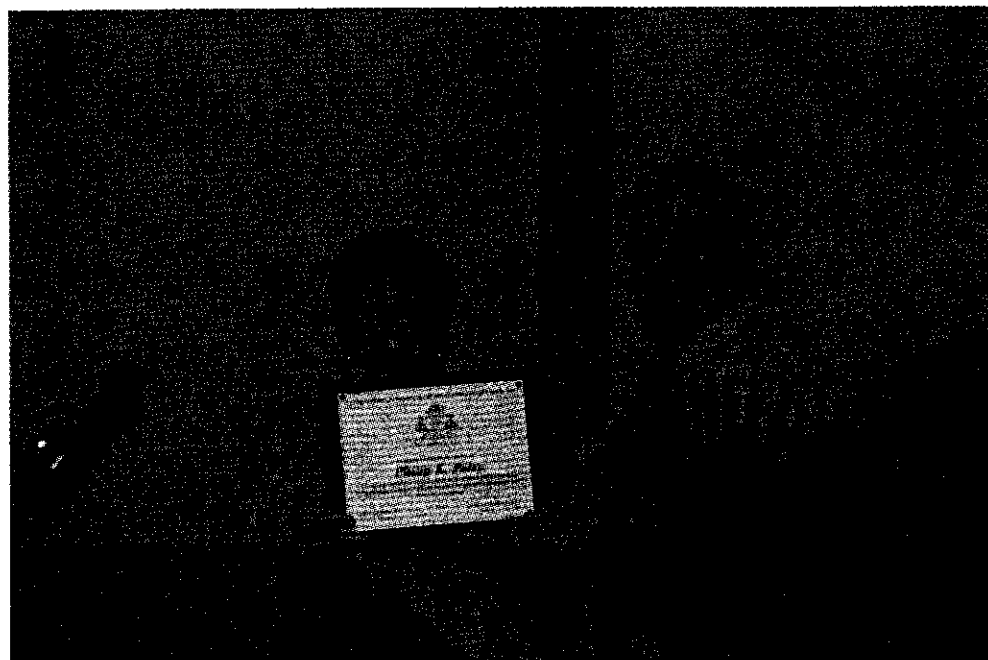
IFN 7-05-699 Vitamin D<sub>3</sub> supplement

**90.16 Niacin Supplement** is a term that may be used in the ingredient list on a feed label of a mixed feed to indicate the addition of either Niacin or Niacinamide. Sources containing only Niacin or Niacinamide must state the source of Niacin on their label. (Adopted 1980, Amended 1981.)

IFN 7-26-003 Niacin supplement

**90.17 Betaine (hydrochloride or anhydrous)** is the crystalline chloride of betaine or anhydrous betaine; a partial replacement for choline. (Proposed 1990, Adopted 1991)

IFN 7-00-722 Betaine hydrochloride



Phil Petry receives The Distinguished service award.

## 354 Feed Ingredient Definitions

**90.25 ADDITIONAL OFFICIALLY RECOGNIZED VITAMIN  
INGREDIENTS FOR ANIMAL FEED USE AT NUTRITONAL LEVELS  
AND IN CONFORMITY WITH CURRENT GOOD MANUFACTURING  
PRACTICES**

<b>Recognized English Name</b>	<b>Article or Substance Indicated</b>	<b>Status Under Food Additive Amendments 21 CFR</b>
Ascorbic Acid IFN 7-00-433	Crystalline Ascorbic Acid Commercial Feed Grade	Reg. 582.5013(GRAS)
L-Ascorbyl-2- Polyphosphate	Stabilized Ascorbic Acid Feed Grade	
L-Ascorbyl-2- Sulfate	Stabilized Ascorbic Acid Feed Grade	Aquatic species (Salmon, Trout, Catfish, Shrimp, and Tilapia)
Biotin IFN 7-00-723	Biotin--Commercial Feed Grade	Reg. 582.5159(GRAS)
Calcium Ascorbate	Commercial Grade	Vitamin C activity in dry feeds (<13% moisture) only
Calcium L-Ascorbyl- 2-Monophosphate	Stabilized Ascorbic Acid Feed Grade, May be used in the feed of any species provided that it is not promoted for species that do not have a dietary requirement for vitamin C.	
Calcium Pantothenate IFN 7-01-079	Crystalline Calcium Panto- thenate--Commercial Feed Grade	Reg. 582.5212(GRAS)
Carotene IFN 7-01-134	The Refined Crystalline Carotene Fraction of Plants	Reg. 582.5245(GRAS)
Choline Chloride IFN 7-01-228	Choline Chloride-- Commercial Feed Grade	Reg. 582.5252(GRAS)
Choline Pantothenate IFN 7-01-229	Crystalline Choline Panto- thenate--Commercial Feed Grade	
Choline Xanthate IFN 7-01-230	Choline Xanthate-- Commercial Feed Grade	Reg. 573.300
Erythorbic Acid (Iso Ascorbic Acid) IFN 7-09-823	Either the Acid or the Sodium Salt	Reg. 582.3041
Folic Acid IFN 7-02-066	Crystalline Folic Acid-- Commercial Feed Grade	
Herring Oil IFN 7-08-048	The Oil Extracted from Whole of Parts of Herring	
Inositol IFN 7-09-354	Vitamin B Complex Vita- min; Lipotropic, Chemical name-Cyclohexandehexol. Also referred to as i-inositol Or meso-inositol.	Reg. 582.5370(GRAS)

## Feed Ingredient Definitions 355

Magnesium L-Ascorbyl-2- Phosphate	Stabilized Ascorbic Acid	Fish Feeds Only
Menadione Dimethylpyri- midinol Bisulfite IFN 7-08-102	Crystalline Menadione--Di- methylpyrimidinol Bisulfite --Commercial Feed Grade	Reg. 573.620
Menadione Nicotin- amide Bisulfite	Source of Vitamin K Activity and supplemental Niacin	Chicken and Turkey feeds at 2 g/ton, Growing and Finishing Swine feeds at 10 g/ton 21 CFR 573.625
Menadione Sodium Bisulfite Complex IFN 7-03-078	The Addition Product of Menadione and Sodium Bi- sulfite Containing not less Than 30% of Menadione	Poultry 2 to 4 g/T
Menhaden Oil IFN 7-08-049	The oil extracted from whole Menhaden	
Niacin; Nicotinic Acid IFN 7-03-219	Crystalline Nicotine Acid-- Commercial Feed Grade	Reg. 582.5530(GRAS)
Niacinamide; Nicotinamide IFN 7-03-215	Crystalline Amide of Nicotinic Acid--Commercial Feed Grade	Reg. 582.5535(GRAS)
p-Aminobenzoic Acid IFN 7-03-513	p-Aminobenzoic Acid- Commercial Feed Grade	
Pyridoxine Hydrochloride IFN 7-03-822	Crystalline Chloride of Pyri- doxine--Commercial Feed Grade	Reg. 582.5676(GRAS)
Riboflavin IFN 7-03-920	Crystalline Riboflavin-- Commercial Feed Grade	Reg. 582.5695(GRAS)
Salmon Oil IFN 7-08-050	The oil extracted from cannery refuse of salmon	
Salmon Liver Oil IFN 7-02-013	The oil extracted from Salmon Livers	
Sardine Oil IFN 7-02-016	The oil extracted from cannery refuse of the packing of sardine	
Shark Liver Oil IFN 7-02-019	The oil extracted from Shark Liver	
Thiamine, Thiamine Hydrochloride IFN 7-04-828	Crystalline Chloride of Thia- mine--Commercial Feed Grade	Reg. 582.5875(GRAS)
Thiamine Mononitrate IFN 7-04-829	Crystalline Mononitrate of Thiamin--Commercial Feed Grade	Reg. 582.5878(GRAS)
Tocopherol IFN 7-00-001	a-Tocopherol--Commercial Feed Grade	Reg. 582.5890(GRAS)
a-Tocopherol Acetate	Commercial Feed Grade dl-a-tocopheryl acetate	Reg. 582.5892(GRAS)

## 356 Feed Ingredient Definitions

IFN 7-18-777	d-a-tocopheryl acetate	
Tuna Oil	The oil extracted from cannery refuse of Tuna	
IFN 7-02-024	refuse of Tuna	
Vitamin A Acetate	Vitamin A Acetate--	Reg. 582.5933(GRAS)
IFN 7-05-142	Commercial Feed Grade	
Vitamin A Palmitate	Vitamin A Palmitate--	Reg. 582.5936(GRAS)
IFN 7-05-143	Commercial Feed Grade	
Vitamin A Propionate	Consists of retinol or esters of retinol formed from edible fatty acids.	
IFN 7-26-311		
Wheat Germ Oil	The oil extracted or expressed from Wheat Germ	
IFN 7-05-207		

\*GRAS--Abbreviation for the phrase "Generally Recognized As Safe" by experts qualified to evaluate the safety of the substance for its intended use.

## 90.26 Source of Vitamins and Their Levels

Vitamin Compound(1)	Vitamin(2)	Vitamin/Vitamin(3) Compound
L-ascorbyl-2-polyphosphate	Ascorbic Acid	0.800
Menadione Dimethylpyrimidinol Bisulfite	Menadione	0.454
Menadione Sodium Bisulfite Complex	Menadione	0.330
Riboflavin-5-Phosphate	Riboflavin	0.730
d-Calcium Pantothenate	d-Pantothenic Acid	0.920
Thiamine Hydrochloride	Thiamine	0.892
Thiamine Mononitrate	Thiamine	0.919
Pyridoxine Hydrochloride	Vitamin B <sub>6</sub>	0.823
Choline Chloride	Choline	0.868
Choline Bitartrate	Choline	0.469
Ferric Choline Citrate	Choline	0.330
Sodium Ascorbate	Ascorbic Acid	0.889

- (1) Term to be used in ingredient statement when declaring fortification, Model Bill, Section 5.
- (2) Term to be used in guaranteed analysis statement when guaranteeing the level of the vitamin, Model Regulation 4(c).
- (3) The ratio is based upon molecular weights and may not be proportional to biological activity. (Adopted 1991)

## 93. WHEAT PRODUCTS

Investigator and Section Editor—Ann Brueck, ID

## Official

**93.1 Wheat Bran** is the coarse outer covering of the wheat kernel as separated from cleaned and scoured wheat in the usual process of commercial milling. (Adopted prior to 1928.)

IFN 4-05-190 Wheat bran

**93.2 Wheat Flour** consists principally of wheat flour together with fine particles of wheat bran, wheat germ, and the offal from the "tail of the mill." This product must be obtained in the usual process of commercial milling and must contain not more than 1.5% crude fiber. (Adopted 1949.)



IFN 4-05-199 Wheat flour less than 1.5% fiber

**93.3 Wheat Germ Meal** consists chiefly of wheat germ together with some bran and middlings or shorts. It must contain not less than 25% crude protein and 7% crude fat. (Adopted 1949, Amended 1953.)

IFN 5-05-218 Wheat germs ground

**93.4 Wheat Mill Run** consists of coarse wheat bran, fine particles of wheat bran, wheat shorts, wheat germ, wheat flour, and the offal from the "tail of the mill". This product must be obtained in the usual process of commercial milling and must contain not more than 9.5% crude fiber. (Proposed 1959, Adopted 1960.)

IFN 4-05-206 Wheat mill run less than 9.5% fiber

**93.5 Wheat Middlings** consists of fine particles of wheat bran, wheat shorts, wheat germ, wheat flour, and some of the offal from the "tail of the mill". This product must be obtained in the usual process of commercial milling and must contain not more than 9.5% crude fiber. (Proposed 1959, Adopted 1960.)

IFN 4-05-205 Wheat flour by-product less than 9.5% fiber

**93.6 Wheat Shorts** consists of fine particles of wheat bran, wheat germ, wheat flour, and the offal from the "tail of the mill". This product must be obtained in the usual process of commercial milling and must contain not more than 7% crude fiber. (Proposed 1959, Adopted 1960.)

IFN 4-05-201 Wheat flour by-product less than 7% fiber

**93.7 Wheat Red Dog** consists of the offal from the "tail of the mill" together with some fine particles of wheat bran, wheat germ, and wheat flour. This product must be obtained in the usual process of commercial milling and must contain not more than 4% crude fiber. (Proposed 1959, Adopted 1960.)

IFN 4-05-203 Wheat flour by-product less than 4% fiber

**93.8 Defatted Wheat Germ Meal** is obtained after the removal of part of the oil or fat from wheat germ meal and must contain not less than 30% crude protein. (Proposed 1960, Adopted 1962, Amended 1964.)

IFN 5-05-217 Wheat germs meal mechanical extracted

NOTE: When "Ground Wheat Screenings" are added to any wheat product such screenings added must be limited to ground wheat screenings not exceeding the run of the mill; and screenings from outside sources must not be added. The declaration of "ground wheat screenings" must be made in the name and in the same size type as the product name itself; i.e., "Wheat Bran with Ground Wheat Screenings", "Wheat Shorts with Ground Wheat Screenings".

## 96. YEAST

Investigator and Section Editor--Mika Alewynse, FDA

### Official

**96.1 Primary Dried Yeast or Dried Yeast** is the dried, non-fermentative yeast of the botanical classification *Saccharomyces* which has been separated from the medium in which propagated. It must consist of yeast cells with no fillers and contain not less than 40% crude protein. (Adopted 1955, Amended 1993, Adopted 1997)

IFN 7-05-533 Yeast primary dehydrated

**96.2 Active Dry Yeast** is yeast which has been dried in such a manner as to preserve a large portion of its fermenting power. It must contain no added cereal or filler and must contain not less than 15 billion live yeast cells per gram. (Adopted 1951)

IFN 7-05-524 Yeast active dehydrated

358 **Feed Ingredient Definitions**

**96.3 Irradiated Dried Yeast, Irradiated \_\_\_\_\_ Dried Yeast** is the dried, non-fermentative yeast which has been subjected to ultraviolet rays in order to produce anti-rachitic potency. (Proposed 1958, Adopted 1959)

IFN 7-05-529 Yeast irradiated dehydrated

NOTE: When Irradiated Dried Yeast or Irradiated \_\_\_\_\_ Dried Yeast is used as an ingredient of proprietary feeds for four-footed animals, the name may be followed by a parenthetical phrase (Source of Vitamin D<sub>2</sub>). (Adopted 1945, Amended 1959)

**96.4 Brewers Dried Yeast** is the dried, non-fermentative, non-extracted yeast of the botanical classification *Saccharomyces* resulting as a by-product from the brewing of beer and ale. It must contain not less than 35% crude protein. It must be labeled according to its crude protein content. (Adopted 1955, Amended 1975, Adopted 1978)

IFN 7-05-527 Yeast brewers dehydrated

**96.7 Torula Dried Yeast or Candida dried yeast** is the dried, non-fermentative yeast of the botanical classification (*torulopsis*) *Candida utilis* (formerly *Torulopsis utilis*) which has been separated from the medium in which propagated. It must contain not less than 40% crude protein. (Adopted 1955, amended 1993)

IFN 7-05-534 Yeast torula dehydrated

**96.8 Yeast Culture\*** is the dried product composed of yeast and the media on which it was grown, dried in such a manner as to preserve the fermenting activity of the yeast. The media must be stated on the label. (Adopted 1957)

IFN 7-05-520 Yeast culture dehydrated

\*NOTE: No reference to media in main ingredient listing is required when yeast culture forms a component of a proprietary mixed feed.

**96.9 Molasses Yeast Condensed Solubles** is obtained by condensing to a syrup consistency the broth remaining after the removal of baker's yeast cells propagated on molasses. (Proposed 1973, Amended 1974)

IFN 5-14-009 Sugarcane molasses yeast solubles condensed

**96.10 Brewers Liquid Yeast** is the non-fermentative, non-extracted yeast of the botanical classification *Saccharomyces* resulting as a by-product from the brewing of beer and ale. It must contain not less than 35% crude protein on a dry weight basis. The guaranteed analysis shall include the maximum moisture. (Proposed 1976, Adopted 1978)

IFN 7-20-878 Yeast brewers liquid

#### Tentative

**T96.5 Grain Distillers Dried Yeast** is the dried, non-fermentative yeast of the botanical classification *Saccharomyces* resulting from the fermentation of grains and yeast, separated from the mash, either before or after distillation. It must contain not less than 40% crude protein. (Adopted 1955, Withdrawn 1993, Adopted 2006)

**T96.11 Yeast Extract** is the concentrated solubles of mechanically ruptured cells of a selected strain of the yeast, *Saccharomyces cerevisiae*. It may be dried or concentrated. It must contain not less than 9% crude protein. (Proposed 1998, Amended 2006)

#### 99. Withdrawn Ingredients

**Table 87.5 Ball Clay** Not accepted for use as a feed ingredient. (Removed 1999)

**T57.152 Calcium Formate** is the calcium salt of formic acid generally expressed as  $\text{Ca}(\text{HOCO}_2)_2$  and its hydrated forms. It is to be used as a source of supplemental calcium in swine diets, not to supply more than 0.6% calcium to the

**Feed Ingredient Definitions 359**

diet. Calcium Formate is currently considered an unapproved food additive, and a food additive petition must be approved prior to its use in feeds. (Adopted 1993, Amended 1999, Removed 1999)