DSM IP Assets, B.V. et al v. Lallemand Specialties, Inc. et al Doc. 151

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WISCONSIN

DSM IP ASSETS, B.V. & DSM BIO-BASED PRODUCTS & SERVICES, B.V.,

Plaintiffs and Counter-Defendants,

v.

LALLEMAND SPECIALTIES, INC. & MASCOMA LLC,

Defendants and Counterclaimants.

PROPOSED CLAIMS CONSTRUCTIONS

16-cv-497-wmc

Plaintiffs DSM IP Assets, B.V. and DSM Bio-Based Products & Services B.V. (collectively "DSM") bring this patent infringement action against Lallemand Specialties, Inc. and Mascoma LLC (collectively "Lallemand") concerning U.S. Patent No. 8,795,998 (the "'998 patent"). Specifically, DSM alleges that Lallemand's products, TransFerm Yield+ ("TFY+") and YP3, infringe. The purpose of this opinion is to provide the parties with the court's proposed claim constructions and the reasoning behind them in advance of the scheduled expert colloquy on Friday, March 16, 2018.

## OPINION

"'[T]he claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips v. v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). For this reason, the right to exclude "begins and ends . . . with the actual words of the claim." *Renishaw PLC v. Marposs Societa' Per Azioni*, 158 F.3d 1243, 1248 (Fed. Cir. 1998). The goal of claims construction "is to give claim terms the

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meaning understood by a person of ordinary skill in the art at the time of invention." *Mass. Inst. of Tech. v. Shire Pharms., Inc.*, 839 F.3d 1111, 1118 (Fed. Cir. 2016) [hereinafter *MIT*] (citing *Phillips*, 415 F.3d at 1312-14). While this includes "a heavy presumption that claim terms are to be given their ordinary and customary meaning," *id.* at 1118 (quoting *Aventis Pharm. Inc. v. Amino Chems. Ltd.*, 715 F.3d 1363, 1373 (Fed. Cir. 2013)), this "meaning" is what a person of ordinary skill in the art would have after reading the entire patent, *id.* (quoting *Phillips*, 415 F.3d at 1321). *See also Renishaw*, 158 F.3d at 1250 ("Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim." (citing *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 389 (1996))).

For patent claims in highly specialized fields of study, like that at issue here, "determining the ordinary and customary meaning of the claim requires examination of terms that have a particular meaning in a field of art," yet are "not immediately apparent," requiring the court to examine intrinsic and extrinsic evidence "'concerning the relevant scientific principles, the meaning of technical terms, and the state of the art.'" *Phillips*, 415 F.3d at 1314 (quoting *Innova*, 381 F.3d at 1116).[1] Similarly, while the "ordinary meaning" inquiry remains "an objective baseline from which to begin claim interpretation," *id.* at 1313 (citing *Innova*, 381 F.3d at 1116), where a patent fails to explicitly define a disputed or arguably ambiguous term, the court may look to the patent

[1] Intrinsic evidence includes the patent itself and the file history, while extrinsic evidence includes evidence like expert testimony, dictionaries, inventor testimony, technical treatises and articles, or evidence of prior art. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 (Fed. Cir. 1996).

as a whole, including its prosecution history, to determine that term's meaning, *Wi-LAN USA, Inc. v. Apple Inc.*, 830 F.3d 1374, 1387 (Fed. Cir. 2016) (citing *Phillips*, 415 F.3d at 1315). *See also Renishaw*, 158 F.3d at 1248 ("The intrinsic evidence, and, in some cases, the extrinsic evidence, can shed light on the meaning of the terms recited in a claim, either by confirming the ordinary meaning of the claim terms or by providing special meaning for claim terms." (citing *Vitronics*, 90 F.3d at 1583)). Still, claims construction is viewed as a question of law, *Wi-LAN*, 830 F.3d at 1381, reserved only for the court, *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 135 S.Ct. 831, 835 (2015).

Here, the parties dispute the proper construction of four terms, all found in claim 1. (*See* Joint Statement on Claims Construction (dkt. #44) 2-3; '998 Patent (dkt. #1-1) 40 (67:12-37).) Plaintiffs claim that all four of their proposed constructions are faithful to the terms' "[p]lain and ordinary meaning[s]," although even they put a gloss on certain terms, while defendants claim that some terms require further construction to be consistent with the claimed invention and prosecution history. (Joint Statement on Claims Construction (dkt. #44) 2-3.) With emphasis on the terms in dispute, Claim 1 specifies:

> 1. Transgenic yeast cells comprising one or more recombinant heterologous, nucleic acid sequences encoding a protein with $NAD^+$-dependent acetylating acetaldehyde dehydrogenase activity (EC 1.2.1.10),
> wherein said cells lack enzymatic activity needed for the NADH-dependent glycerol synthesis, or
> said cells have a reduced enzymatic activity with respect to the NADH-dependent glycerol synthesis
> compared to a corresponding wild-type yeast cell, and
> wherein said cells are free of NAD-dependent glycerol 3-phosphate dehydrogenase activity or have reduced NAD-dependent glycerol 3-phosphate dehydrogenase activity

> compared to corresponding wild-type cells, and/or
> wherein the cells are either free of glycerol phosphate phosphatase activity or have reduced glycerol phosphate phosphatase activity compared to corresponding wild-type cells, and
> which comprise a genomic mutation in at least one gene selected from the group consisting of GPD2, GPD2, GPP1 and GPP2, and
> wherein said cells further comprise one or more nucleic acid sequences encoding an acetyl-Coenzyme A synthetase activity (EC 6.2.1.1) and one or more nucleic acid sequences encoding $NAD^+$-dependent alcohol dehydrogenase activity (EC 1.1.1.1).

('998 Patent (dkt. 1-1) 40 (67:12-37) (emphasis added).) The court addresses each of the four disputed terms below.

| **Term 1** | |
|---|---|
| "one or more recombinant heterologous, nucleic acid sequences encoding a protein with NAD+-dependent acetylating acetaldehyde dehydrogenase activity (EC 1.2.1.10)" | |
| **DSM's Proposed Construction** | **Lallemand's Proposed Construction** |
| "one or more recombinant heterologous, nucleic acid sequences that encode a protein having NAD+-dependent acetylating acetaldehyde dehydrogenase activity (EC 1.2.1.10)" | "a recombinant heterologous, nucleic acid encoding an NAD+-dependent acetylating acetaldehyde dehydrogenase enzyme" |

DSM proposes changing "nucleic acid sequences *encoding* a protein with NAD+-dependent acetylating acetaldehyde dehydrogenase activity" to "nucleic acid sequences *that encode* a protein having NAD+-dependent acetylating acetaldehyde dehydrogenase activity." In contrast, Lallemand proposes: (a) limiting the cells to having *a* "recombinant heterologous, nucleic acid" instead of the possibility of *one or more* "recombinant heterologous[] nucleic acid sequences" and (b) encompassing an "NAD+-dependent acetylating acetaldehyde dehydrogenase *enzyme*" instead of "a protein with

NAD+-dependent acetylating acetaldehyde dehydrogenase *activity* (EC 1.2.1.10)."

Plaintiffs explain that EC numbers classify enzymes based on the reaction they catalyze, which means the "EC 1.2.1.10" is reserved for proteins that catalyze the conversion of acetyl-Coenzyme A to acetaldehyde. (Pls.' Opening Br. (dkt. #59) 15.) In response, defendants argue that the claim specifies a protein that has "NAD+-dependent acetylating acetaldehyde dehydrogenase activity" -- a particular enzymatic activity. (Defs.' Opp'n (dkt. #77) 26-27.) Plaintiffs characterize this dispute as a question whether AdhE and other bifunctional acetylating acetaldehyde dehydrogenase enzymes are included, adding that because the patent identifies AdhE it would be improper to exclude a preferred embodiment. (Pls.' Reply (dkt. #97) 8-9.)

The court will not adopt either side's proposed construction, having determined that the plain and ordinary meaning of this term is indeed appropriate. As an initial matter, the court sees no reason to limit the term to a single "recombinant heterologous[] nucleic acid," where the term specifies "one or more . . . sequences." As to plaintiffs' proposal to change the word "encoding" to "that encode," the court is unconvinced that there is a meaningful difference, as importantly, if there is a difference, no basis to depart from the claim's actual syntax exists. The court also rejects defendants' proposed change of "NAD+-dependent acetylating acetaldehyde dehydrogenase activity (EC 1.2.1.10)" to "NAD+-dependent acetylating acetaldehyde dehydrogenase enzyme." As plaintiffs point out, the Enzyme Commission number -- the EC number -- is a unique four-digit number which describes the chemical reaction catalyzed. Specifically, the first digit identifies one of six classes; "the second and third digits describe the type of reaction catalyzed"; and

"the fourth digit is employed to distinguish between enzymes of the same function on the basis of the actual substrate in the reaction catalyzed." Douglas S. Clark & Harvey W. Blanch, *Biochemical Engineering* 1 (2d. ed. 1997). The enzyme identified by "EC 1.2.1.10" is "acetaldehyde dehydrogenase (acetylating)." Information on EC 1.2.1.10 -- acetaldehyde dehydrogenase (acetylating), BRENDA, https://www.brenda-enzymes.org/enzyme.php?ecno=1.2.1.10 (last visited Mar. 1, 2018). Replacing "activity" with "enzyme" would appear to change the claim's meaning since it is the *activity* -- not the enzyme that performs the activity -- that is at the heart of this portion of the claim term and, indeed, the invention itself. Thus, this term simply means "one or more recombinant heterologous, nucleic acid sequences encoding a protein with NAD+-dependent acetylating acetaldehyde dehydrogenase activity (EC 1.2.1.10)." (*See* '998 Patent (dkt. 1-1) 40 (67:12-15).)

The parties discuss the second and third terms together, and the court will follow suit, while actually construing the terms in dispute individually.

| **Term 2** | |
|---|---|
| "said cells . . . have reduced NAD-dependent glycerol 3-phosphate dehydrogenase activity [GPD] compared to corresponding wild-type cells" | |
| **DSM's Proposed Construction** | **Lallemand's Proposed Construction** |
| "the cells exhibit a reduction in the rate of the reaction catalyzed by GPD in the enzymatic production of glycerol compared to the corresponding wild-type yeast cells" | "the cells include modifications to one or more genes encoding GPD activity such that GPD is expressed considerably less than in the wild-type yeast cell or such that one or more genes encode GPD with reduced activity" |

| Term 3 | |
|---|---|
| "said cells have a reduced enzymatic activity with respect to the NADH-dependent glycerol synthesis compared to corresponding wild-type cells" | |
| **DSM's Proposed Construction** | **Lallemand's Proposed Construction** |
| "the cells exhibit a reduction in the rate of enzymatic production of glycerol compared to the corresponding wild-type yeast cell" | "the cells include modifications to one or more genes encoding one or more enzymes needed for NADH-dependent glycerol synthesis such that one or more enzymes are expressed considerably less than in the wild-type yeast cell or such that one or more genes encode a polypeptide with reduced activity" |

DSM argues that "enzymatic activity" is defined by enzymology and metabolic engineering as "the enzyme-catalyzed rate of product conversion under a given set of conditions, usually measured as the concentration change (substrate consumption or product formation) per unit time," which is usually expressed "in terms of units based upon the rate of the reaction that the enzyme promotes." (Pls.' Opening Br. (dkt. #59) 18.) According to DSM, therefore, "'enzymatic activity' is synonymous with the rate of the enzyme-catalyzed reaction, with an increased enzymatic activity corresponding to an increased reaction rate (due to lower activation energy) and a reduced enzymatic activity corresponding to a reduced reaction rate (due to a higher activation energy)." (*Id.* at 19.) Thus, DSM argues that both "reduced enzymatic activity terms" should be construed to mean: "(1) the cells exhibit a reduction in the rate of enzymatic production of glycerol compared to corresponding wild-type yeast cells; and (2) the cells exhibit a reduction in the rate of the reaction catalyzed by GPD in the enzymatic production of glycerol

compared to the corresponding wild-type yeast cells." (*Id.*)

Lallemand counters that DSM's proposed constructions would render *any* reduction in glycerol production an infringement, but that unreasonably and unnecessarily simplifies the claims. Lallemand further argues that DSM's reading must be rejected for three additional reasons: (1) inappropriately including "enzymatic production of glycerol" in both terms would make one superfluous; (2) intrinsic evidence establishes that "enzymatic activity" refers to the *amount of enzyme* expressed making it improper to equate enzymatic activity with the rate of substrate consumption or product formation; and (3) no extrinsic evidence requires a different meaning for "enzymatic activity." (Defs.' Opp'n (dkt. #77) 7-8.) In response, DSM first points out that its construction does not make one term superfluous because a reduction in enzymatic activity could be achieved under Claim 1 by deleting GPP activity -- without necessarily impacting the GPD-catalyzed reaction at all. (Pls.' Reply (dkt. #97) 12.) Secondly, DSM explains that enzymatic activity cannot mean the "amount of enzyme" because enzymatic activity is dependent on other factors, such as temperature, pH, and substrate concentration. (*Id.* at 26.) Further, DSM argues, the structural requirement of genetic modification comes from a different term, and it need not, and should not, be read into terms 2 and 3, especially because the specification contemplates other methods. (*Id.* at 13-14; Pls.' Opening Br. (dkt. #59) 19-20.) Third, DSM argues that Lallemand's proposed construction would actually exclude the embodiment introducing a separate metabolic pathway to compete with the NADH-glycerol synthesis pathway. (Pls.' Reply (dkt. #97) 15-16.)

Finally, Lallemand likewise emphasizes that its proposed constructions of terms 2 and 3 differ from DSM's in two ways: (1) the meaning of "enzymatic activity"; and (2) the structural requirements necessary for a "reduction." (Defs.' Opening Br. (dkt. #64) 15.) As to the meaning of "enzymatic activity," Lallemand proposes construing it as a measure of the expression or availability of GPD in the cell, while DSM construes it as a measurement of the rate of the GPD-catalyzed reaction. As to the structural requirements necessary to measure "a reduction," Lallemand proposes tying the reduction to the genetic modification, while DSM does not.

As an initial matter, "activity" is a noun that refers here to a metabolic process, whose "rate" would normally be understood by one skilled in the art to be measured by the change in moles of a substrate converted or of its converted product per unit of time. Here, GPD [an enzyme] catalyzes the conversion of dihydroxyacetone phosphate ("DHAP") to glycerol-3-phosphate ("G-3-P"), so that "activity" is measured by the change in DHAP or the change in G-3-P over time.[2]

Turning to term 2, the plain language simply provides that the patented cells have reduced GPD activity as compared to wild-type cells. Contrary to Lallemand's proposal, this language does not limit the reduction in the rate of activity to a genetic modification removing or reducing production of GPD; indeed, term 2 does not specify the means by

[2] The conversion of DHAP to G-3-P generally involves a 1:1 reaction ratio so the rate of change in either the concentration of DHAP or the concentration of G-3-P divided by the amount of time should provide an approximately equal measure of activity. This reaction can be displayed as:

$$\text{DHAP} \xrightarrow[GPD]{} \text{G-3-P}$$

which the reduction is achieved.[3]

Accordingly, DSM's proposal specifying that the cells "exhibit a reduction in the rate of the reaction catalyzed by GPD" is a clarification of the "have reduced NAD-dependent glycerol 3-phosphate dehydrogenase activity [GPD]" language found in the term. Similarly, DSM's addition of "enzymatic production of glycerol" further clarifies that the claim term is talking about GPD's function in the production of glycerol, not its other possible functions. As such, the court will adopt DSM's proposal as to term 2, construing it as "said cells exhibit a reduction in the rate of the reaction catalyzed by GPD in the enzymatic production of glycerol compared to the corresponding wild-type yeast cells."

For similar reasons, DSM's proposed construction of term 3 is closer to the mark than Lallemand's proposal. Term 3 specifies that the patented cells have decreased metabolic activity regarding the NADH-dependent glycerol synthesis as compared to wild-type cells. As with term 2, term 3 does not require genetic modification.[4] Accordingly, DSM's proposed language -- "exhibit a reduction in the rate" -- provides appropriate clarification. However, the term's construction should maintain a specific

[3] In fact, genetic modification is required by a different term. ('998 Patent (dkt. #1-1) at 40 (67:30-32 ("which comprise a genomic mutation in at least one gene selected from the group consisting of GPD1, GPD2, GPP1, and GPP2")); *id.* (68:39-41 ("The cells of claim 1, wherein at least one said mutation is a complete deletion of said gene in comparison to the corresponding wild-type yeast gene.")).) Reading the genetic modification requirement into this term would make the later term superfluous. *See WiLAN*, 830 F.3d at 1391 (noting the "presumption that differently worded claims cover different claim scope," stemming from "the legal canon of construction against superfluity" such that "[a] construction that would cause two differently worded claims to cover exactly the same claim scope would render one of the claims superfluous, so [courts] apply a presumption against such constructions").

[4] *See supra*, note 3.

reference to the "NADH-dependent glycerol synthesis." Thus, term 3 will be construed to mean "said cells exhibit a reduction in the rate of NADH-dependent glycerol production compared to the corresponding wild-type yeast cell."

| **Term 4** | |
|---|---|
| "wherein said cells further comprise one or more nucleic acid sequences encoding an acetyl-Coenzyme A synthetase activity (EC 6.2.1.1) and one or more nucleic acid sequences encoding NAD+-dependent alcohol dehydrogenase activity (EC 1.1.1.1)" | |
| **DSM's Proposed Construction** | **Lallemand's Proposed Construction** |
| "the cells comprise (i) one or more nucleic acid sequences that encode an acetyl-Coenzyme A synthetase activity and (ii) one or more nucleic acid sequences that encode an NAD+-dependent dehydrogenase activity" | "wherein said cells further comprise one or more nucleic acid sequences encoding an acetyl-Coenzyme A synthetase activity and one or more nucleic acid sequences encoding NAD+-dependent alcohol dehydrogenase activity, whereby the cells are net consumers of acetate/acetic acid such that the cells can reoxidize NADH by the reduction of acetate/acetic acid to ethanol via NADH-dependent reactions in place of glycerol synthesis and whereby the cells grow preferentially in the presence of acetate" |

The parties basically agree on the substance of DSM's proposed construction.[5] The dispute arises from Lallemand's three additional limitations: (1) "the cells are net consumers of acetate/acetic acid"; (2) "the cells can reoxidize NADH by the reduction of acetate/acetic acid to ethanol via NADH-dependent reactions in place of glycerol synthesis"; and (3) "the cells grow preferentially in the presence of acetate." Lallemand

[5] There are two slight differences: (1) DSM modifies "encoding" to "that encode," while Lallemand uses "encoding" as found in the disputed term; and (2) DSM removes the "alcohol" from the "NAD+-dependent alcohol dehydrogenase activity," while Lallemand keeps it in, consistent with the disputed term. (The addition of the romanettes in DSM's proposal is non-substantive, while improving readability.)

argues that its additions are based on the patent applicant's statements to distinguish the invention from the prior art. (Defs.' Opp'n (dkt. #77) 18.) Specifically, Lallemand bases the first addition on the patent applicant's statement that "[t]here is no suggestion to modify a yeast cell in order to make it a net consumer of acetate"; the second addition is based on a statement that the invention "is capable of using acetate as an electron acceptor to reoxidize NADH and therefore avoids or reduces the need for glycerol synthesis"; and the third addition on "[t]he invention provides a yeast cell that actually grows preferentially in the presence of acetate." (*Id.* at 24.)

DSM argues that Lallemand has failed to meet the "high standard" of establishing prosecution disclaimer. (Pls.' Opening Br. (dkt. #59) 24-25 (citing *MIT*, 839 F.3d at 1119).) As to the first two additions, in particular, DSM argues that the ability of the cells to use the acetate in the production of ethanol instead of glycerol is a "further advantage," not a disclaimer. (*Id.* at 25-26.) Further, DSM argues that "Lallemand's argument is scientifically flawed" because the proposed "functional acetate limitations are not even commensurate in scope with the functions of the nucleic acid sequences specifically recited in the disputed claim term." (Pls.' Reply (dkt. #97) 25-26.)[6] As to the remaining addition, DSM argues that the patentee actually noted that the patented cell did grow preferentially with acetate, but that that statement was not a limitation required by the claims but rather was prompted by a Lallemand corporate

[6] Specifically, DSM argues that a yeast cell with only (EC 6.2.1.1) and alcohol dehydrogenase activity (EC 1.1.1.1) (as specified in the term itself) cannot convert acetate to ethanol and that the claimed cell's ability to "consume acetate and create ethanol stems from the acetyl-Coenzyme A synthetase and alcohol dehydrogenase activities *in combination with* the claimed acetylating acetaldehyde dehydrogenase activity." (Pls.' Reply (dkt. #97) 25.)

representative's admission that the accused products consume acetate. (Pls.' Opening Br. (dkt. #59) 26-27.) DSM also argues that Lallemand's construction defines the claimed cells "in terms of how they might be used," even though the claims do not contain that requirement. (Pls.' Reply (dkt. #97) 26.)

A patent's prosecution history sheds light on how the inventor and the Patent and Trademark Office conceptualized the patent. *Phillips*, 415 F.3d at 1317. Prosecution disclaimer is a doctrine that prevents "patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution." *MIT*, 839 F.3d at 1119 (quoting *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003)). However, the doctrine only applies where the patentee's disavowal is "both clear and unmistakable." *Id.* (quoting *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1325 (Fed. Cir. 2013)). Anything short of "clear and unmistakable," which must be proved by the party attempting to invoke prosecution disclaimer, does not warrant application of the doctrine. *Id.* This is a "high standard." *See id.* at 1120.

Having reviewed the prosecution history, the court concludes that Lallemand has not met this "high standard." Even without the addition of Lallemand's proposed limitations, the patented invention would not clearly be obvious. Indeed, the patentee did not argue that these features were present in the invention in an attempt to distinguish it from the prior art. Rather, the patentee argued that one of ordinary skill in the art would not realize the benefits of production of acetate since Sonderegger and Valadi tried to *reduce* the production of acetate and viewed that as a negative. Thus, the invention actually teaches away from this prior art by making use of a formerly

disfavored enzyme.

Further, these additions are not scientifically necessary. Claim 1 provides for a yeast cell that has three modifications: (1) a genetic modification to reduce the production of GPD and/or GPP; (2) the addition of alcohol dehydrogenase (EC 1.1.1.1) and acetyl-Coenzyme A synthetase (EC 6.2.1.1); and (3) the addition of acetylating acetaldehyde dehydrogenase activity (EC 1.2.1.10). Without the second modification, the yeast cells would not be able to function adequately because the only modification would have been to delete GPD or GPP, meaning that the cells would not be able to use glycerol production to achieve redox balance, thereby stymying the production of ethanol. In the invention, acetate is catalyzed to become acetyl-CoA, which in turn permits the acetylating acetaldehyde dehydrogenase activity to produce ethanol, via alcohol dehydrogenase. Thus, term 4 provides the clarification of acetate as the basis for the redox reaction. Lallemand's additional limitations therefore are not necessary.

Thus, the court construes this term to mean "the cells comprise (i) one or more nucleic acid sequences encoding an acetyl-Coenzyme A synthetase activity (EC 6.2.1.1) and (ii) one or more nucleic acid sequences encoding an NAD+-dependent alcohol dehydrogenase activity (EC 1.1.1.1)."

Entered this 7th day of March, 2018.

BY THE COURT:

/s/

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WILLIAM M. CONLEY
District Judge