(3) Reference Lab

Although establishment of an EK/Cetus lab is still under study, there is a decided preference to contract or establish a JV with an existing lab. This would be quicker and less espensive up front. Candidates are: Pathology Institutes, Berkeley or Dianon, Connecticut. Other proposals are being considered. The areas of infectious diseases (HIV/HPV, cancer, genetics and forensics) may lead to more than one relationship with laboratories. Some options are expected to be selected before the next RDMC meeting (February 1 and 2, at Cetus).

(4) Renegotiation of the EK/Cetus Agreement

The major concern is less than adequate R&D support to fully exploit the opportunities provided by PCR technology. Cetus encouraged Kodak to increase PCR license or sell the technology in order to realize the commerical opportunities before competing technology is developed. PCR strategy statement will be prepared in draft form for discussion at the February RDMC and in final form two weeks later.

(5) Blood Bank

FDA approval of HTLV-I test is not expected before February 1988. Continued delays in revenue are disappointing and will lead to a review of options at the end of the first quarter 1988. Under any circumstances Kodak recommends not withdrawing from this market before SureCell products are available, in order to minimize adverse image in the marketplace. Bill Gerber, Paul Law and John Knowles will explore options to become OEM supplier to Olympus and/or Smith-Kline Beckman.

(6) Reporting Format

A format for financial and project milestone reporting has been established and agreed upon. The first "live" report will be issued in late January and will review 1987 financials and current time lines. Fred Marcellus (EK) will issue the report with input from Cetus.

Scientific reports at Kodak will be altered in order to better communicate with Cetus.

(7) Public Relations and Marketing Review Procedure

The attached procedure (Attachment IV) was accepted for Kodak releases relating to the venture. This should procide adequate means for comments, revisions and notification before release.

Marketing promotional material is not subject to this procedure but will be offered for review of technical content when appropriate.

(8) LRPD

A loss of $140K is forecast. This is less than the earlier estimate of $200-300K loss. All responsibilities will be in the hands of LRPD in 1988. Current transfer price for new kits has been increased to reflect Cetus' actual costs. The inventory of reagents will be bought by LRPD in January for approximately $70K.

(9) Licensing PCR

A list of requests is attached (Attachment V) along with the guidelines for granting licenses. Bill Gerber is managing this process.

PAL:llf

cc: RDMC Members

Attachment I

Target	Formula Decision	Internal Trials	Clinical Trials	FDA Subm.	Prodn.	FDA Approval	Sales
Strep A	2/88	5/88	5/88	6/88	8/88	9/88	9/88
Chlamydia	12/15/87	1/88	1/88	2/88	4/88	5/88	5/88 •
hCG				11/87	12/87	1/88	1/88 •
HSV (510K) (IND)	12/25/87	1/88	1/88	3/88	4/88	4/88 7/88-10/88	4-10/88 (FDA) •
GC (from Cetus 1/88)	3/88	1/88	3/88	4/88	6-7/88	7-8/88	7-8/88
HIV-Rapid	1/15	1/88	2/88	5/15	4/88	8/88-2/89	8/88-2/89 (FDA)
HIV-PCR	4/88						

• Possible FY88 Cetus Revenue. No Revenue forecasted from FDIC to Cetus

Attachment 1

Joint Development Program (K$)
(12/10/87)

	87 AOP	87 E Y/E		88 FCST.	
Oct. RDMC					
CETUS	7100	7600	(level of effort)	7950	(incl. forensics 530, HRI pmts 350)
Kodak	5100	6400	(Rapid Aids 600)	6500	
CPI - rapid test milestones		250		700	(delayed milestones)
CPI - COMBI & Western Blots		200		50	
Bagshaw Patent		50		450	
	12200	14500		15650	
Dec. 7 Agreement					
CETUS		7600	(level of effort)	7470	(HRI pmts to Special Items of Cost)
Kodak		5800	(Rapid Aids 600)	6250	
CPI - rapid test milestones		250		700	
CPI - COMBI & Western Blots		100		150	(slower spending rate)
Contract R&D		0		380	(HRI)
Bagshaw Patent		0		0	(to Special Items of Cost)
		13750		14950	

Attachment 11

ATTORNEY'S EYES ONLY
RESTRICTED

Critical Success

	1987 AOP	87 E-Y/E (12/5/87) Cetus/EK	Blood Bank	87 Total Est. Y/E	88 est (12/5/87) Cetus/EK	Blood Bank	1988 Total	89 est (12/5/87) Cetus/EK	Blood Bank	1989 Total
Cetus/EK Joint Dev. (K$)										
Cetus	7100	7600	0	7600	7600	0	7600	8250	0	8250
Kodak	5100	5700	100	5800	6500	0	6500	6750	0	6750
Payments to CPI	250	250	100	350	700	150	850	100	100	200
Total	12200	13550	200	13750	14800	150	14950	15100	100	15200
Cetus Share @ 35%	4270	4743	70	4813	5180	53	5233	5285	35	5320
Kodak Share @ 65%	7930	8808	130	8938	9620	98	9718	9815	65	9880

	1987 E-Y/E			1988 est			1989 est		
Cetus/EK Joint Profit (K$)									
Sales (Gross @ 30% Margin)	800	0	100	100	18900	5870	24770	32535	7560	40095
Cost of Goods	300	0	50	50	3692	2233	5925	5699	1625	7324
Manuf Dev & Pre-Production	0	800	0	800	745	0	745	500	0	500
HRI & Bagshaw Payments	0	50	0	50	800	0	800	0	0	0
SADA (50% of Sales)	400	0	50	50	9450	2935	12385	16268	3780	20048
Royalty (9% of Sales)	0	0	8	8	0	470	470	0	605	605
Gross Profit	100	-850	-8	-858	4213	232	4445	10069	1550	11619
Loss carry forward	0	0	0	0	1187	8	1195	0	0	0
EK ROI (20% of Capital exp.)	320	325	0	325	100	0	100	0	0	0
EK ROI (20% of net book value)	0	0	0	0	723	0	723	992	0	992
Cetus ROI (20% of $60M)	160	12	0	12	12	0	12	12	0	12
Net Profit/Partnership	-380	-1187	-8	-1195	2191	224	2415	9065	1550	10615
Cetus Share @ 35%	-133	-415	-3	-418	767	79	845	3173	543	3715
Kodak Share @ 65%	-247	-772	-5	-777	1424	146	1570	5892	1008	6900
(EK Capital - Net Book Value)	1600	0			3614			4960		
(EK Capital - Capital Expend.)		1627			500			0		

RMS 71130

001158
CETUS

Attachment IV

APPROVAL PROCESS FOR BOX PUBLIC ANNOUNCEMENTS

The approval process for public information relating to products, technology or plans of Biological Diagnostics will be a 3-part process as follows (normally will take two weeks from date of first draft):

(1) Preliminary Interactive Editing (Parallel Process)

- The draft announcement and/or text along with the intended media targets will be sent by Paul Law or Linda Ferry to the following people for comment; a target date of release will be priminently noted, normally two weeks after first draft.

Cetus	Katharine Russell	(via FAX)
	Bill Gerber	(via FAX)
CPI	Jeff Meshulam	(via FAX)
	Richard Montagna	(via FAX)
EK	John Zeman	(via PROFS)
	Paul Law	(via PROFS)
	Paul Schnipelsky	(via PROFS)
	David Frank	(via PROFS)
	Art Rosenstein	(via PROFS)
	Dan Shilt	(via PROFS)
	Dennis Delahunty	(via PROFS)
	John Knowles	(via PROFS)
	Gerry Battist	(via PROFS)

- A response via FAX, PROFS, or KMX will be expected to Paul Law (258-0351) or Linda Ferry (258-0282) within five working days of transmission. The due date for comments will be presented.

(2) Final Approval

- At least two full days prior to release, the announcement and/or text will be delivered by Jim Blamphin (or designate) to the following people:

Cetus	Bill Gerber
CPI	Jeff Meshulam
EK	Kay Whitmore
	Frank Strong
	John Zeman
	Paul Law

- Stopping the release will be an exception and done by notifying Paul Law (KMX 258-0351).

(3) Release

- Jim Blamphin will release announcements on the designated date.

001159
CETUS

12/15/87

EXHIBIT I

ATTORNEY'S EYES ONLY
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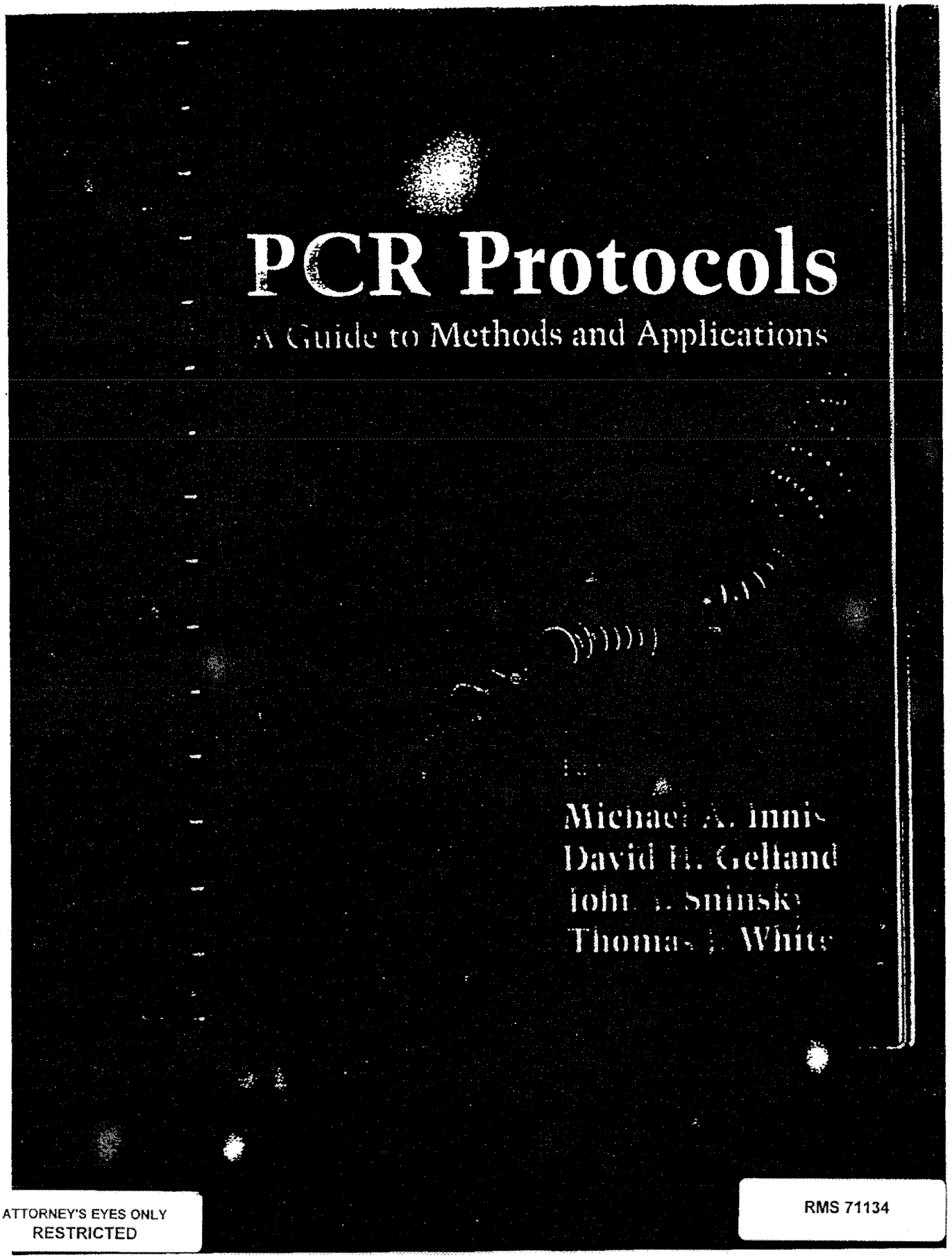
Exhibit I to the Sninsky Affidavit
is a publication entitled "PCR Protocols:
A Guide to Methods and Applications"
Edited by Sninsky, et al.

A copy of the exhibit is contained
within an envelope attached to the
original affidavit filed with the
Register in Chancery, a copy of the
Affidavit delivered to Vice Chancellor
Berger and one of the copies of the
Affidavit served upon Plaintiff's
counsel and upon Intervenor's counsel



PCR
PROTOCOLS

PCR
PROTOCOLS

A GUIDE TO METHODS AND APPLICATIONS

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CONTENTS

Part Two RESEARCH APPLICATIONS

Part Five
INSTRUMENTATION AND SUPPLIES

EXHIBIT J

PERKIN ELMER CETUS
761 Main Ave., Norwalk, CT 06859

GeneAmp® PCR Reagent Kit with

AmpliTaq® DNA Polymerase (250 Units)

(Deoxynucleoside triphosphate: DNA Deoxynucleotidyltransferase, EC 2.7.7.7)

NOT FOR DIAGNOSTIC OR MEDICAL USE
RESEARCH USE ONLY
See notice to purchaser

Part No. N801-0055

The Perkin-Elmer Cetus *GeneAmp* PCR Reagent Kit is designed to perform the *GeneAmp*™ Polymerase Chain Reaction (PCR) process on all DNA templates. It provides sufficient reagents for 100 amplifications of 100 µL each. It includes full length lambda DNA and control primers for 10 control amplifications.

The *GeneAmp* PCR process is a simple and powerful method,[1-4] invented by K. Mullis and patented by Cetus Corporation, which allows *in vitro* amplification of DNA segments (including cDNA)[5] through a succession of incubation steps at different temperatures.[1,2,3,4] Typically, the double stranded DNA is heat denatured, the two primers complementary to the 3' boundaries of the target segment are annealed at low temperature and then extended at an intermediate temperature. One set of these three consecutive steps is referred to as a cycle. The *GeneAmp* PCR process is based on the repetition of this cycle and can amplify DNA segments by at least 10^5 fold, and potentially as high as 10^9 fold,[1] under the conditions described below.

LIST OF KIT COMPONENTS

Store the *GeneAmp* PCR Reagent Kit and *AmpliTaq* DNA Polymerase at −20°C in a constant temperature freezer. If stored under proper conditions, the product will maintain performance through the control date printed on the label.

Reagent	*Volume*	*Concentration*	*Comments*
AmpliTaq DNA Polymerase	50 µL	5 U/µL	Extends primer during PCR amplification
dATP	320 µL	10 mM	Deoxynucleosidetriphosphates dissolved in water, pH 7.0.
dCTP	320 µL	10 mM	
dGTP	320 µL	10 mM	
dTTP	320 µL	10 mM	
[10X] Reaction Buffer (see composition)	1.4 mL		Provides preferred pH and ionic strength for amplification.
Control Template	100 µL	1 µg/mL	Whole bacteriophage lambda DNA as a template for PCR.
Control Primer #1	50 µL	20 µM	Primer pair defines a 500 base segment on the lambda target DNA: nucleotides 7131 through 7630 (see on page 4).
Control Primer #2	50 µL	20 µM	

NOTE: [10x] Reaction Buffer composition, (solution has been autoclaved)
100 mM Tris-HCl, pH 8.3 (at 25°C)
500 mM KCl
15 mM $MgCl_2$
0.01% (w/v) gelatin (Sigma, Cat. No. G2500, St. Louis, MO)

AmpliTaq DNA Polymerase

The key component in the *GeneAmp* PCR Reagent Kit is *AmpliTaq* DNA Polymerase (Part No. N801-0060). Perkin-Elmer Cetus' *AmpliTaq* DNA Polymerase is a recombinant, thermostable, 94kDa DNA polymerase encoded by a modified form of the *Thermus aquaticus* DNA polymerase gene which has been inserted into an *Escherichia coli* host.[4] *AmpliTaq* DNA Polymerase and native *Taq* DNA Polymerase are covered by U.S. Patent 4,889,818 issued to Cetus Corporation, and licensed to Perkin-Elmer Cetus Instruments. Additional patent applications on genes encoding thermostable DNA polymerases, and methods and formulations for stable preparations of thermostable DNA polymerase are pending. Its features are described on page 4.

NOTICE TO PURCHASER ABOUT LIMITED LICENSE

This product is designed for use in the *GeneAmp* Polymerase Chain Reaction (PCR) process covered by patents issued to Cetus Corporation. The seller has a limited license under such patent rights, and purchase of this product includes a fully paid-up, limited, non-exclusive sublicense under such patent rights to use this product to perform the *GeneAmp* PCR process only for research and development activities and for industrial quality assurance testing. For this purpose the license for "research and development" includes the development of commercial products, such as new therapeutic products. No license is granted for any other uses, for example (1) the diagnosis or detection of disease or other health-related condition in humans, animals or plants, or (2) genetic analysis for identification of individuals for forensic or other purposes. No other license is granted expressly, impliedly, or by estoppel. For information concerning the availability of additional licenses to practice the PCR process, contact Cetus Corporation, Director of Business Development, PCR Division, at 1400 Fifty-Third Street, Emeryville, CA 94608, Tel. (415) 420-3300.

PERKIN ELMER CETUS

PROTOCOL FOR DNA AMPLIFICATION

I. General Advice

Due to the enormous amplification possible with the *GeneAmp*™ PCR process, small levels of DNA contamination, especially from previous PCR reactions and Positive Control templates, can result in product formation even in the absence of purposefully added template DNA.[1] If possible, set up reaction mixes in areas separate from other DNA handling. The use of dedicated or disposable vessels, solutions, and pipettes (preferably positive displacement pipettes) for DNA preparation, reaction mixing, and sample analysis will minimize cross contamination.[1] Use of the *GeneAmp* PCR Carry-over Prevention Kit (**Part No. N808-0068**) will prevent reamplification of PCR products from previous amplifications.

Perform reactions with 100 µL of reaction mix in capped 0.5 mL, polypropylene microcentrifuge tubes. Perkin-Elmer Cetus 0.5 mL *GeneAmp* Reaction Tubes (**Part No. N801-0180**) provide the best heat transfer when using Perkin-Elmer Cetus DNA Thermal Cyclers, because of their uniform fit in the wells. Since DNA may stick to plastic and since nucleases are often found on surfaces, it may be preferable to use sterile, siliconized tubes and pipette tips.

A Master Mix of reagents for all samples (water, buffer, dNTP's and enzyme) can be prepared first, then aliquoted to the individual tubes. Then add the primers and template DNA. Using such mixes will minimize reagent losses on pipette tips and increase pipetting accuracy.

II. Dilution of Control Template

Prepare a 10-fold dilution of the Control Template in 10mM Tris-HCl pH 8.0 (room temperature), 1 mM EDTA, 10 mM NaCl. Additional dilutions may be used as controls for dilute DNA.

III. Reaction Mix

	Component	*Addition Order*	*Volume*	*Final Concentration*
Master Mix	Autoclaved ultra-filtered water	1	61.5 µL	
	[10x] Reaction Buffer	2	10 µL	1X
	dATP	3	2 µL	200 µM
	dCTP		2 µL	200 µM
	dGTP		2 µL	200 µM
	dTTP		2 µL	200 µM
	AmpliTaq® DNA Polymerase	4	0.5 µL	2.5 Units/100 µL
	Control Primer #1	5	5 µL	1.0 µM
	Control Primer #2		5 µL	1.0 µM
	Control Template, 1:10 dilution	6	10 µL	1 ng/100 µL
	Total Mix		100 µL	

IV. Notes on Reaction Mix for Controls

1. Mix gently (avoid generating bubbles) the *AmpliTaq* DNA Polymerase or other recently thawed reagents, then spin down in a microcentrifuge before pipetting. Pipette the enzyme carefully and slowly; the viscosity of the 50% glycerol in the buffer can lead to pipetting errors. If possible, use a positive displacement pipette. Using Master Mixes (see above) will increase accuracy and reduce enzyme loss on tips, and reduce tube-to-tube variability.
2. To reduce evaporation or refluxing, overlay the mix with 50 to 100 µL of mineral oil (Sigma Chemical Co., St. Louis, MO). The oil should not interfere when withdrawing samples. If the entire volume is to be recovered, 100 µL of high purity chloroform can be added after amplification. The aqueous phase containing the DNA will then float on the chloroform-oil mixture, allowing easy collection.

V. Reaction Mix for Amplifying DNA Templates

1. The conditions described above are also a useful starting place for amplification of different DNA targets using primers designed by the user. Optimization of reactions for each primer-template pair may be necessary and can be achieved by varying magnesium chloride concentration, primer concentration, dNTP concentration and anneal-extend (**Section VII**) temperature. The effect of these variations can be monitored by examining the intensity and distribution of product samples electrophoresed on 3% NuSieve®/1% Seakem® agarose (FMC Corp., Rockland, ME) gels and visualized with ethidium bromide staining.[1]
2. The DNA segment to be amplified from the template can be up to 10 kb long,[14] although 100 to 1000 bases are more typical and easier to amplify. Start with enough copies of the template to be sure of obtaining a signal after 25 or 30 cycles: preferably $> 10^4$ copies but less than 1 µg total sample DNA per 100 µL. Low concentrations of target DNA may require up to 35 or more cycles to produce sufficient product for analysis.
3. If proteases are present in the sample DNA (such as impure genomic DNA), inactivate the proteases by heating samples to 95°C for 5 minutes before adding the *AmpliTaq* DNA Polymerase. This step can be carried out automatically with Perkin-Elmer Cetus DNA Thermal Cyclers using a time delay file linked to the PCR cycle file.
4. The single-strand DNA primers should be 15 to 30 bases in length. The %G+C of primers should be near 50%, to maximize specificity. To avoid potential problems, primers should be purified by gel electrophoresis or HPLC ion-exchange chromatography. The optimal primer concentrations need to be determined empirically, by testing concentrations in the range of 0.1 to 1.0 µM. Primer concentrations that are too low will result in little or no PCR product, while concentrations that are too high may result in amplification of non-target sequences. Primer concentrations in the range of 0.2 to 0.5 µM will work for most PCR amplifications. Primer sequences should not complement within themselves or to each other, particularly at the 3' ends. The primers in the *GeneAmp*® PCR Reagent Kit have been designed with a GG/CC overlap at the 3' end, to show one consequence of

complementary sequences. Their use results in production of 46 to 50 base pair products called primer dimer. This product may occur to some extent even without such an overlap. Reducing the primer concentration (up to 5 fold, to 0.2 μM) will greatly reduce such products.

5. The optimal magnesium concentration needs to be determined empirically, by testing concentrations up to 4 mM $MgCl_2$ for each primer set. Too little or too much $MgCl_2$ could reduce amplification efficiency or result in non-specific products. If the samples contain EDTA or other chelators, raise the $MgCl_2$ concentration in the reaction mix proportionately. Magnesium Chloride concentrations should also be adjusted in parallel with significant changes in the concentrations (higher or lower) of sample DNA and dNTPs.

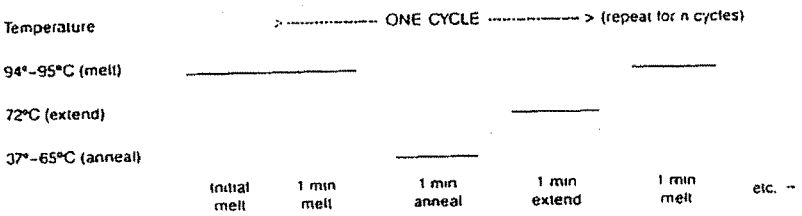
6. Keep concentrations of dNTPs in the reaction mix balanced; if the concentration of any one is significantly different from the rest, the *AmpliTaq*® DNA Polymerase will tend to misincorporate, slow down and terminate prematurely.[1]

7. Reactions can be performed in volumes from 20 to over 200 μL per tube. If different volumes of primer or template DNA are used in the Master Mix, adjust the volume of water in the Master Mix by an equivalent amount to keep the concentrations of other reactants constant.

VI. Temperature Cycling for the Control Reagents

The *GeneAmp*® PCR Reagent Kit is optimized and quality control tested for performance on Perkin-Elmer Cetus *GeneAmp*™ PCR Instrument Systems. Optimal performance of the *GeneAmp* PCR process is influenced by choice of temperature, time at temperature, and length of time between temperatures for each step in the cycle.

Begin with a template melting step (at least 1 minute at 94° to 95°C), then start cycling. A typical starting cycle profile for the DNA Thermal Cycler and DNA Thermal Cycler 480 will be:



After the last cycle, extend the polymerization step by several more minutes, to complete all strands. The samples can be stored at −20° until subsequent analysis.

If using the *GeneAmp* PCR System 9600, please refer to Perkin-Elmer Cetus Technical Data Sheet L-1405 entitled "The *GeneAmp* PCR System 9600: Transportability of Protocols" for guidelines concerning how to adjust protocols for optimal PCR performance.

VII. Cycle Optimization for Amplification of other DNA Templates

Optimal performance of the *GeneAmp*™ PCR process is influenced by choice of temperature, time at temperature, and length of time between temperatures for each step in the cycle. These parameters may be efficiently optimized using Perkin-Elmer Cetus *GeneAmp* PCR Instrument Systems, which come with operating instructions.

The following paragraphs discuss the effect of changing various conditions.

High G+C content DNA needs very high annealing (>60°C) and melting temperatures or the use of 7-deaza-2'-deoxy-GTP mixed with dGTP, to overcome secondary structure.[1,6] The half life of *AmpliTaq* DNA Polymerase (<35 minutes at >95°C)[1,7] suggests 95°C as the maximum practical melting temperature. It is very important in the early cycles to be sure to completely melt the template DNA. When genomic DNA is used as the starting template, melting at 97°C for the first few cycles will ensure single stranded template for the PCR reaction. The melting temperature should be reduced for the later cycles because the smaller PCR product usually melts completely at a lower temperature (unless the PCR product is excessively G+C rich) than the starting genomic DNA.

Higher annealing temperatures (45° to 65°C) generally result in much more specific product.[1,4] The optimal anneal temperature can be determined empirically by testing at 5°C or smaller increments until the maximum in specificity is reached. At these temperatures *AmpliTaq* DNA Polymerase has significant activity and extension of primed templates is occurring. For some primer-template pairs extension is completed during the 1 min annealing step and a separate extension step is unnecessary. Two temperature PCR cycles consist of 1 min at 94° to 95°C followed by 1 min at 45° to 65°C; no hold time at 72°C is necessary.

The length of the target sequence will affect the required extension time. Typically, *AmpliTaq* DNA Polymerase has an extension rate of 2,000 to 4,000 bases per minute at 70° to 80°C. Polymerization rates are significant even below 55°C and with some templates, up to 85°C.[1,8] As the amount of DNA increases in later cycles, the number of *AmpliTaq* DNA Polymerase molecules may become limiting for the extension time allotted. Increasing the extend times in later cycles may be needed to maintain efficiency of amplification. This can be achieved by using the auto-segment extension feature of Perkin-Elmer Cetus DNA Thermal Cyclers.

PERKIN ELMER CETUS

PERFORMANCE CLAIM

Under the conditions described above, with 2 minutes for the 72°C extension step, the *GeneAmp*® PCR Reagent Kit will yield a 10^5 fold amplification efficiency, in 25 cycles, starting with 1 ng of control template, and using 100 pmoles of each control primer and 2.5 units of *AmpliTaq*® DNA polymerase.

AmpliTaq® ENZYME CHARACTERISTICS

Concentration: 5 Units/μL

Unit Definition: One unit of enzyme is defined as the amount that will incorporate 10 nmoles of dNTPs into acid insoluble material per 30 minutes at 74°C under the analysis conditions below.

Analysis conditions:[4] 25 mM TAPS (*tris*-(hydroxymethyl)-methyl-amino-propanesulfonic acid, sodium salt) pH 9.3 (at 25°C), 50 mM KCl, 2 mM $MgCl_2$; 1 mM β-mercaptoethanol; 200 μM each dATP, dGTP, dTTP; 100 μM [α-^{32}P]-dCTP (0.05 to 0.1 Ci/mmole); activated salmon sperm DNA, in a final volume of 50 μL and incubated at 74°C for 10 minutes. The salmon sperm DNA is activated by a modification of the methods in reference 11.

Storage buffer:
50% glycerol (v/v)
100 mM KCl
20 mM Tris-HCl pH 8.0
0.1 mM EDTA (ethylenediaminetetraacetic acid)
1 mM DTT (Dithiothreitol)
0.5% Tween 20®
0.5% Nonidet P40®

Storage temperature: Store *AmpliTaq* DNA Polymerase at −20°C, in a constant temperature freezer. If stored under proper conditions, the enzyme will remain active through the control date printed on the label.

Associated activities: Non-specific endonuclease and exonuclease activities were not detectable after one hour incubation of 600 ng of supercoiled pBR322 (dam⁻, dcm⁻) or 600 ng of *Msp*I-digested pBR322 DNA, respectively, at 74°C, in the presence of 8 units of *AmpliTaq* DNA Polymerase. The enzyme has a 5′ to 3′ nick translation or a polymerization enhanced 5′ to 3′ nuclease activity[5] but lacks a 3′ to 5′ exonuclease activity.[6,7]

SEQUENCES

Sequence[11] (+ strand) of 500 nucleotide target segment of bacteriophage lambda target segment amplified using primers in the *GeneAmp* PCR Reagent Kit.

Nucleotide					
	(5′)	<——Region for Control Primer 1——>			
7131			GATGAGTTCG	TGTCCGTACA	ACTGGCGTAA TCATGGCCCT
7171	TCGGGGCCAT	TGTTTCTCTG	TGGAGGAGTC	CATGACGAAA	GATGAACTGA TTGCCCGTCT
7231	CCGCTCGCTG	GGTGAACAAC	TGAACCGTGA	TGTCAGCCTG	ACGGGGACGA AAGAAGAACT
7291	GGCGCTCCGT	GTGGCAGAGC	TGAAAGAGGA	GCTTGATGAC	ACGGATGAAA CTGCCGGTCA
7351	GGACACCCCT	CTCAGCCGGG	AAAATGTGCT	GACCGGACAT	GAAAATGAGG TGGGATCAGC
7411	GCAGCCGGAT	ACCGTGATTC	TGGATACGTC	TGAACTGGTC	ACGGTCGTGG CACTGGTGAA
7471	GCTGCATACT	GATGCACTTC	ACGCCACGCG	GGATGAACCT	GTGGCATTTG TGCTGCCGGG
7531	AACGGCGTTT	CGTGTCTCTG	CCGGTGTGGC	AGCCGAAATG	ACAGAGCGCG GCCTGGCCAG
7591	AATGCAATAA	CGGGAGGCGC	TGTGGCTGAT	TTCGATAACC	(nucleotide 7630)
	<——Region for Control Primer 2——> (3′)				

ACTUAL PRIMER SEQUENCES

Primer	Nucleotides	Sequence	Strand
Control Primer 1	7131 - 7155	(5′)GATGAGTTCGTGTCCGTACAACTGG(3′)	(Complement of - Sequence)
Control Primer 2	7606 - 7630	(5′)GGTTATCGAAATCAGCCACAGCGCC(3′)	(Complement of + Sequence)

Note: 1) The 3′ ends have a GG/CC overlap enhancing production of 46 to 50 bp products: Primer Dimer.
2) Lambda genome is ~48.5 Kb. Target Segment (including primers) is 500 bp (~1% of total)