



Center for Engineering Plants for Resistance Against Pathogens
A NATIONAL SCIENCE FOUNDATION SCIENCE AND TECHNOLOGY CENTER

Virtual DNA Fingerprinting Laboratory

HELP & INFORMATION FILES

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This product represents the efforts of many people dedicated to enhancing the science education and knowledge of our nation's students. This program has been completely funded by the National Science Foundation (Grant BIR-8920216) and the University of California, Davis and has not been supported, underwritten or influenced by any commercial organization or company in any way.

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Installation Notes

1. The DNA Fingerprinting Laboratory is set to display in 640 x 480 resolution. If your monitor is set to a higher resolution, you might want to reset your monitor to display 640 x 480. The program will still run in higher resolution but will not fill the entire computer screen. Instead, the rest of your screen will be blacked out.
2. The program will run best if your computer is set to display at least 16-bit color.
3. Prior to installing program, please quit all other programs.
4. To Install on hard drive
Insert CD-ROM into drive and double click on My Computer
Double click on CD ROM drive icon
Double click on **DNA Fingerprinting** folder
Double click on **Install** folder
Double click on **Video** or **No Video** folder *The video version is a larger install (90 MB) and may not run smoothly on older computers*
Double click on **setup.exe**
To play, click on **Start>Programs>DNA Fingerprinting Lab> DNA**
5. To Play from CD ROM (no video):
Insert CD ROM into drive and double click on My Computer
Double click on CD ROM drive icon
Double click on **DNA Fingerprinting** folder
Double click on **run from CD ROM** folder
Double click on **dna.exe**
6. If you need to exit the program and the quit button is not working, press (**Ctrl**) + (**Q**).

Computer Requirements (Windows)

Minimum Requirements (PC)

486 processor
Windows 95
16 MB RAM
256 color graphics display
sound card
30 MB of free hard drive space (if running off of CD-ROM and not installing to hard drive)
CD-ROM drive

Recommended (PC)

Pentium II or higher processor
Windows '95, '98, or NT
24 MB RAM
16-bit color graphics display
sound card
150 MB of free hard drive space
CD-ROM drive

Game Instructions

Welcome to the virtual DNA fingerprinting laboratory! Your job is to analyze DNA from evidence recovered at a crime scene. In each of the seven episodes in this game, you will perform one step in the process of DNA fingerprinting. By the end you will be able to analyze your results and deduce the guilty suspect.

Different rooms in the lab become available during different episodes. Click on one of the wall maps to determine which areas are accessible during a given episode. As you move your mouse over the room on the map, text will appear telling you what items are available in that particular area.



Look around the lab carefully. When the **arrow** cursor turns into a **hand**, be sure to try and click on the item to either add it to your inventory or use the item in some way.



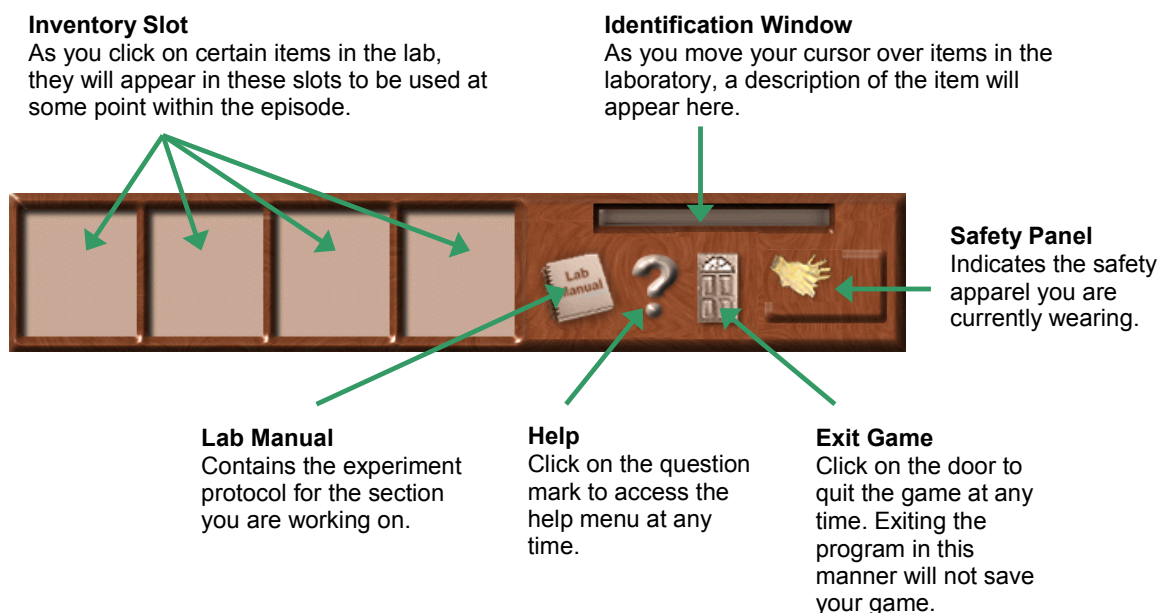
A **look** cursor allows you to look at an item but not pick it up.



You may move inventory items at certain points in the game when the **move** cursor appears. When this is displayed over an inventory item, click and drag that item across the screen to be used with another item in the virtual lab.



The menu bar illustrated below appears on every screen of the virtual lab. Review the description of each section.



If you don't know what to do next, try the following:

1. Review the lab manual, maybe you missed a step.
2. Click on the computer on your virtual desk. The computer contains pertinent articles and information required for completing the laboratory successfully. The computer also has quizzes that will boost your score.
3. Check out the suspect files located in your desk drawer. Each episode, more information is available about each of the suspects.
4. As a last resort, call for help on your desk phone. Clicking on the hint button will reveal a hint about the particular section you are working on.

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Teacher Notes

How to choose a specific ending:

If you wish to set the program to run a specific ending, run the program **choose end.exe**. The ending you select will stay in effect until you run the program again. This program creates a file called **ending.txt** on your hard drive. If the file is removed, you will need to run the choose end.exe program again to reset the ending.

If you do not run the **choose end** program, the game is set to automatically have a random ending each time it is played.

Scoring:

If your students have a question about scoring, the scoring table is included in this help file. This table explains all the events that trigger a point addition or subtraction.

When your students save their games, a file is created in the DNA Fingerprinting folder entitled "name".txt. Do not delete these files until your students have completed their work with the program. If these files are deleted, you will not be able to receive a cumulative score.

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Scoring

At the conclusion of each segment you will receive your score for the segment as well as your total score for the game. You will also have the option of saving your game and returning at a later time. You may not save your game in the middle of an episode. You must sign in each episode with the same name and save your game after each episode if you wish to receive a cumulative score.

There are several ways to gather points in the game. First, follow the lab protocols as outlined in your manual. Next, read articles and take quizzes on your desk computer. Finally, determine the correct suspect. Remember that points will be deducted for incorrect procedures.

PART 1

Plus		Minus	
points	function	points	function
15	gloves on	5	choose clothes in evidence box
10	choose hair	5	choose glass
10	choose blood		
10	choose skin cells		
10	open lab manual		
10	read suspect info		
10	lab coat on		
10	safety glasses on		
15	read computer articles		
100		10	

PART 2

Plus		Minus	
points	function	points	function
10	look at lab manual		
10	wearing gloves		
10	wearing coat		
10	wearing safety glasses		
15	read computer articles		
10	read suspect info		
5	blood to centrifuge		
10	waste to biohazard container	10	waste to sink
5	lysis buffer to tube	5	p. digest to tube before lysis buffer
5	protein digest to tube		
5	salt to tube		
5	ethanol to tube	5	ethanol to tube before salt
100		20	

PART 3

Plus		Minus	
points	function	points	function
10	look at lab manual		
10	wearing gloves		
10	wearing coat		
10	safety glasses		
15	read enzyme computer article		
10	read suspect info		
5	get ice bucket		
5	add ice to bucket	5	get ice with no bucket
5	get enzymes with ice in bucket	5	get enzymes with no ice
5	get buffer		
5	dial in correct buffer amount	5	dial in wrong buffer amount
5	dial in correct DNA amount	5	dial in wrong DNA amount
5	dial in correct enzyme amount	5	dial in wrong enzyme amount
5	move pipet to tips (buffer screen)	5	no new tip - buffer screen
5	move pipet to tips (DNA screen)	5	no new tip - DNA screen
5	move pipet to tips (enzyme screen)	5	no new tip - enzyme screen
10	move pipet to buffer tube		
10	move pipet to DNA tube		
10	move pipet to enzyme tube		
5	tube in water bath		
30	computer quiz		
		5	don't close freezer door
180	(should not exceed)	45	(may be higher if actions are repeated)

PART 4

points	function	points	function
10	look at lab manual		
10	wearing gloves		
10	wearing coat		
10	safety glasses		
10	read suspect info		
15	read article <i>gel electrophoresis</i>		
5	correct edta amount	5	incorrect EDTA amount
5	correct tris amount	5	incorrect Tris amount
5	correct acid amount	5	incorrect Boric Acid amount
5	correct water amount	5	incorrect water amount
		5	incorrect chemical (Calcium chloride)
		5	incorrect chemical (nutrient agar)
		5	incorrect chemical (sulfuric acid)
5	tray to gel box		
5	buffer to gel box		
5	micropipet to tips before dye	5	no tip before dye
10	micropipet to loading dye (correct amt)	5	incorrect amount of dye
5	micropipet to tips before dna	5	no tip before dna
10	micropipet to DNA (correct amt)	5	incorrect DNA amount
10	micropipet to negative side of gel	5	micropipet to positive side of gel
10	power on (box hooked up correctly)	5	power on before box hooked up
5	correct voltage	5	incorrect voltage
20	dilutions quiz		
		5	don't close freezer door

170

75

(may be higher if actions are repeated)

PART 5

points	function	points	function
10	look at lab manual		
10	wearing gloves		
10	wearing coat		
10	safety glasses		
10	read suspect info		
15	read computer article		
10	do probe examples		
5	gel to tray		
5	buffer to tray	5	buffer to tray before gel
5	membrane to tray		
5	towels to tray	5	paper towels to tray before membrane
5	membrane to oven		
5	probe to tray	5	probe to tray before oven done
5	membrane to cartridge		
5	film to cartridge	5	film to cartridge before membrane
		5	exposing film to light

115

25

(may be higher if actions are repeated)

PART 6

Plus		Minus	
points	function	points	function
10	look at lab manual		
10	wearing gloves		
10	wearing coat		
10	safety glasses		
10	read suspect info		
15	read computer article		
5	PCR buffer to DNA	5	wrong chemical to DNA
5	DNA to thermocycler		
5	Taq to tube	5	wrong enzyme to tube
5	first temp correct	5	first temp incorrect
5	second temp correct	5	second temp incorrect
5	third temp correct	5	third temp incorrect
5	number cycles correct	5	number cycles incorrect
100		30	<i>(may be higher if actions are repeated)</i>

PART 7

Plus		Minus	
points	function	points	function
15	read computer article		
10	computer gel quiz		
10	read lab manual		
5	get files from cabinet		
10	correct hair match	5	incorrect hair match
10	correct blood match	5	incorrect blood match
10	correct skin match	5	incorrect skin match
30	correct suspect id	20	incorrect suspect id
100		35	

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About Virtual DNA Laboratory & CEPRAP

The Virtual DNA Fingerprinting Laboratory was designed and written by Barbara Soots of the Center for Engineering Plants for Resistance Against Pathogens. Nena Bloom provided Additional programming assistance.

This program is made possible by support from the National Science Foundation and the University of California, Davis.

The software is intended to provide a general introduction to the topic of DNA fingerprinting. Please note that some of the protocols have been simplified to lend themselves to this format.

This is a work of fiction. Resemblance to any persons living or dead is purely coincidental. Any opinions, findings, conclusions, or recommendations are those of the authors and do not necessarily reflect the views of the NSF. The program is supported by the NSF under grant BIR 8920216.

The Center for Engineering Plants for Resistance Against Pathogens is a National Science Foundation Science and Technology Center located at the University of California, Davis. Research focuses on plant-pathogen interactions, with the goal of using this understanding to engineer disease resistance in plants.

If you have questions or comments regarding the ***Virtual DNA Fingerprinting Lab*** software or CEPRAP's other educational programs, please contact:

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Game Credits and Copyright Information

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Sound Effects and Programming Assistance

Nena Bloom

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Dr. Paul Feldstein

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Video Filming and Editing:

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Playtesting:

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Diyvesh Patel

Linda Curro

Egbert Schwartz

Rob Hayworth

Pat Seawell

CEPRAP faculty and staff photos appearing in software:

Joshua Anderson (Ted Smithson)	Rob Hayworth
Jaskaran Birak (Jane Elliott)	Vicki Klaassen
Nena Bloom	Jim Lincoln
Rick Bostock	Ali McClean
George Bruening	Barbara Soots
Linda Curro	Sandy Vice (Scarlet Jeanus)
Paul Feldstein	Valerie Williamson
John Gardner	Jafar Yaghoobi
David Gilchrist (Clyde Beecham)	

CEPRAP faculty and staff video segments:

Adriana Bernal	<i>Restriction Enzymes</i>
George Bruening	<i>DNA Extraction</i>
Kevin Fort	<i>Gel Electrophoresis</i>
Rob Hayworth	<i>Polymerase Chain Reaction</i>
Barbara Soots	<i>Introduction/Conclusion</i>
Jafar Yaghoobi	<i>Southern Blotting</i>

Copyright Information (articles):

DNA Evidence Comes Into Its Own. Eric A. Fischer, National Academies of Science

Evidence Extraction. www.fbi.gov

Ancient History. Ann Gibbons/©_998. Reprinted with permission of Discover Magazine

Special Report: Gel Electrophoresis Creates a Revolution. Holly Ahern and Ricky Lewis. Volume 4, #15 The Scientist. 1990.

The Basics of DNA Fingerprinting. Kim-An Lieberman and Kate Brinton.
(<http://www.biology.washington.edu/fingerprint/dnaintro.htm>).

What is PCR? The National Human Genome Research Institute, Division of Intramural Research.

Amplification of the DS180 Locus. Adapted from Campbell, A. M., Williamson, J.H., Padula, D. and Sundby, S. (1997) Use PCR & a Single Hair to Produce a ‘_DNA Fingerprint_’ The American Biology Teacher, 59(3) 172-178.

Who is the Biological Father? Determining Paternity through DNA Testing. Robin JR Blatt, The Gene Letter

Understanding Gene Testing- How do scientists develop predictive gene tests? U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute.

Copyright Information (graphics & sound):

Phase image of lambda genomic DNA & Attack of the Red Blood Cells. Images courtesy of Digital Instruments, Santa Barbara, CA

Insect in amber graphic. Doug Lundberg, lundberg@d20.co.edu, America West.

Basic CPK DNA model & Ball and Stick model. Paul Thiessen. (<http://www.chemicalgraphics.com>)

Microscope slide photos- blood, skin, & bone. Calkins Science Center. Grand Rapids Community College.

Painted chromosomes. Image courtesy of the University of Chicago, Dept. of Human Genetics (Christa M. Lese and David H. Ledbetter) and Vysis, Inc. (Downer's Grove, IL).

DNA from Cell. Image courtesy of the National Human Genome Research Institute/National Institutes of Health.

Watson & Crick photo and Rosalind Franklin photo. Cold Spring Harbor Lab Archives.

Central Dogma of Molecular Biology, The Genetic Code, & DNA Structure. Access Excellence at the National Health Museum. (<http://www.accessexcellence.com>).

Chromosome 1. Image courtesy of FoodPhotography.com.

Miscellaneous 3-D models. 3DCafe and Platinum Pictures Multimedia, Inc.

selected tracks from *Suspense & Mystery CD*. Award Winning Music. QCCS Productions, Shaun Harris - Executive Producer.

selected tracks from *Suspense & Tension CD*. Music 2 Hues Publishing 1999.

Tools Used To Create DNA Fingerprinting Lab:

Intel Pentium III processor running Windows NT 4.0

Macromedia Authorware 4

Macromedia Director 5

Adobe Photoshop 5.0

Adobe Premiere

Adobe After Effects

Caligari TrueSpace 4.0

