

eDNA: networking software tailored for identity testing laboratories

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Abstract

Software (known as eDNA 2.0) has been developed for information management for identity testing labs. The software operates in a browser-based, multiuser environment compatible with intranet or internet accessibility. eDNA 2.0 manages accessioning through reporting in a user-friendly, intuitive manner. Parentage testing and forensic applications are incorporated into eDNA, and a kinship module is under development. Highlights of eDNA 2.0 include (1) accessioning templates that record information in a flexible, annotated way that can be easily tracked, (2) phenotype entry for any number of user-defined STR test batteries, (3) questioned relationships defined using dropdown menus, (4) entry of screening results for body fluids, (5) user-defined methods for dealing with mixed DNA profiles, and (6) capability to examine exclusions for possible sample errors. © 2003 Elsevier B.V. All rights reserved.

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1. Introduction

Often, identity testing laboratories rely on multiple software applications to manage the information associated with casework processing. This is especially true in small laboratories where one software application may manage accessioning information while another performs statistical calculations and still a third is used to prepare final reports. Operating a lab in such an environment is less than optimally efficient and is especially prone to the introduction of transcription errors.

Several software packages have been created for calculations and reporting of DNA typing results. Often, however, such products do not manage information generated by an identity testing lab in a comprehensive way. A software product known as eDNA is described here that provides virtually complete information management for the laboratory

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providing parentage testing and/or forensic DNA typing. eDNA software is based upon Microsoft “.net” technology compatible with networking and simultaneous multitasking. Maneuvering in eDNA is accomplished through hyperlinks embedded in program.

Analysis Results Edit

Case Number	1234 Test			
Case Role	AF			
Sample Name	Alleged Father			
Sample Type	Buccal Swab			
Received Date	7/17/2003			
Markings				
Panel	Profiler Plus			

Analysis By: on Today Theta

System	Allele 1	Allele 2	Ignore	Frequency
D3S1358	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
vWA	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
FGA	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
D8S1179	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
D21S11	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
D18S51	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
D5S818	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
D13S317	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
D7S820	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="checkbox"/>	0
Profile Frequency				0
Likelihood - One in				0

Sample View

Actions Add a new Sample Edit Sample Edit Results Delete this Sample Views Agency View Case View Contact View Sample View Set Sample Sample Match Gen SS Cert Change Selection Agency Select Case Select Contact Select Sample Select Return To Main Menu Previous Page	Sample Info Case Number 1234 Test Name/Address Alleged Father Address anywhere Any City, Any State 00000 Phone Race Caucasian Role Alleged Father Sex Male Received On 7/17/2003 Received By Robert W. Allen, Ph.D. Received Via Courier Collected By American Embassy, Ehtiopia Self Collected No Sample Type Buccal Swab Markings Password Cert Copy No Panel Profiler Plus Notes Last Updated Robert W. Allen, Ph.D. 7/17/2003 2:36:00 PM		Analysis Results Analyzed By Robert W. Allen, Ph.D. 7/17/2003 <table border="1"> <thead> <tr> <th>System</th> <th>Allele 1</th> <th>Allele 2</th> <th>Ignore</th> </tr> </thead> <tbody> <tr><td>D3S1358</td><td>15</td><td>17</td><td>No</td></tr> <tr><td>vWA</td><td>18</td><td>0</td><td>No</td></tr> <tr><td>FGA</td><td>21</td><td>23</td><td>No</td></tr> <tr><td>D8S1179</td><td>11</td><td>12</td><td>No</td></tr> <tr><td>D21S11</td><td>27</td><td>28</td><td>No</td></tr> <tr><td>D18S51</td><td>11</td><td>14</td><td>No</td></tr> <tr><td>D5S818</td><td>11</td><td>12</td><td>No</td></tr> <tr><td>D13S317</td><td>8</td><td>11</td><td>No</td></tr> <tr><td>D7S820</td><td>7</td><td>11</td><td>No</td></tr> <tr><td colspan="4">Likelihood 0.00000E+00</td></tr> </tbody> </table>				System	Allele 1	Allele 2	Ignore	D3S1358	15	17	No	vWA	18	0	No	FGA	21	23	No	D8S1179	11	12	No	D21S11	27	28	No	D18S51	11	14	No	D5S818	11	12	No	D13S317	8	11	No	D7S820	7	11	No	Likelihood 0.00000E+00			
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Likelihood 0.00000E+00																																																		

Fig. 1. DNA profile screens for an alleged father before and after completion.

Cases are accessioned using templates for identities and relationships of specimens. If a lab performs work for a client repeatedly, a database of clients is listed in a dropdown list to easily designate names and addresses to receive a report. A database of sample types can also be created in eDNA to track the numbers of samples received. Once a case has been accessioned and DNA typing results produced, DNA profiles are entered for each sample using the templates shown in Fig. 1.

In addition to DNA profiles, results from pre-screening of evidentiary samples for blood, semen, saliva, and urine can be entered into eDNA. Up to six alleles can be entered for each STR system to accommodate mixtures.

Once DNA profile results have been entered for a case, the comparisons to be made are defined by the user from dropdown lists. Each comparison comprises a “test result” for the samples that are to be compared. After a comparison has been defined, a “Calculate” link executes the analysis. In parentage cases involving an excluded alleged parent, eDNA has a feature allowing the child and/or known parent to be matched with other samples received during a user-defined time. An example of results in a parentage test appear in the “Summary Matrix” area in the Test Information screen Fig. 2.

The Test Information screen can be printed and serves as a useful document for Supervisory or Director review. An isolated inconsistency is treated as a mutation by eDNA which calculates a PI value based upon user-defined mutation rates (Fig. 2).

Once a case has been analyzed, it moves to the “Work Queue” for review. Supervisors, directors, or other individuals who review casework data can be designated to have a Work Queue. Ultimately, the file will enter the Work Queue of the Director. After Director review, the case moves to the “Print Queue” for final report printing.

Test View

Actions

[Add a new Test](#)

[Edit this Test](#)

[Delete this Test](#)

Calculate

Views

[Agency View](#)

[Case View](#)

[Contact View](#)

[Sample View](#)

[Test View - All](#)

Change Selection

[Agency Select](#)

[Case Select](#)

[Contact Select](#)

[Sample Select](#)

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Test Information

Case Number	1234 Test
Test ID	143
Test Type	Paternity
Status	Awaiting Review
Calculated	7/17/2003 2:43:00 PM
Test Result	Passed with a probability of 99.5542%
Cert Printed	** Not printed **
Test Locked	No

Sample Name	Sample Role	Received	Analysis
Alleged Father	Alleged Father	7/17/2003	7/17/2003
Child Sample	Child	7/17/2003	7/17/2003
Mothers Sample	Mother	7/17/2003	7/17/2003

Summary Matrix

System	Mother	Child	Alleged Father	PI	Mutation Code	Pattern	Rule
D3S1358	18	15 16	15 17	2.0300		P/PQ/OR	1/2Q where Q equals .2463
WVA	17 18	16 18	18	0.0027	None	PQ/OR/Q	Pattern Failure
FGA	26 28 21 26	21 23	2.8818			PQ/OR/RS	1/2R where R equals .1735
D8S1179	10 13 10 12	11 12	3.4388			PQ/PR/RS	1/2R where R equals .1454
D21S11	32.2 33.2 27 32.2	27 28	10.6932			PQ/PR/RS	1/2R where R equals .0459
D18S51	11 13 11 14	11 14	2.8818			PQ/PR/PR	1/2R where R equals .1735
D5S818	11 13 11 13	11 12	0.8965			PQ/PQ/PR	1/[2(P + Q)] where P equals .4103 and Q equals .1452
D13S317	10 12 8 10 8	11 8	5.0251			PQ/PR/RS	1/2R where R equals .0995
D7S820	8 13 7 13	7 11	29.0698			PQ/OR/RS	1/2R where R equals .0172

CPI Pop = 223
Probability = 99.5542%

Fig. 2. Test information screen.