Louis A. Vargas
Director, Quality Assurance
421 East 26th Street, 13th Floor, New York, NY 10016
Telephone: 212-323-1905 Fax: 646-500-6707
Email: lvargas@ocme.nyc.gov
Official Website: www.nyc.gov/ocme

ROOT CAUSE ANALYSIS REPORT
RCA# 2016-01
OCTOBER 26, 2016

Executive Summary

On July 14, 2016, the Office of the Chief Medical Examiner (OCME) Quality Assurance Director was informed of an error which resulted in an incorrect Specimen ID number entered into the DNA HITS application, software that matches DNA profiles and notifies agencies of positive matches. The erroneous information led to the arrest of the individual associated with the incorrect Specimen ID. After careful review, the QA Director determined that this was a "significant event" within the meaning of Title 17, Chapter 2, Section 17-207 of the Administrative Code of the City of New York. On September 7, 2016, OCME assembled a Root Cause Analysis (RCA) Committee to identify the causal factors and corrective actions to be taken for this event, which was identified as RCA# 2016-01.

The RCA Committee met and reviewed Forensic Biology's forensic match reporting process and identified several issues. The root cause for this event was identified as the pre-population of fields in the DNA HITS application. As discussed below, the RCA Committee recommends that the DNA HITS application be modified so that the application no longer pre-populates fields when reporting a match. The Committee also recommends that the Specimen ID field be entered twice by the analyst before the DNA HIT is submitted. Other contributing factors and corrective actions were also reviewed regarding staff training and review of work.

Background

Forensic Biology is a laboratory operating within the Office of Chief Medical Examiner. Its mission includes performing DNA testing on physical evidence from criminal cases within the City of New York. Staffed by more than 160 criminalists, supervisors and managers, Forensic Biology performs serology and DNA testing on nearly every category of crime including homicide, sexual assault, felony assault, robbery, burglary, hate crimes and weapons possession.

After a DNA profile is obtained and found to be suitable for entry, Forensic Biology uploads it to the Combined DNA Index System (CODIS). CODIS is a software database maintained by the FBI to aid in criminal investigations. The CODIS hierarchy includes DNA databases at the local, state and national levels. If a match between a forensic sample and an offender sample is identified at any level, CODIS sends both forensic laboratories a Candidate Match Detail Report. The laboratories verify the match and then exchange case information. If a match is confirmed, Forensic Biology reports the match to the New York City Police Department (NYPD) and District Attorney (DA) offices through a web-based application called DNA HITS. A Forensic Biology analyst enters the sample and incident information into DNA HITS which is then verified by a reviewer. Once approved by the reviewer, the information is submitted and DNA

HITS sends an immediate notification email to DA offices and makes an automatic entry into the NYPD Electronic Case Management System. See Appendix A for a diagram of the workflow.

Event Description

On September 8, 2014, Forensic Biology received a navy blue baseball cap (CAP1) and a black baseball cap (CAP2) for testing. DNA profiles were obtained from both caps and were uploaded to the state and national levels of the Combined DNA Index System (CODIS) in March 2015.

On March 30, 2015, Forensic Biology received Candidate Match Detail Reports for both caps. Match reports are electronic reports generated by CODIS when a potential candidate match is made by the CODIS software. The laboratory confirmed the matches and entered them into DNA HITS in early April 2015.

On March 28, 2016, Forensic Biology received a match report between CAP2 and a North Carolina forensic laboratory sample. After confirming the match, Forensic Biology requested information from the North Carolina laboratory.

On April 7, 2016, Forensic Biology received the Match Data response from the North Carolina laboratory. The North Carolina case was an unsolved rape case from 2007.

On April 8, 2016, Forensic Biology incorrectly entered the match of the North Carolina sample to **CAP1** instead of **CAP2** in DNA HITS. The North Carolina investigators relied on the incorrect DNA HITS information (the North Carolina laboratory did not report out the suspect name) and issued a warrant. The individual associated with CAP1 was arrested in New York City on July 8, 2016.

The Department of Forensic Biology was informed of the error by the NYPD on July 12, 2016. The contact at the NYPD Liaison Unit stated that the individual arrested could not be the source of the DNA on the North Carolina sample because he was incarcerated at the time of the incident. That same day, the laboratory recalled the incorrect DNA HIT and entered the correct match.

The arrested individual was released on July 13, 2016 and the individual associated with CAP2 is in custody in Virginia. See Appendix B for a detailed chronology of events.

Composition of RCA Committee

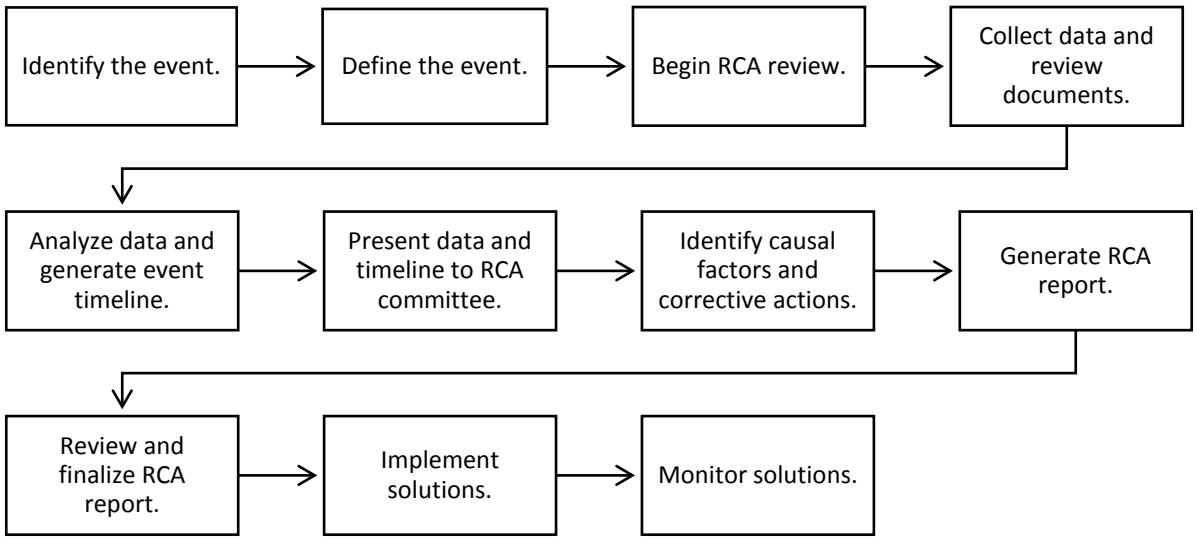
The RCA Committee is a multidisciplinary team of professionals assembled in accordance with criteria defined by Title 17, Chapter 2, Section 17-207 of the City's Administrative Code. The RCA committee includes OCME employees and an external expert who serves in a medical or scientific research field. The members of this RCA committee include the following:

- The root cause analysis officer.
- Two laboratory employees who are knowledgeable in the area relating to the event.
- A member of the OCME executive management.
- Two employees from OCME departments that are not implicated by the event.

- An outside expert with risk management experience in the medical field.

OCME Root Cause Analysis Process

Root Cause Analysis (RCA) is a structured methodology used to study and learn from events. The goal of the RCA is to understand what happened, identify why it happened and recommend solutions to prevent recurrence. The process used is as follows:



Review of Remedial Actions

Following a review of the match reporting process and the event timeline, the RCA committee reviewed the immediate remedial actions taken by Forensic Biology after being informed of the error. The actions taken are listed below:

- Forensic Biology immediately recalled the incorrect DNA HIT and entered a new DNA HIT for the North Carolina match associated with CAP2.

- The analyst and reviewer involved with entering the incorrect DNA HIT were not permitted to enter new DNA HITS until they were retrained. They were also required to successfully complete a proficiency test. The proficiency test was reviewed by their manager and they were approved to resume entering DNA HITS on July 29, 2016.

- A retrospective study was performed to determine if similar errors were made by the involved analyst and reviewer. The CODIS Custodian and QA Manager reviewed a total of eighty-one DNA HITS that were entered two weeks prior to the incident and two weeks after. No other errors were found during this review.

The RCA committee found the actions regarding the recall and retesting of involved staff to be appropriate.

Regarding the retrospective study, the RCA committee discussed the number of DNA HITS reviewed and the criteria used to select cases. Because of the seriousness of the error, the RCA

committee recommends that Forensic Biology increase the number of DNA HITS reviewed. The committee requested Forensic Biology to determine how many DNA HITS were actually performed during the analyst's three month rotation with the CODIS unit. If feasible, Forensic Biology should review the DNA HITS that were not included in their retrospective study.

Causes and Contributing Factors

The RCA committee further examined the workflow and employed cause and effect analysis to identify causes and contributing factors for entering the incorrect sample in DNA HITS. Using this methodology, the RCA committee identified the following causal factors:

1. *The DNA HITS application's pre-population of fields when a match is reported can introduce errors into the application.*

   Evidence: The RCA committee reviewed the DNA HITS application and the process used to report a match and enter a new hit. In addition, the Root Cause Analysis officer reviewed the standard operating procedure for this workflow. No issue was found with the documented procedure; however the RCA committee had significant concern regarding the DNA HITS application.

   During the review of the "New Hit" data entry form, the RCA committee learned that when a new match is reported, if the case has a sample with prior matches reported, then the most recently reported sample information is automatically loaded to the form. If the information is available, DNA HITS will pre-populate the "Sample Information" and "Incident Information" sections of the "New Hit" form. The analyst and reviewer are then responsible for reviewing the data before the match is reported.

   The RCA committee expressed concern regarding the pre-populating of critical fields such as the Specimen ID field. The Specimen ID corresponds to additional data, such as suspect information. Because the DNA HIT included the Specimen ID for CAP1 instead of CAP2, the information for the suspect associated with CAP1 was used to make the arrest. The Specimen ID must be accurate so that the correct individual is associated with the DNA HIT. Because of the significant consequence associated with this input error, the RCA Committee recommends that the Specimen ID field be manually entered. Pre-populating fields can be a time-saving feature however, as it is currently applied in DNA HITS, the pre-populating feature is a shortcut that enables data entry errors. The Specimen ID field should be manually entered the first time, not pre-populated with potentially incorrect information which then requires an individual to identify and correct the error. The RCA committee has determined this to be the root cause for this error.

2. *Samples have nearly identical Specimen ID numbers.*

   Evidence: The Specimen ID field is a 16-24 digit number that is formed by combining the item's Forensic Biology number, the last three digits of the voucher number, the item description and the case type descriptor. In this error, the Specimen IDs for both baseball caps are identical except for a one character difference. This is because both samples

have the same Forensic Biology number and both samples are baseball caps on the same voucher/case type. The only difference between them is in the item description where the baseball caps are designated as CAP1 and CAP2. The nearly identical Specimen ID numbers contributed to the failure of both the analyst and the reviewer to notice the single character difference in the 16 digit alphanumeric string.

3. The analyst had little experience reporting non-routine DNA matches.

Evidence: The RCA committee learned that the CODIS unit is staffed by four individuals, two of whom are permanently assigned to this unit. The analyst position is a rotating position that moves a criminalist from the Forensic Biology laboratory to the CODIS unit for three months. In the laboratory, the analyst normally performs bench work on cases. When rotating in the CODIS unit, the analyst conducts match reviews and submits match reports through DNA HITS.

The RCA committee noted that the analyst began her rotation in the CODIS unit on March 14, 2016 and the error was made on April 8, 2016. This meant that the analyst had only four weeks of experience performing the work when the error occurred.

The RCA committee also learned that the analyst training primarily consists of the CODIS Custodian reviewing the CODIS manual with the rotating analyst. The RCA committee noted that the training was mostly passive learning and it only reviewed routine procedures. It did not include a review of non-routine entries the analyst may encounter or an opportunity to use DNA HITS in a training setting.

The RCA committee also discussed the analyst's past performance and the workload volume. The CODIS Custodian informed the committee that her review did not find any issues with the analyst's past performance and the workload volume was fairly standard for the day.

4. The reviewer did not identify the incorrect Specimen ID number due to a slip.

Evidence: The RCA committee learned that the reviewer that checked the analyst's work has over ten years of experience reviewing and approving match reports in DNA HITS. The committee also learned that the majority of matches reported by Forensic Biology involve cases with only one CODIS sample and therefore, one Specimen ID. The reviewer would normally not expect to find more than one Specimen ID for the case. Additionally, the Specimen ID numbers are nearly identical, further reducing the probability of catching the error during routine work.

The RCA committee determined that the incorrect Specimen ID number was likely missed due to a slip by the reviewer. A slip is a classification of human error which is defined as an action that is not carried out as intended. Slips usually occur in very familiar tasks which an individual can perform without much conscious attention. A slip may also occur when an individual must deviate from an established routine but automatic processes inappropriately override intentional processes. In this case, the slip

occurred because the reviewer was already very familiar with the purpose and process of reporting routine matches.

The RCA committee also discussed the reviewer's past performance and the workload volume. The CODIS Custodian informed the committee that her review did not find any issues with the reviewer's past performance and the workload volume was fairly standard for the day.

See Appendix C for the cause and effect analysis.

Corrective Action Plan

Before the RCA committee met, Forensic Biology had already taken steps and implemented the following revisions to the CODIS manual:

- The addition of a list of DNA HITS fields to be entered and reviewed by the analyst and reviewer.

- Guidance on how to make specimen descriptions more unique.

The RCA committee reviewed the above corrective actions and found them to be appropriate. In addition to the actions already implemented by Forensic Biology, the RCA committee recommends the following actions:

1. Stakeholders should deactivate the pre-populating feature on the "New Hit" data entry form of DNA HITS. As it is currently applied, the pre-populating feature is a shortcut that enables data entry errors.

2. Stakeholders should revise the "New Hit" data entry form to require double entry of the Specimen ID field. Double entry is a confirmation step used to reduce data entry errors. It provides a second opportunity for the analyst to enter and verify the data.

3. Forensic Biology must enhance their training program for rotating analysts. The laboratory should consider adding a practical component such as developing a "training version" of DNA HITS so that analysts can practice reporting matches. Other suggestions include a written proficiency test or reviewing case studies of non-routine entries that an analyst may encounter.

4. Forensic Biology must implement a monthly audit that reviews the reported matches of SDIS and NDIS hits where pre-population of information in DNA HITS occurs.

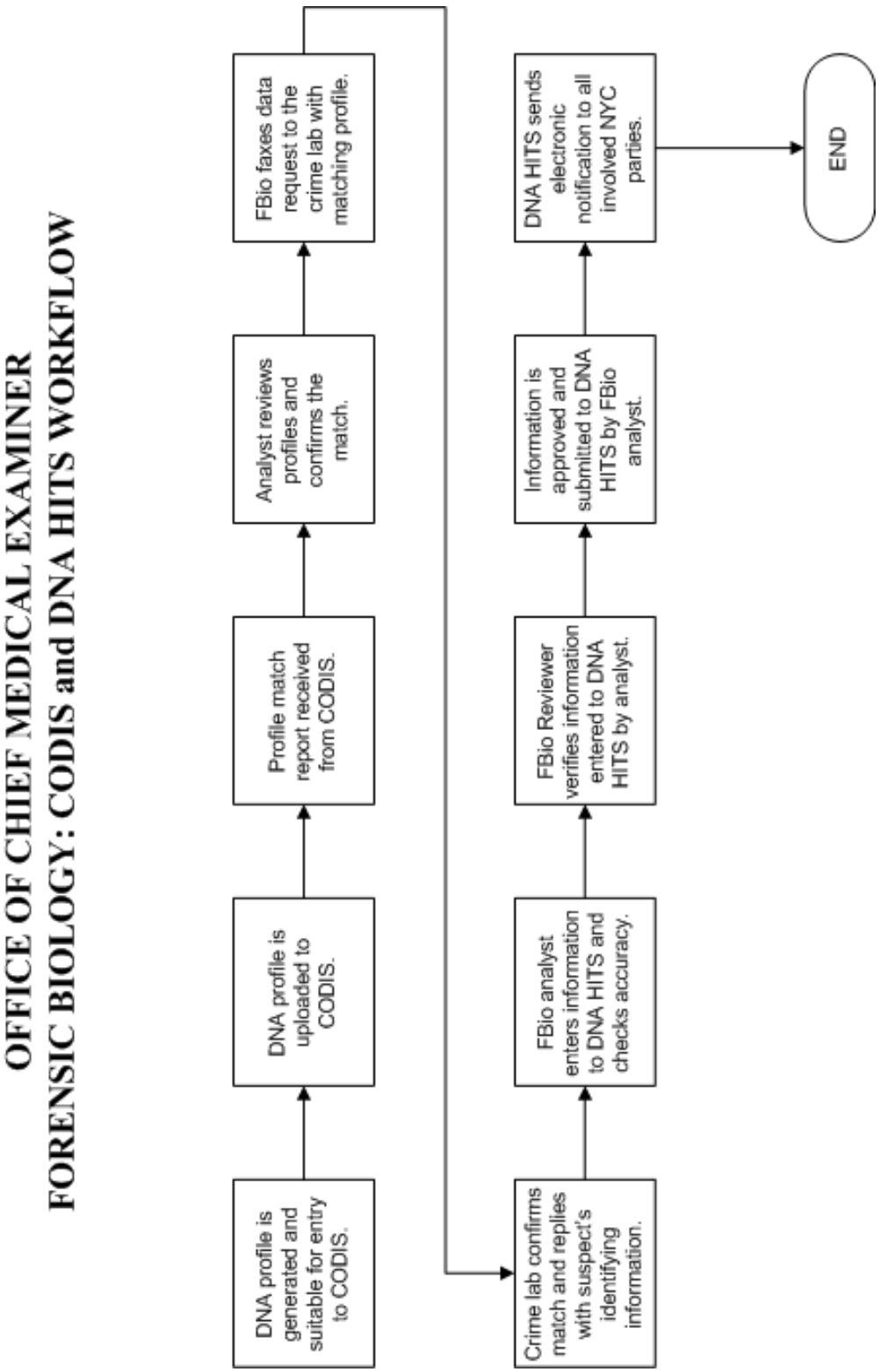
See Appendix D for a cause map with identified corrective actions.

Summary of Corrective Actions

Causal Factor	Corrective Action	Recommended Completion Date
The DNA HITS application pre-populates fields when a match is reported.	1. Stakeholders should deactivate the pre-populating feature on the "New Hit" data entry form of DNA HITS. 2. Stakeholders should revise the "New Hit" data entry form to require double entry of the Specimen ID field.	1/2/17
Samples have nearly identical Specimen ID numbers.	1. Revision to the CODIS manual which included a list of DNA HITS fields to be entered/reviewed by the analyst and reviewer. 2. Revision to the CODIS manual which included guidance on how to make specimen descriptions more unique.	Completed on 8/25/16
The analyst had little experience reporting non-routine DNA matches.	Forensic Biology must enhance their training program for rotating analysts.	1/2/17
The reviewer did not identify the incorrect Specimen ID number due to a slip.	Forensic Biology must implement a monthly audit that reviews the reported matches of SDIS and NDIS hits where pre-population of information in DNA HITS occurs.	1/2/17

The Quality Manager and Laboratory Director will monitor the implementation and effectiveness of improvements.

Appendix A

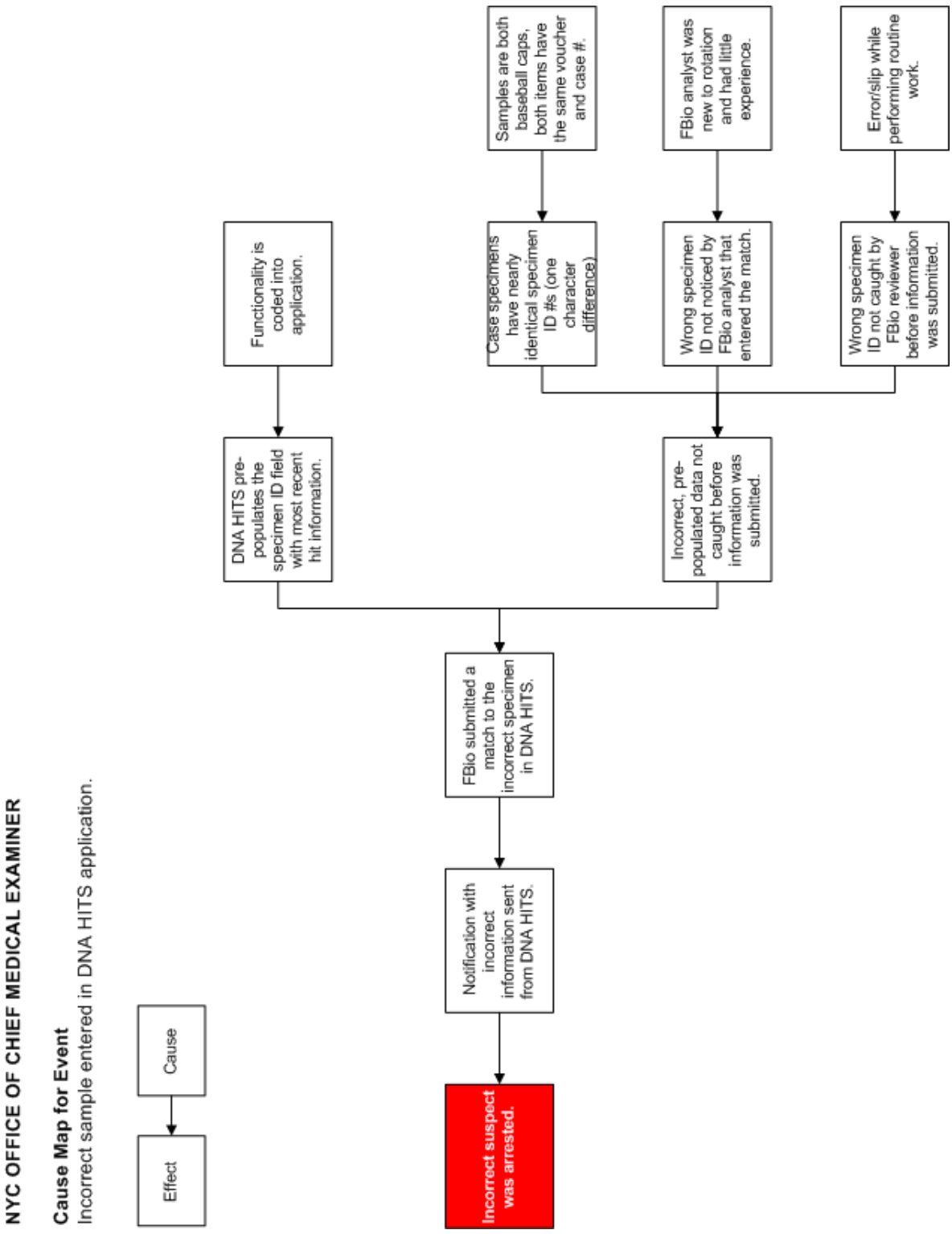

OFFICE OF CHIEF MEDICAL EXAMINER
FORENSIC BIOLOGY: CODIS and DNA HITS WORKFLOW
DNA profile is generated and suitable for entry to CODIS.
DNA profile is uploaded to CODIS.
Profile match report received from CODIS.
Analyst reviews profiles and confirms the match.
FBio faxes data request to the crime lab with matching profile.
Crime lab confirms match and replies with suspect's identifying information.
FBio analyst enters information to DNA HITS and checks accuracy.
FBio Reviewer verifies information entered to DNA HITS by analyst.
Information is approved and submitted to DNA HITS by FBio analyst.
DNA HITS sends electronic notification to all involved NYC parties.
END

Appendix B

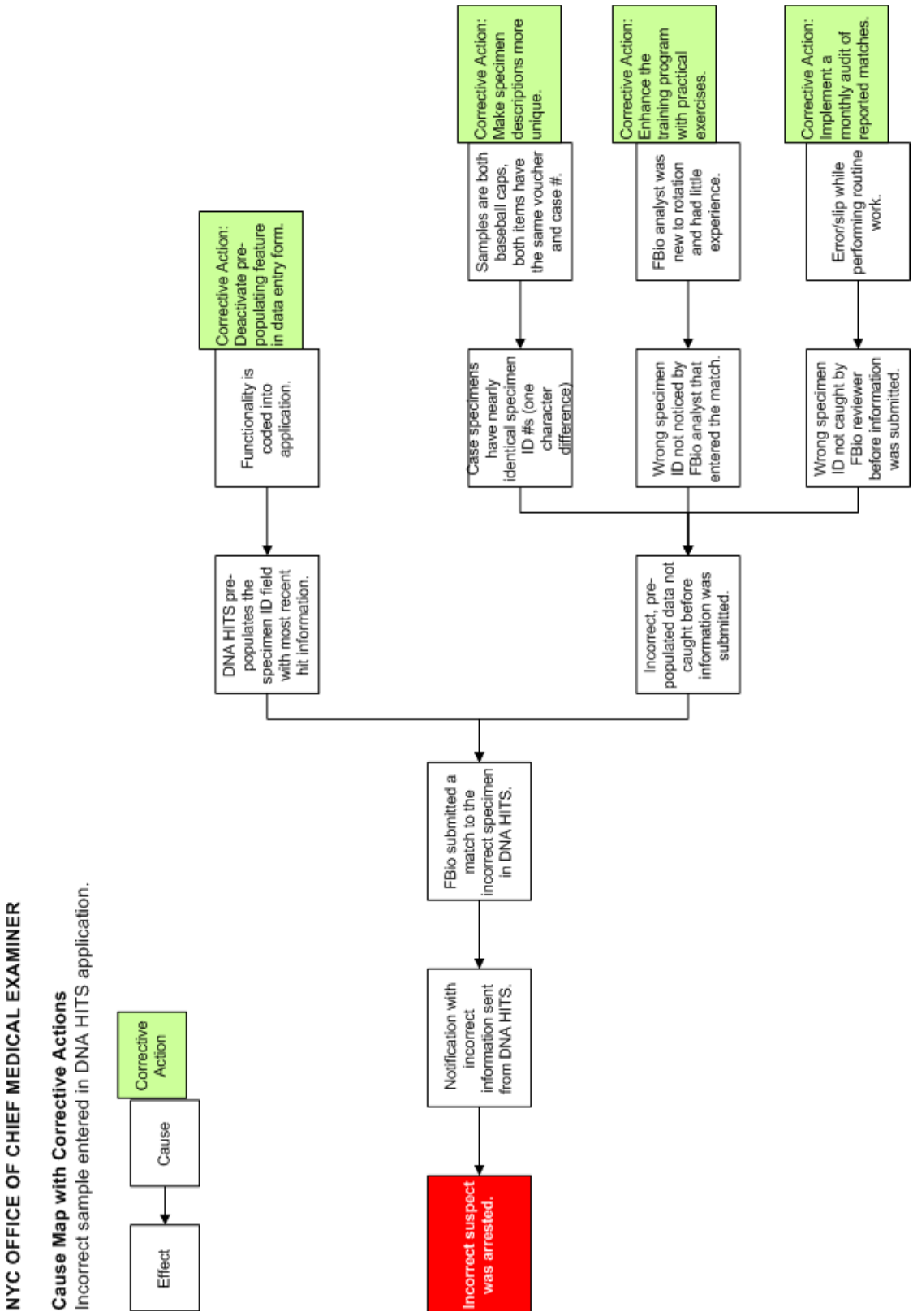
CHRONOLOGY OF EVENTS

DATE	EVENT
9/8/14	Forensic Biology (FBio) received evidence for testing. Evidence included a navy blue cap (CAP1) and a black cap (CAP2).
3/20/15	DNA profiles for CAP1 and CAP2 were imported into LDIS.
3/26/15	DNA profiles for CAP1 and CAP2 were uploaded into SDIS and NDIS.
3/27/15	FBio issued a laboratory report for this case. DNA profiles were obtained from CAP1 and CAP2. Both profiles were found to be suitable for entry into CODIS.
3/30/15	State Match Detail Report received for CAP1. National Match Detail Report received for CAP2. FBio confirmed both matches.
4/2/15	FBio entered a DNA HIT for match associated with CAP2.
4/3/15	FBio entered a DNA HIT for match associated with CAP1.
3/28/16	National Match Detail Report received between CAP2 and a North Carolina sample.
3/30/16	FBio confirmed the match.
4/1/16	FBio prepared the Match Data Request form and faxed the request to North Carolina laboratory.
4/7/16	FBio received the Match Data Response from North Carolina laboratory.
4/8/16	FBio entered a DNA HIT for North Carolina match associated with CAP1 instead of CAP2. The North Carolina investigators relied on the incorrect DNA HITS information (the North Carolina laboratory did not report out the suspect name) and issued a warrant.
7/8/16	Individual associated with CAP1 was arrested based on DNA HIT information.
7/12/16	FBio was informed of the error by the NYPD. The 4/8/16 DNA HIT was recalled and removed from the system. FBio entered a DNA HIT for the North Carolina match associated with CAP2.
7/13/16	The arrested individual associated with CAP1 was released.

Appendix C


NYC OFFICE OF CHIEF MEDICAL EXAMINER
Cause Map for Event
Incorrect sample entered in DNA HITS application.
Cause
Effect
Incorrect suspect was arrested.
Notification with incorrect information sent from DNA HITS.
FBio submitted a match to the incorrect specimen in DNA HITS.
DNA HITS pre-populates the specimen ID field with most recent hit information.
Incorrect, pre-populated data not caught before information was submitted.
Functionality is coded into application.
Case specimens have nearly identical specimen ID #s (one character difference)
Wrong specimen ID not noticed by FBio analyst that entered the match.
Wrong specimen ID not caught by FBio reviewer before information was submitted.
Samples are both baseball caps, both items have the same voucher and case #.
FBio analyst was new to rotation and had little experience.
Error/slip while performing routine work.

Appendix D


NYC OFFICE OF CHIEF MEDICAL EXAMINER
Cause Map with Corrective Actions
Incorrect sample entered in DNA HITS application.
Corrective Action
Cause
Effect
Incorrect suspect was arrested.
Notification with incorrect information sent from DNA HITS.
FBio submitted a match to the incorrect specimen in DNA HITS.
DNA HITS pre-populates the specimen ID field with most recent hit information.
Incorrect, pre-populated data not caught before information was submitted.
Functionality is coded into application.
Case specimens have nearly identical specimen ID #s (one character difference)
Wrong specimen ID not noticed by FBio analyst that entered the match.
Wrong specimen ID not caught by FBio reviewer before information was submitted.
Corrective Action: Deactivate pre-populating feature in data entry form.
Samples are both baseball caps, both items have the same voucher and case #.
FBio analyst was new to rotation and had little experience.
Error/slip while performing routine work.
Corrective Action: Make specimen descriptions more unique.
Corrective Action: Enhance the training program with practical exercises.
Corrective Action: Implement a monthly audit of reported matches.