B194 Hair as a Trap for Evidence and a Tool for the Forensic Investigation

Giulia Caccia, BSc, LABANOF, Università degli Studi di Milano, Milan , ITALY; Annalisa Cappella, PhD, LABANOF, Sezione di Medicina Legale, Milano 20133, ITALY; Alberto Amadasi, MD, Università di Bologna, Bologna 40126, ITALY; Debora Mazzarelli, BS, LABANOF, Sezione di Medicina Legale, Milan 20133, ITALY; Agostino Rizzi, BSc, CNR, Milan; Cristina Cattaneo, PhD, LABANOF, Sezione di Medicina Legale, Milan 20133, ITALY*

Learning Overview: After attending this presentation, attendees will understand the importance of a thorough analyses of hair and its potential in providing crucial information within forensic casework.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by showing the effectiveness of hair as a substrate even in the presence of nuisance factors such as environmental contaminants.

Hair is perhaps the largest and most preservable interface between human body and environment. Hair is frequently preserved along with skeletal remains, but what is the ability of the hair to retain evidences if exposed to environment? And which are the effects of deterioration of an open environment? How long can biological evidence be detected and determined on hair? Given the lack of literature, this pilot study tested the effectiveness of hair as a "trap" of evidence and resource for forensic investigation.

Fifty-seven samples of hair, taken from a single donor, were taken had substrata. One-third of the samples were treated with two biological samples (blood and semen taken from two donors), chosen because of their frequency in forensic contexts. All samples were monitored for a maximum period of three months. Samplings were performed after 24 hours, 48 hours, 1 week, 1 month, 2 months, and 3 months. Each sample was analyzed with the following techniques:

- macroscopic and mild magnification analyses using episcope microscope
- morphological and chemical analysis using scanning electron microscope Cambridge Stereoscan 360
- analyses with light microscopy and hematoxylin-eosin staining
- Luminol test

Results on blood: close environment-bloodstains were macroscopically visible until the end of the trial (3 months), though with a change in color. The basic pool of chemical elements (chloride, sulphur, potassium, sodium, phosphorus) was always recognizable. Luminol provided strong and positive evidence until the end of the trial.

Open environment-blood stains were macroscopically invisible starting to 1 week of trial (Time 3). The basic pool of chemical elements was extremely altered and no longer recognizable over 1 month (Time 4). Luminol gave strong and positive evidence until 1 week, then the intensity decreased.

Results on semen: close environment-semen stains were macroscopically visible until the end of the trial (3 months). The basic pool of chemical elements (sodium, chloride, potassium, phosphorus, sulphur) was always recognizable. The additional technique of optical microscopy showed well preserved semen until the end of the trial.

Open environment- semen stains were macroscopically invisible starting to 1 week of trial (Time 3). The basic pool of chemical elements was extremely altered and no longer detectable from 1 week (Time 3). The additional technique of optical microscopy showed detectable sperm until 1 week and sperm still partly visible but severely altered.

The efficacy of hair as evidence was highlighted. Results also showed the influence of environment and time, as blood and semen were detectable until the end of the trial in close environment but not in open space. Regarding blood, Luminol was the most effective technique both in close and in open environment, regardless of contamination and dilution. For what concerned semen, optical microscopy was the most reliable technique even if a most specific coloring could narrow the problems of determinability since some structure may be visible until the end of the trial. The present pilot study showed the effectiveness of hair as a substrate even in the presence of nuisance factor such as environmental contaminants (rain, mineral elements, etc.), further studies on techniques could therefore be taken forward.

Forensic Pathology, Hair, Biological Fluids