

## P198. FUTURE TRENDS IN FORENSIC SCIENCES

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Recent advances in genetics/genomisc/proteomics have started to reveal novel knowledge about the genes and mechanism involved in forensic biology and genetics.

In Latin, mortis means “of death”. When describing a recent death, evaluating the early post-mortem interval or relating the “fresh” stage of decomposition to the corpse, oftentimes the mortis triad is invoked. This triad is concerned with the onset and eventual dissipation of three aspects of the death process: rigor mortis (a temporary stiffening of the musculature primarily due to the failure of sarco/endoplasmic reticulum  $Ca^{2+}$ -ATPase (SERCA) pumps) , algor mortis (the cooling of the body to ambient temperatures since the metabolic regulation of body core temperature has failed), and livor mortis (the settling of blood in dependent areas of the body). What has historically been omitted from death investigations has been the value of odor mortis – or the “smell of death”. The advantage to the death investigator of expanding the triad into a tetrad is that the ‘smell of death’ lingers well past the fresh stage of decomposition and, as the odor changes and migrates, can be a valuable aid to investigators in the areas of post-mortem interval (PMI) determinations location of clandestine graves, and verification of decompositional events.

DNA testing for observable characteristics or “Forensic DNA Phenotyping (FDP)” is a emerging new field of forensic genetics. To date, FDP mostly involves the prediction of human observable externally visible characteristics (EVCs; skin tone, hair color, eye color, face shape, male baldness, adult body height, freckling, left-handedness and ethnicity, etc), and sometimes the inference of bio-geographic ancestry (the biogeographical ancestry: BGA). If appearance information of an unknown sample donor can successfully be obtained from a crime scene this information is expected to be useful during police investigation. Recently, at least for one EVC, eye colour, the accumulated knowledge has already been used to produce a forensically validated DNA test (VisiGen Consortium; The Identitas Chip-2012, led by Dr. Manfred Kayser) suitable for forensic case work applications.

The sudden death of a young, apparently fit and healthy person is amongst the most challenging scenarios in clinical medicine. Sudden cardiac death (SCD) is a devastating and tragic outcome of a number of underlying cardiovascular diseases. In up to 30% of young SCD, no cause of death is identified at postmortem, so-called autopsy-negative or sudden arrhythmic death syndrome (SADS). Where no cause of death is identified, genetic testing of DNA extracted from postmortem blood, the molecular autopsy, may identify a cause of death in up to 30% of SADS cases.

Herein, we will summarize the current information on the future trends such as odor signatures, DNA phenotyping and molecular autopsy, and how this new knowledge may be applied to criminal investigations.