

New method for more accurate determination of time of death at crime scenes

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Researchers from Amsterdam UMC, the University of Amsterdam and the Netherlands Forensic Institute (NFI) - partners in the forensic research institution the Co van Ledden Hulsebosch Center—have developed a method that allows for a more accurate determination of the time of death at a crime scene. Existing methods can only give a window of several hours; the new method reduces this to less than an hour. The research has been published in the journal *Science Advances*.

In investigations concerning people found dead at a [crime scene](#), detectives want to establish the time of death with the highest possible level of accuracy. The more accurate the time given, the better it can be compared against suspects' alibis—so a small margin of error around the time of death can lead to a reduction in the number of potential suspects. Using the method now published in *Science Advances*, a time of death can be calculated accurately to within an average of 45 minutes for people who have been dead between five and fifty hours. According to Prof. Maurice Aalders, professor by special appointment of Forensic Biophysics at the University of Amsterdam's AUMC and the Van 't Hoff Institute for Molecular Sciences, this is a major step forward in forensic investigation.

Current method is rather coarse

The method currently applied by the police is based on the cooling of the body after death, Aalders explains. "The temperature is determined rectally. Combined with [body weight](#) and ambient conditions it can be looked up in a table how many hours have passed since a person died." However, these tables are far from ideal. For instance, in the cooling process it can make quite a difference whether a person is built heavily or thinly. Aalders: "The model does not incorporate this, so with persons of equal weight but with different body structures the outcome is the same. This implies that the results are not that reliable." He adds that the method is also not ideal since an invasive measurement has to be made, which can destroy traces of evidence.

More accurate determination

To improve determinations of time of death, Aalders and his colleagues investigated many alternatives, including the determination of potassium in the eye and the analysis of proteins in tissue. These methods have not

yet been put into practice.

In the method reported in *Science Advances*, a crime scene detective non-invasively measures the temperature in one to four places, using a thermal camera or by applying sensors to the body. The data then go into a model that can be much more precisely tailored to the situation found at the crime scene. For example, information can be incorporated regarding clothing, whether the body is found (partly) in water, on what surface it has been found, and so on.

The new approach has been tested with bodies where the exact time of death was known. On average, the results obtained deviated 45 minutes from the actual value. And with a maximum deviation of just over an hour, the results are much better than those of the currently used method.

3-D model

Even though the new model already offers drastic improvements for practical police work, Aalders sees a potential for further refinement. "We are convinced that even more accurate results can be obtained," he says. "We are working on a method with which we capture a body at the crime scene in 3-D by means of structure from motion photogrammetry. This involves photographing from all directions and applying a computer program to generate a 3-D image. This is then immediately used in our model to calculate the cooling. In this way, investigators can determine the time of [death](#) even more accurately for a variety of bodies, postures and situations."

More information: Leah S. Wilk et al. Reconstructing the time since death using noninvasive thermometry and numerical analysis, *Science Advances* (2020). [DOI: 10.1126/sciadv.aba4243](https://doi.org/10.1126/sciadv.aba4243)

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