

Researchers isolate compounds and esters given off by dying humans

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Credit: Cristie Guevara/public domain

(Phys.org)—A team of researchers at the University of Leuven in Belgium has succeeded in identifying the unique group of compounds and esters that are given off by the human body as it decomposes. In their paper posted in the journal *PLoS ONE*, the team describes the study

they carried out using actual human remains, what they found and their hopes that their findings can be used in future forensic and search efforts.

Most people have heard of what is commonly known as "the smell of death" though the phrase is also used to describe people near to dying. Still, [human](#) beings undoubtedly give off a unique chemical cocktail after they die—one that dogs can identify using only their noses. Scientists have wondered for many years about the nature of that cocktail and have more recently begun to conduct studies to determine if its exact makeup could be found. In this new effort, the team in Belgium believes it has done just that.

To separate the chemicals emitted from humans during decomposition, from other animals, the team gathered animal (frog, pig, mouse, rabbit, mole, turtle, fish and bird remains) and human parts and put them in separate chambers where they could be studied with a [gas chromatograph](#) over a period of six months. That led to the identification of 452 unique compounds— principle component analysis showed that just eight of those compounds were distinct to humans and pigs (a close physiological sample). Closer examination of just the pig and human remains revealed five esters ([organic compounds](#) typically found in fats and oils, some of which are what humans smell when fruit is rotting) that were unique to just humans.

The researchers suggest that their results might be used to assist in training search dogs, or even perhaps in building a machine able to detect the smell of decaying human bodies, which could then be put into search robots. They acknowledge that more work still needs to be done because their study included only body parts—some tissue and organs—it is possible that a whole [human body](#) emits more [compounds](#) than just those parts studied, particularly parts associated with the gut.

More information: Rosier E, Loix S, Develter W, Van de Voorde W, Tytgat J, Cuypers E (2015) The Search for a Volatile Human Specific Marker in the Decomposition Process. *PLoS ONE* 10(9): e0137341.

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Abstract

In this study, a validated method using a thermal desorber combined with a gas chromatograph coupled to mass spectrometry was used to identify the volatile organic compounds released during decomposition of 6 human and 26 animal remains in a laboratory environment during a period of 6 months. 452 compounds were identified. Among them a human specific marker was sought using principle component analysis. We found a combination of 8 compounds (ethyl propionate, propyl propionate, propyl butyrate, ethyl pentanoate, pyridine, diethyl disulfide, methyl(methylthio)ethyl disulfide and 3-methylthio-1-propanol) that led to the distinction of human and pig remains from other animal remains. Furthermore, it was possible to separate the pig remains from human remains based on 5 esters (3-methylbutyl pentanoate, 3-methylbutyl 3-methylbutyrate, 3-methylbutyl 2-methylbutyrate, butyl pentanoate and propyl hexanoate). Further research in the field with full bodies has to corroborate these results and search for one or more human specific markers. These markers would allow a more efficiently training of cadaver dogs or portable detection devices could be developed.

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