

Researchers find the smell of metal can be deceiving

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In the process of conducting research on iron plumbing infrastructure and drinking water quality, two Virginia Tech researchers in the College of Engineering uncovered that the smell of iron when you touch metal is really not iron at all.

Andrea Dietrich, professor in civil and environmental engineering (CEE), and Dietmar Glindemann, research associate in CEE, are working on unraveling the complex chemistry of smell, especially as it relates to the aesthetics of water.

Of all the human senses, odor has been the most difficult to scientifically explain. Only two years ago, Linda Buck and Richard Axel were awarded the Nobel Prize in Medicine for being the first to decipher the genes that determine the sense of smell.

“We are the first to demonstrate that when humans describe the “metallic” odor of iron metal, there are no iron atoms in the odors. The odors humans perceive as “metallic” are really by-products of the metals reacting with skin or impurities in the metal itself,” said Dietrich. The research is being funded by the National Science Foundation with additional funding provided by the UFZ Centre for Environmental Research in Germany.

Angewandte Chemie (International Edition) recently published Dietrich and Glindemann’s research paper, “The Two Smells of Touched or Pickled Iron (Skin) Carbonyl-Hydrocarbons and Organophosphines.”

Other contributors to the research include Hans-Joachim Staerk and Peter Kuschik.

In their paper, Dietrich and Glindemann explain the source of the "metallic" odor that is generated when a person picks up keys, coins or metal objects. The odor results from a metal induced oxidation of skin lipids so it is surprisingly a type of human body odor. The compounds people smell are actually aldehydes and ketones, and not any iron containing compounds.

The same "metallic" odor is produced if you rub blood on skin, so the researchers speculate that the "blood scent" may result from this reaction. The ability to smell blood sensitively would be an evolutionary advantage that allowed early humans and their animal ancestors to track wounded prey.

One of the products produced when skin comes in contact with metal is octeneone (OEO). Humans can smell OEO at concentrations as low as 5 parts per trillion, which indicates humans are highly evolved for detecting this compound. "The fact that iron metal produces a whole host of "smelly" organic molecules when humans touch it or acid attacks it was unexpected. While our deciphering of chemistry is scientifically fascinating, it also has a wide range of benefits, from designing tests to monitor human diseases associated with oxidative damage to cells to improving blood-scent tracking," said Glindemann.

Dietrich, the PI for this project, is a member of the Sustainable Drinking Water Infrastructure (SDWI) research group at Virginia Tech which looks at problems with providing drinking water to society such as health, safety, and security.

Source: Virginia Tech, by Karen Gilbert

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