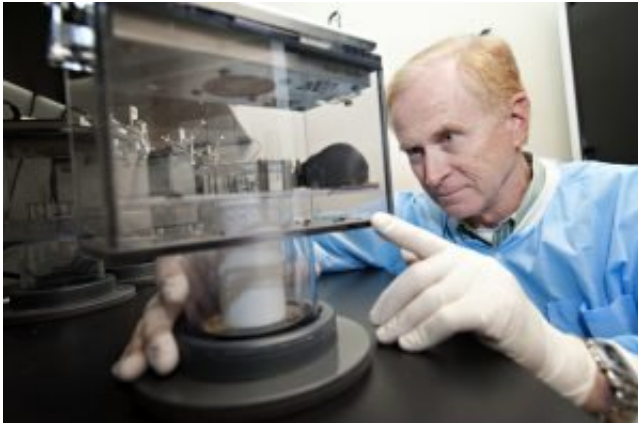


# Mice help find gene for bad breath

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Prof. Kent Lloyd, director of the UC Davis Mouse Biology Program, in the lab. Gene-edited and “knockout” mice have become a vital tool in biomedical research. Credit: Karin Higgins/UC Davis

An international team of researchers has identified a cause for chronic bad breath (halitosis), with the help of gene knockout mice from the UC Davis Mouse Biology Program. The results are published Dec. 18 in the journal *Nature Genetics*.

While most cases of bad breath are linked bacteria growing in the mouth, up to 3 percent of the population have chronic halitosis of no obvious cause.

"It's important to identify the cause of persistent halitosis, and differentiate that cause from relatively benign causes (e.g., gum disease)

and the more morbid causes such as liver cirrhosis," said Professor Kent Lloyd, director of the Mouse Biology Program at UC Davis.

Researchers at Radboud University in The Netherlands have been studying families with chronic bad breath for several years. They found that these people produced a lot of sulfur-based [compounds](#) in their breath, especially methanethiol which has an unpleasant boiled-cabbage smell. Methanethiol is normally produced during digestion but broken down in the body.

Some bacteria can break down sulfur compounds. Based on bacterial genes, the team identified a human protein, selenium binding protein 1, which can convert methanethiol into other and compounds.

## **Sulfur compounds in blood**

When they looked at their human patients, they found that all had mutations in the SELENBP1 gene that produces this protein and they all had high levels of methanethiol and dimethyl sulfide in their [blood](#). When blood reaches the lungs, these smelly sulfur compounds leave the blood and are exhaled in breath.

Similarly, mice with a genetic knockout of the mouse equivalent of SELENBP1 had low levels of the [protein](#) and high levels of methanethiol and other volatile [sulfur compounds](#) in their blood.

"While we didn't put our noses up to the mice's mouths, we did measure high amounts of some of these odor-forming chemicals in their blood, matching precisely what was found in the patients," Lloyd said.

SELENBP1 has also been associated with some cancers in human, although it is not clear how this works. Currently there is no treatment for this form of halitosis, but the genetic studies and a better

understanding of [sulfur](#) metabolism might lead to treatments in the future.

**More information:** Arjan Pol et al, Mutations in SELENBP1, encoding a novel human methanethiol oxidase, cause extraoral halitosis, *Nature Genetics* (2017). [DOI: 10.1038/s41588-017-0006-7](https://doi.org/10.1038/s41588-017-0006-7)

Provided by UC Davis

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