

# Genetic mutation in a quarter of all Labradors hard-wires them for obesity

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All Labradors and flatcoated retrievers are highly food-motivated. But dogs with the genetic mutation face a double whammy: they not only want to eat more, but also need fewer calories because they're not burning them off as fast. Credit: University of Cambridge

New research finds around a quarter of Labrador retriever dogs face a

double-whammy of feeling hungry all the time and burning fewer calories due to a genetic mutation. The results are [published](#) in the journal *Science Advances*.

This obesity-driving combination means that [dog owners](#) must be particularly strict with feeding and exercising their Labradors to keep them slim.

The mutation is in a gene called POMC, which plays a critical role in hunger and energy use.

Around 25% of Labradors and 66% of flat-coated retriever dogs have the POMC mutation, which researchers previously showed causes increased interest in food and risk of obesity.

The new study reveals how the mutation profoundly changes the way Labradors and flat-coated retrievers behave around food. It found that although they don't need to eat more to feel full, they are hungrier in between meals.

In addition, dogs with the POMC mutation were found to use around 25% less energy at rest than dogs without it, meaning they don't need to consume as many calories to maintain a healthy body weight.

"We found that a mutation in the POMC gene seems to make dogs hungrier. Affected dogs tend to overeat because they get hungry between meals more quickly than dogs without the mutation," said Dr. Eleanor Raffan, a researcher in the University of Cambridge's Department of Physiology, Development and Neuroscience who led the study.

She added, "All owners of Labradors and flat-coated retrievers need to watch what they're feeding these highly food-motivated dogs, to keep them a healthy weight. But dogs with this genetic mutation face a double

whammy: they not only want to eat more, but also need fewer calories because they're not burning them off as fast."

The POMC mutation was found to alter a pathway in the dogs' brains associated with body weight regulation. The mutation triggers a starvation signal that tells their body to increase [food intake](#) and conserve energy, despite this being unnecessary.

Raffan said, "People are often rude about the owners of fat dogs, blaming them for not properly managing their dogs' diet and exercise. But we've shown that Labradors with this genetic mutation are looking for food all the time, trying to increase their energy intake. It's very difficult to keep these dogs slim, but it can be done."

The researchers say owners can keep their retrievers distracted from this constant hunger by spreading out each daily food ration, for example by using puzzle feeders or scattering the food around the garden so it takes longer to eat.

In the study, 87 adult pet Labrador dogs—all a healthy weight or moderately overweight—took part in several tests including the 'sausage in a box' test.

First, the dogs were given a can of dogfood every 20 minutes until they chose not to eat any more. All ate huge amounts of food, but the dogs with the POMC mutation didn't eat more than those without it. This showed that they all feel full with a similar amount of food.

Next, on a different day, the dogs were fed a standard amount of breakfast. Exactly three hours later they were offered a sausage in a box and their behavior was recorded. The box was made of clear plastic with a perforated lid, so the dogs could see and smell the sausage, but couldn't eat it.

The researchers found that dogs with the POMC mutation tried significantly harder to get the sausage from the box than dogs without it, indicating greater hunger.

The dogs were then allowed to sleep in a special chamber that measured the gases they breathed out. This revealed that dogs with the POMC mutation burn around 25% fewer calories than dogs without it.



A quarter of all Labradors have a genetic mutation that triggers a starvation signal in their body, making them feel hungry all the time *and* burn off fewer calories. It's very difficult to keep these dogs slim, but it can be done. Credit: University of Cambridge

The POMC gene and the brain pathway it affects are similar in dogs and humans. The new findings are consistent with reports of extreme hunger in humans with POMC mutations, who tend to become obese at an early age and develop a host of clinical problems as a result.

Drugs currently in development for human obesity, underactive sexual desire and certain skin conditions target this brain pathway, so understanding it fully is important.

A mutation in the POMC gene in dogs prevents production of two chemical messengers in the dog brain, beta-melanocyte stimulating hormone ( $\beta$ -MSH) and beta-endorphin, but does not affect production of a third, alpha-melanocyte stimulating hormone ( $\alpha$ -MSH).

Further laboratory studies by the team suggest that  $\beta$ -MSH and beta-endorphin are important in determining hunger and moderating energy use, and their role is independent of the presence of  $\alpha$ -MSH.

This challenges the previous belief, based on research in rats, that [early onset](#) human obesity due to POMC mutations is caused only by a lack of  $\alpha$ -MSH. Rats don't produce beta-melanocyte stimulating hormone, but humans and dogs produce both  $\alpha$ - and  $\beta$ -MSH.

**More information:** Marie Dittmann et al, Low resting metabolic rate and increased hunger due to  $\beta$ -MSH and  $\beta$ -endorphin deletion in a canine model, *Science Advances* (2024). [DOI: 10.1126/sciadv.adj3823](https://doi.org/10.1126/sciadv.adj3823). [www.science.org/doi/10.1126/sciadv.adj3823](https://www.science.org/doi/10.1126/sciadv.adj3823)

Provided by University of Cambridge

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