

# Shed post-Christmas pounds just by breathing

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Credit: Peter Häger/Public Domain

Ever wondered where the fat goes when somebody loses weight? Most of it is breathed out as carbon dioxide, making the lungs the primary excretory organ for weight loss, explain Australian researchers in the Christmas issue of The *BMJ*.

Widespread misconceptions about losing weight led Ruben Meerman and Andrew Brown at the University of New South Wales to calculate how we "lose weight."

Human [fat](#) cells store triglyceride, which consists of just three kinds of atoms; carbon, hydrogen and oxygen. Shedding unwanted fat requires unlocking the atoms in triglyceride molecules by a process known as oxidation.

By tracing every atom's pathway out of the body, the authors discovered that when 10 kg of fat are fully oxidised, 8.4 kg departs via the lungs as carbon dioxide (CO<sub>2</sub>). The remaining 1.6 kg becomes water (H<sub>2</sub>O).

Their analysis shows that the inhaled oxygen required for this metabolic process weighs nearly three times more than the fat being 'lost'. To completely oxidise 10 kg of human fat, 29 kg of oxygen must be inhaled producing a total of 28 kg of [carbon dioxide](#) and 11 kg of water.

"None of this biochemistry is new, but for unknown reasons it seems nobody has thought of performing these calculations before," say the authors. "The quantities make perfect sense but we were surprised by the numbers that popped out."

"These results show that the lungs are the primary excretory organ for [weight loss](#)," they add. "The water formed may be excreted in the urine, faeces, sweat, breath, tears, or other bodily fluids and is readily replenished."

"The exhaled carbon can only be replaced by eating food or consuming beverages such as milk, fruit juices or sugar-sweetened drinks," the authors say.

At rest, an average 70 kg person exhales around 200 ml of CO<sub>2</sub> in 12

breaths per minute. Each of those breaths therefore excretes 33 mg of CO<sub>2</sub>, of which 8.9 mg is carbon. By simply exhaling 17,280 times, an average person therefore loses at least 200 grams of carbon every day and roughly a third of that weight loss is achieved during eight hours of sleep.

"Keeping the weight off simply requires that you put less back in by eating than you've exhaled by breathing," explain the authors.

Replacing one hour of rest with exercise that raises the metabolic rate to seven times that of resting by, for example, jogging, removes an additional 40 g of carbon from the body, raising the total by about 20% to 240 g.

But the authors point out that, for comparison, a single 100 g muffin represents about 20% of an average person's total daily energy requirement. "Physical activity as a weight loss strategy is, therefore, easily foiled by relatively small quantities of excess food," they say.

"Our calculations show that the lungs are the primary excretory organ for fat," they conclude. "Losing weight requires unlocking the carbon stored in fat cells, thus reinforcing that often heard refrain of 'eat less, move more.'" The authors recommend these concepts be included in secondary school science curriculums and university biochemistry courses "to correct widespread misconceptions about weight loss."

**More information:** [www.bmj.com/cgi/doi/10.1136/bmj.g7257](http://www.bmj.com/cgi/doi/10.1136/bmj.g7257)

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