

## Metabolism Changes With Age, Just Not When You Might Think

Researchers have precisely measured life's metabolic highs and lows, from birth to old age, and the findings might surprise you. The findings appear [Aug. 13, 2021] in the journal *Science*.

DURHAM, N.C. -- Most of us remember a time when we could eat anything we wanted and not gain weight. But a new study suggests your metabolism per pound of weight-- the rate at which you burn calories -- actually peaks much earlier and starts its decline later than you might guess.

"There are lots of physiological changes that come with growing up and getting older," said study lead-author Herman Pontzer, associate professor of evolutionary anthropology at Duke

University. Pontzer and an international team of scientists analyzed the average calories burned by

more than 6,600 people ranging from one week old to age 95 as they went about their daily lives in 29 countries worldwide.

To come up with a number for total daily energy expenditure, the researchers relied on the

**doubly labeled water method**, first used to measure total daily energy expenditure in humans by Dale Schoeller, a member of the Biotechnology Center at the University of Wisconsin-Madison and co-author of the study. It's a urine test in which a person drinks water in which the hydrogen and oxygen in the water molecules have been tagged with naturally occurring "heavy" forms, and then measuring how quickly they're flushed out. Scientists have used the technique to measure energy expenditure in humans since the 1980s validations by Schoeller, but studies have been limited in size and scope due to cost. So multiple labs decided to share their data in a single database, to tease out truths that weren't fully revealed in previous work. Some people think of their teens and 20s as the age when their calorie-burning potential hits its peak. But the researchers found that, pound for pound, infants had the highest metabolic rates of all. Energy needs shoot up during the first 12 months of life, such that by their first birthday, a one-year-old burns calories 50% faster for their body size than an adult. And that's not just because, in their first year, infants are busy tripling their birth weight. "Of course, they're growing, but even once you control for that, their energy expenditures are rocketing up higher than you'd expect for their body size and composition," said Pontzer. "Something is happening inside a baby's cells to make them more active, and we don't know what those processes are yet," Pontzer said. After this initial surge in infancy, the data show that metabolism slows by about 3% each year until we reach our 20s, when it levels off.

Midlife was another surprise. Perhaps you've been told that it's all downhill after 30 when it

comes to your weight. But while several factors could explain the thickening waistlines that

often emerge during our prime working years, the findings suggest that a changing

metabolism isn't one of them. In fact, the researchers discovered that energy expenditures during these middle decades – our 20s, 30s, 40s and 50s -- were the most stable. Even during pregnancy, a woman's calorie needs were no more or less than expected given her added bulk as the baby grows. The data suggest that our metabolisms don't really start to decline again until after age 60. The slowdown is gradual, only 0.7% a year, but by age 95, one needs 26% fewer calories each day than someone in midlife.

Lost muscle mass as we get older may be partly to blame, the researchers say, since muscle burns more calories than fat. But it's not the whole picture. "We controlled for muscle mass," Pontzer said. "It's because their cells are slowing down." The patterns held even when differing activity levels were taken into account. But the research lends support to the idea that it's more than age-related changes in lifestyle or body composition. "All of this points to the conclusion that tissue metabolism, the work that the cells are doing, is changing over the course of the lifespan in ways we haven't fully appreciated before.

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