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Eating dirt can be good for the belly, researchers find

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Most of us never considered eating the mud pies we made as kids, but for many people all over the world, dining on dirt is nothing out of the ordinary. Now an extensive meta-analysis forthcoming in the June issue of *The Quarterly Review of Biology* helps explain why.

According to the research, the most probable explanation for human geophagy—the eating of earth—is that it protects the stomach against toxins, parasites, and pathogens.

The first written account of human geophagy comes from Hippocrates more than 2,000 years ago, says Sera Young, a researcher at Cornell University and the study's lead author. Since then, the eating of earth has been reported on every inhabited continent and in almost every country.

Despite its ubiquity, scientists up to now have been unable to definitively explain why people crave earth. Several hypotheses had been considered plausible. Some researchers think geophagy is simply a consequence of food shortage. In other words, people eat dirt to ease the pangs of hunger, even though it doesn't provide any nutritional value. Others have suggested that nutrition is exactly why dirt is consumed; perhaps people crave dirt because it provides nutrients they lack, such as iron, zinc, or calcium. Still others posit that earth has a protective effect, working as a shield against ingested parasites, pathogens, and plant toxins.

To sort through the possible explanations, Young and her colleagues analyzed reports from missionaries, plantation doctors, explorers, and

anthropologists to put together a database of more than 480 cultural accounts of geophagy. The database includes as many details as possible about the circumstances under which earth was consumed, and by whom. The researchers could then use patterns in the data to evaluate each potential explanation.

They found the hunger hypothesis unlikely. Studies in the database indicate that geophagy is common even when food is plentiful. Moreover, when people eat dirt they tend to eat only small quantities that are unlikely to fill an empty stomach.

The nutrition hypothesis was also a poor fit to the data. The database shows that the kind of earth people eat most often is a type of clay that contains low amounts of nutrients like iron, zinc, and calcium. Plus, if calcium deficiency drove people to eat dirt, one would expect them to do it most often at life stages when they need calcium the most—adolescence or old age. But that isn't the case, according to the database. Reports do indicate that geophagy is often associated with anemia, but several studies have shown that cravings for earth continue even after people are given iron supplements. What's more, some research suggests that clay can bind to nutrients in the stomach, making them hard to digest. If that's true, it's not a lack of nutrients that causes geophagy; rather it could be the other way around.

Overall, the protection hypothesis fits the data best, the Cornell researchers found. The database shows that geophagy is documented most commonly in women in the early stages of pregnancy and in pre-adolescent children. Both categories of people are especially sensitive to parasites and pathogens, according to Young and her colleagues. In addition, geophagy is most common in tropical climates where foodborne microbes are abundant. Finally, the database shows that people often eat earth during episodes of gastrointestinal stress. It's unlikely the intestinal problems are caused by the dirt itself because the

type of clay people usually eat comes from deep in the ground, where pathogens and parasites are unlikely to contaminate it. Plus, people usually boil the clay before eating it.

More study would be helpful to confirm the protection hypothesis, the researchers say, but the available data at this point clearly support it over the other explanations.

"We hope this paper stimulates [more] research," Young and her colleagues write. "More importantly, we hope readers agree that it is time to stop regarding geophagy as a bizarre, non-adaptive gustatory mistake."

"With these data, it is clear that geophagy is a widespread behavior in humans … that occurs during both vulnerable life stages and when facing ecological conditions that require protection."

More information: Sera L. Young, Paul W. Sherman, Julius Beau Lucks, Gretel H. Pelto, "Why on Earth?: Evaluating Hypotheses about the Physiological Functions of Human Geophagy." *The Quarterly Review of Biology* 86:2 (June 2011).

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