

# Can rice and flushing the toilet be slowly poisoning you?

December 4 2018

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Many of the substances that humans consume on a regular basis as parts of their basic diet actually contain harmful toxins. Rice, barbecued meat and drinking water all pose threats to human health as hosts to potent toxins, carcinogens and opportunistic pathogens. In many cases, the rise in concentrations of these harmful substances is a direct result of human activity, such as the use of harmful pesticides in crops and even advances in green technology. Risk assessment can be a useful tool for determining the actual threat to human health with numerous variables between population groups and degrees of uncertainty.

As a result of human activities, arsenic pollution is rising and high levels of inorganic arsenic can be found in all types of rice. Rice is now the single biggest food source of inorganic arsenic, the more toxic form which can be readily absorbed by the gastrointestinal (GI) tract. While the toxic symptoms generally take a long time to develop, long-term ingestion, particularly for people with rice-based diets, can result in various health problems, including cancer, heart disease and decreased intelligence.

The FDA's 2016 Arsenic in Rice and Rice Products Risk Assessment Report estimated that 63-99 percent was bioaccessible. Zheng Zhou, MPH, Indiana University, performed a systematic review to summarize the current state of knowledge on the bioaccessibility of arsenic in rice and a meta-analysis to provide a more robust probabilistic estimation. In the study, "A [systematic review](#) on bioaccessibility of arsenic in rice," Zhou analyzed 143 articles from PubMed and Toxline online databases.

The [meta-analysis](#) showed that the median bioaccessibility estimate was 73.1 and 88.6 percent for total and inorganic arsenic, respectively, revealing that a majority of the arsenic found in rice is being absorbed into the consumer's system, where it can build up over time.

Heat-processed meat may contain high concentrations of polycyclic aromatic hydrocarbons, a class of chemical components, including benzo[a]pyrene (BaP), classified as a group 1 human carcinogen by the International Agency for Research on Cancer. To minimize risk from dietary exposure, food and health authorities may advise to limit certain meat preparation practices such as barbecuing. Stylianos Georgiadis, Technical University of Denmark, and his team of researchers sought to estimate the extra lifetime risk of cancer due to exposure to BaP through barbecued meat.

The study, "Risk assessment of benzo[a]pyrene in heat-processed meat in Denmark: A probabilistic approach," will help risk managers and policy makers properly evaluate and communicate the cancer risk associated with heat-processed meat consumption, accounting for population variability and associated uncertainties.

Green building practices and design elements, focused on the efficient use of [water](#) and energy, such as low-flow fixtures and high-efficiency appliances continue to gain popularity. The percentage of homes with an average toilet flush volume of less than two gallons has increased from 8.5 percent in 1999 to 37 percent in 2016. Adoption of these technologies has drastically reduced [water consumption](#) in the U.S., however, plumbing system design has not adequately kept pace. The result has been an increase in hydraulic retention time, or "water age," which can adversely affect water quality.

With increased water age comes a reduction of disinfectant residual, increased leaching of pipe materials into the bulk water and the

promotion of opportunistic pathogens such as *Legionella* spp., *Mycobacterium* spp. and *P. aeruginosa*, and are the primary cause of waterborne disease in developed countries. Ryan Julien, PE, Michigan State, conducted a study aimed at estimating water age within premise plumbing of a full-scale residential net-zero building to evaluate health risks. Julien's study, "Estimating water age and its effects on water quality in a full-scale green home," reviews multiple flow regimes to estimate water age during use and compare these results to measured water quality in the home.

Lead exposure is still a prominent concern in many communities, and there is no safe level of exposure. To better understand the relationship between [lead exposure](#) in drinking water from private wells and [human health](#) outcomes, Abhishek Komandur, University of North Carolina at Chapel Hill, conducted a study titled "Determining the relationship between drinking private well water and children's blood lead levels." Private drinking wells are not covered by the Safe Drinking Water Act and many individuals do not test their wells for lead and other contaminants.

Komandur uses regression models to explore the relationship between water lead and blood lead in 60 children under the age of seven in North Carolina. "We hope the results from this research will encourage more people to test water from their private wells," states Komandur. "We also hope that it will provide more evidence to connect households to a municipal water supply."

These studies will be presented during the Dietary and Drinking Water Exposures session on Tuesday, Dec. 4 from 1:30-3:00 p.m. at the 2018 Society for Risk Analysis (SRA) Annual Meeting at the New Orleans Marriott in New Orleans, Louisiana.

Provided by Society for Risk Analysis

Citation: Can rice and flushing the toilet be slowly poisoning you? (2018, December 4) retrieved 2 May 2024 from <https://phys.org/news/2018-12-rice-flushing-toilet-slowly-poisoning.html>

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