

Science You Can Use

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Dear Science: My septic system recently failed without warning, costing me nearly \$10,000 to fix. What could I have done to prevent this? -- Buck R.

Dear Buck: Septic systems are, sooner or later, a reliable reminder that what we dump into the world we live in, will dump back. Here are there some things you can do to help minimize the number of times that happens.

As the term is typically used, a *septic system* is a system that treats on-site wastewater generated on that site. It is estimated there are at least 25 million septic systems in the US (i.e., about one in four residences has a septic system). Each year, about half a million new septic systems are added to the total.

There are two general types of septic systems. Both have a large tank, called a septic tank, that receives wastewater, typically from drains and toilets in houses.

In one type of septic system, which I will call a “closed” system, the septic tank accumulates whatever flows into it. In a closed system, the tank must be pumped out often enough to prevent it from overflowing. Depending on the rate at which wastewater enters the tank and the size of the tank, this pumping may have to be done once a month, or sewage will back up through your sewer pipes, exiting wherever it finds an opening – like into your sink or tub/shower, or into a toilet bowl. If you have a closed system, ask your septic system service company how often you need it pumped.

In the other type of septic system, which I will call a “leach” system, the tank is connected to a discharge pipe. Wastewater accumulates to the level of the discharge pipe (typically located about two feet below the top of the tank. While the wastewater is in the tank, microorganisms (bacteria, molds, and yeasts) at least partially break down (“digest”) some of the organic matter in the wastewater. This partially treated wastewater then discharges into an underground system of perforated chambers or pipes. Wastewater from the chambers or pipes soaks (“leaches”) into the soil, where microorganisms further digest some of the organic matter in the wastewater.

From here on, let’s assume you have a leach system.

It’s obvious that anything that interferes with the free flow of wastewater in your septic system can easily cause sewage to back up into places you wish it hadn’t. For example, tree roots can invade your sewer pipes (especially older clay sewer pipes) or aging septic tanks. Or your child can flush a toy down the toilet. Root invasions can be reduced by replacing clay sewer pipes with plastic pipe and repairing or replacing the septic tank when needed. You can’t replace children, but with your encouragement, most of them can be persuaded that flushing a toy duck down a toilet isn’t nearly as funny as they think it is.

Some of the solids that enter your septic tank during normal operation cannot be digested by the microorganisms in the tank. This typically leads to a build-up of sediment in the tank, reducing your tank's ability to process wastewater. For example, if your clothes washer discharges into your septic system, man-made fibers (typically nylon and polyester) that tank microorganisms can't digest will typically be carried in the wastewater (cotton fibers in washing-machine effluent, in contrast, digest fairly quickly in a properly operating septic system). In addition, non-organic components of ordinary soil – such as fine sand particles – are present in almost all dirty laundry and on our bodies. Non-organic materials can accumulate in the septic tank. In order to help reduce the probability that these normally occurring non-digestible materials cause problems, you should have your septic tank pumped out – for most residential septic systems, about every two years. Ask your septic service company

In addition, anything that interferes with the digestive activity of the microorganisms in your septic tank can cause serious problems. Here's a list of a few things that can give your septic system severe indigestion:

1. More than a cup of cooking oil or fats (e.g., bacon grease) per month. Pour spent cooking oil and fat into a container and put the container in the trash.
2. Food waste. Put a fine strainer (less than 1 mm mesh size) in your sink drain and empty what it catches into your trash.
3. More than about a cup of chlorine bleach per week. Substitute non-chlorine bleach.
4. Some medicines, especially antibiotics. Your pharmacist can tell you how to properly dispose of unused medicines.
5. Anything that can't be readily digested by the microorganisms in the septic tank (see the link at the end of this article for a good list).
6. Anything your local public landfill calls "hazardous waste", including paint, motor oil, some household cleaners, and petroleum-based solvents. Take all of these to a state-certified hazardous waste collection site for disposal.

In short, to paraphrase the 14th-century French theologian/philosopher Jean Buridan, "Mind the beast that bears you."

For further information, see US Environmental Protection Agency, "How to care for your septic system", <https://www.epa.gov/septic/how-care-your-septic-system>.

Jack Horner is a systems engineer. Thanks to Sue Farrington for suggesting the topic.