



# The United Sludge-Free Alliance Recommended Reading

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## **Seeking solutions in sludge**

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In a room in Mason Laboratory, a team of Yale researchers are finding ways to deal with the nation's sewage.

Kyle Bibby GRD '12 and Chris Ziembra GRD '11 study pathogens in sewage sludge and ways to effectively kill them. Professor Jordan Peccia, who advises the pair, said their research could help the Environmental Protection Agency reevaluate regulations on the use of treated sewage sludge.

"We want to provide unbiased science in an argument in which almost everyone has a dog in the fight," Peccia said.

Building on Peccia's work in the field, Bibby is analyzing sludge samples from municipal sewage treatment plants across the United States to identify the main pathogens in sludge, including the Legionella bacterium and the Adenovirus, both of which cause minor respiratory diseases.

While sewage treatment plants primarily monitor the amount of E. coli bacteria in treated sludge, Bibby said there can be other pathogens in the sludge even if the treatment process killed many of the harmful organisms. Ziembra's research focuses on the relationship between the killing rate of bacteria and temperature. His data has indicated that cooking sewage sludge at 60 degrees Celsius may be the most energy efficient process for killing bacteria.

Treatment plants currently kill many of the pathogens and break down the solids in sewage sludge by cooking it at 37 degrees Celsius for about 30 days. But 37 degrees Celsius, which is around body temperature, is not warm enough to kill most pathogens, so some plants treat the sludge at 50 to 55 degrees Celsius, Ziembra said. But 60 degrees Celsius may be optimum temperature, Peccia said.

At this temperature, there is a huge increase in the rate of bacteria death, Ziembra said. While the extra heat requires more energy, Ziembra said the cooking time can be decreased, which may indicate that sewage treatment plants can kill more bacteria while maintaining current costs.

"The best way to mitigate the public's concern over the health risks would be to make the treatment process more effective in killing bacteria," Ziembra said.

Since the United States produces about 7 million tons of sewage sludge per year, storing the waste in landfills is expensive and not sustainable, Bibby said. But burning sludge in incinerators — the disposal method used in Connecticut and much of the Northeast — releases pollutants such as mercury into the air while consuming large amounts of energy, Ziembra said. Environmental laws and public opinion also make it nearly impossible for states to build new incinerators, he added.

Currently, recycling the treated waste as fertilizer may be the most sustainable and cheapest disposal option for sludge, Ziembra said.

Sewage sludge contains high concentrations of plant nutrients, such as nitrogen and phosphorus, while improving soil's capacity to hold water, Ziemba said. But even though these fertilizers can be beneficial for agriculture, there is widespread public uncertainty about their health risks, he added.

"There's no controversy about the agricultural benefits of using [treated waste] as fertilizer," Ziemba said. "The controversy is about the metals, pathogens and chemicals that may be persistent in the [sewage] after treatment."

Soon after the EPA allowed treated sewage to be used as fertilizer, thousands of people filed lawsuits, alleging, despite lack of evidence, that the fertilizers were making them sick. While the Centers for Disease Control have agreed to investigate the risks, no investigation has been conducted. Counties and towns in 16 states have already restricted or banned the use of treated sewage as fertilizer.

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