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#644 - Excrement Happens -- Part 1
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Recently we came upon a history of the management of human excreta -- urine and feces -- starting back in the mists of time and working forward to the present day.[1] It turns out that this unlikely topic can tell us something important about the way humans make environmental decisions. For that reason, we're going to recap the story here. The original author, Abby A. Rockefeller, deserves credit for all the original work, though not, of course, blame for any of our lapses or misinterpretations in the retelling. Where we have supplemented Ms. Rockefeller's history with additional facts, they appear inside square brackets.

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Humans began to lead a settled life, growing crops to supplement hunting and gathering, only about 10,000 years ago. For all time before that, humans "deposited their excreta -- urine and feces -- on the ground, here and there, in the manner of all other land creatures." The soil and its communities (including plants, small animals and microorganisms) captured almost all of the nutrients in animal excrement and recycled them into new components for soil. In this way, the nutrients were endlessly recycled within the soil ecosystem and largely kept out of surface water.

As a result, what we call "pure water" is low in nutrients, particularly the major nutrients nitrogen and phosphorus. Because these conditions have existed for a very long time, life in lakes, rivers, and oceans is accustomed to the relative absence of these nutrients. Over the past couple of billion years, life has flourished in this low- nutrient environment, growing complex and interdependent in the process -- an aquatic condition we call "clean" and "healthy."

When a body of water is suddenly inundated with nutrients -- especially nitrogen and phosphorus -- things change drastically. One or a few organisms flourish and begin to crowd out the others. We can all recall seeing a body of water that is pea-soup green from overgrowth of algae. Such a water body is clearly sick, choked, its diversity vastly diminished.

Today, much of the surface water of the planet is in a state of ill health because of misplaced nutrients. And a main contributing culprit is misplaced human excreta.

Long ago, human civilizations split into two camps regarding the management of excreta. Many Asian societies recognized the nutrient value of "night soil" (as it became known). For several thousand years, and up until very recently, Asian agriculture flourished by recycling human wastes into crop land.

The opposing camp, particularly in Europe, had ambiguous feelings about human waste -- was it valuable fertilizer or was it a nasty and embarrassing problem to get rid of?

In Europe, a pattern evolved: The first stage was urinating and defecating on the ground near dwellings. As population density increased, this became intolerable and the community pit evolved. For privacy, this evolved into the pit privy or "outhouse" -- a privacy structure atop a hole in the ground. Despite what many people may think, the pit privy is not environmentally sound -- it deprives the soil of the nutrients in excrement, and by concentrating wastes it promotes pollution of groundwater by those same nutrients.

Before the advent of piped water in the late 18th century, European towns stored excreta in cesspools (lined pits with some drainage of liquids) or in vault privies (tight tanks without any drainage). The "night soil" was removed by "scavengers" and was either taken to farms, or dumped into pits in the ground or into rivers. In general, Europeans never developed a clear and consistent perception of the nutrient value of excrement, as Asians had done.

In ancient Rome, the wealthy elite had indoor toilets and running water to remove excrement via sewers. Later, European

cities developed crude sewer systems -- usually open gutters but sometimes covered trenches along the center or sides of streets -- though they had no running water until the 18th or even 19th centuries. The putrefying matter in these stagnant ditches did not move until it rained -- thus the name "storm sewers" -- and many cities prohibited the dumping of human wastes into such sewers.

With the advent of piped water, things changed dramatically. In this country, the first waterworks was installed in Philadelphia in 1802 and by 1860 136 cities were enjoying piped water systems. By 1880, the number was up to 598. With piped water, per-capita water use increased at least 10-fold, from 3-5 gallons per person per day to 30-50 gallons per person per day or even more.

Water piped into homes had to be piped out again. This caused cesspools to overflow, thus increasing the problems of odors and of water-borne diseases. To solve these problems, cesspools were connected to the city's crude sewer systems which ran along the streets. The result was epidemics of cholera. In Paris in 1832, 20,000 people died of cholera. Around the world, the combination of piped water and open sewers has consistently led to outbreaks of cholera.

To solve this problem, engineers designed closed sewer systems, pipes using water as the vehicle for carrying away excrement. This solution engendered a debate among engineers: some wanted to return sewage to agricultural land, others argued that "water purifies itself" and wanted to pipe sewage straight into lakes, rivers, and oceans. By 1910, the debate was over and sewage was being dumped into water bodies on a grand scale.

In the cities, cholera epidemics abated. However, cities drawing their drinking water downstream from sewage discharges began having outbreaks of typhoid. This engendered another debate: whether to treat sewage before dumping it into water bodies used for drinking, or whether to filter drinking water. Public health officials favored treating sewage before dumping it; sanitary engineers favored dumping sewage raw and filtering water before drinking. The engineers prevailed. As cities began to filter and disinfect their drinking water, typhoid abated.

Throughout the 20th century, the U.S. and Europe industrialized rapidly. Industry developed a huge demand for low-cost waste disposal, and sewers were the cheapest place to dump because the public was paying. As the pressure for greater waste disposal capacity increased, industrialized nations allocated vast sums of money to construct centralized sewer systems to serve the combined needs of homes and factories.

As a result, the nutrients in excrement became mixed with industrial wastes, many of them toxic. So by the 1950s, essentially every body of water receiving piped wastes was badly polluted with a combination of excessive nutrients and toxicants. This led to a demand to treat wastes before dumping them into water. Thus began the "treatment" phase of the "get rid of it" approach to human waste.

As centralized sewer systems evolved, first came "primary treatment." This consists of mechanically screening out the dead cats and other "floatables." All other nutrients and toxic chemicals remain in the waste water that is discharged to a river or ocean.

Next came "secondary treatment" which speeds up the biological decomposition of wastes by forcing oxygen into them, by promoting bacterial growth, and by other means. This is an energy-intensive process and therefore expensive. Unfortunately, it, too, leaves many of the nutrients and toxic chemicals in the discharge water.

[The Congressional Research Service recently estimated that the federal government spent $69.5 billion on centralized sewage

treatment plants, 1973-1999.

Despite this huge expenditure, the Congressional Research Service said in 1999, "States report that municipal discharges are the second leading source of water quality impairment in all of the nation's waters (rivers and streams, lakes, and estuaries and coastal waters). Pollutants associated with municipal discharges include nutrients..., bacteria and other pathogens, as well as metals and toxic chemicals from industrial and commercial activities and households."[2]]

To the extent that primary and secondary treatment are successful, they move nutrients and toxicants (combined) into a new form: sludge. Sludge is the de-watered, sticky black "cake" created in large quantities by modern sewage treatment plants. Sludge contains everything that can go down the drains in homes and industries and which a treatment plant is able to get back out.

In the FEDERAL REGISTER November 9, 1990, U.S. Environmental Protection Agency describes sludge this way:

"The chemical composition and biological constituents of the sludge depend upon the composition of the wastewater entering the treatment facilities and the subsequent treatment processes. Typically, these constituents may include volatiles, organic solids, nutrients, disease- causing pathogenic organisms (e.g., bacteria, viruses, etc.), heavy metals and inorganic ions, and toxic organic chemicals from industrial wastes, household chemicals, and pesticides."

Industry is currently using 70,000 different chemicals in commercial quantities; any of these may appear in sludge. About 1000 new chemicals come into commercial use each year, so any of these, too, may appear in sludge. A description of the toxicants that may be found in sludge would fill several books. The U.S. General Accounting Office has reported -- not surprisingly -- that municipal sludge contains radioactive wastes (from both medical and military sources).[3]

With hundreds of sewage treatment plants producing toxic sludge in mountainous quantities, the next question was, what in the world to do with it?

For many years, coastal cities dumped sewage sludge into the oceans, where it created large "dead zones" that could not support marine life. Other communities dumped their sludge into landfills, where it could pollute their groundwater. Still others incinerated their sludge, thus creating serious air pollution problems, then landfilled the remaining ash or simply heaped the ash on the ground for the wind to disperse.

In 1988 Congress outlawed the ocean dumping of sewage sludge. At this point, many communities faced a real waste crisis. There was no safe (or even sensible) place to put the mountains of toxic sludge that are generated every day by centralized sewage treatment systems.

It was at this point in history that U.S. Environmental Protection Agency (EPA) -- feeling tremendous pressure to "solve" the sludge disposal problem -- discovered that sewage sludge is really "night soil" -- the nutrient-rich product that has fertilized crops in Asia for several thousand years. EPA decided that the expedient thing to do with sewage sludge was to plow it into the land.

Shortly after 1992, when the ban on ocean dumping went into effect, EPA renamed toxic sludge "beneficial biosolids," and began aggressively campaigning to sell it to the American people as fertilizer.

[To be continued]

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)

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[1] Abby A. Rockefeller, "Civilization and Sludge: Notes on the History of the Management of Human Excreta," CURRENT WORLD LEADERS Vol. 39, No. 6 (December 1996), pgs. 99-113. Ms. Rockefeller is president of the ReSource Institute for Low Entropy Systems, 179 Boylston St., Boston, MA 02130; telephone (617) 524-7258.

[2] U.S. General Accounting Office, NUCLEAR REGULATION; ACTION NEEDED TO CONTROL RADIOACTIVE CONTAMINATION AT SEWAGE TREATMENT PLANTS [GAO/RCED-94-133 (Washington, D.C.: U.S. General Accounting Office, May 1994).

[3] Claudia Copeland, WASTEWATER TREATMENT: OVERVIEW AND BACKGROUND [98-323 ENR] (Washington, D.C.: Congressional Research service, January 20, 1999). Available at: http://- www.cnie.org/nle/h2o-29.html .

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