Fact or Fiction?

Jack W. Dini
1537 Desoto Way
Livermore, CA 94550
E-mail: jdini@comcast.net

Humans Excrete Toxic Stuff

Every human being is a "polluter," says Dr. Jane M. Orient, and she is right on the mark. From head to toe we are continually adding "stuff to the environment." The typical human body exhausts 20 grams of organic products per day in intestinal gas, sweat, urine and feces.[1]

The average human is more microbe than mammal, a veritable super-organism comprising ten times as many microbial cells as human cells.[2] Every day we shed forty million flakes of skin, each one supporting a rich flora of bacteria with characteristic odors. All this invisible and odorous dandruff drifts along behind us in a vapor trail, leaving a track that leaps out at a bloodhound like neon lights. Even on a quiet day, we produce several pints of sweat, the smell of which is so distinctive that most dogs can retrieve a pebble from a river bed and return it to the hand of the man who threw it. In a laboratory test, a dog showed that it could identify the single glass slide in a box that had been touched briefly by one human fingertip six weeks previously.[3]

Let's look at what else we create, starting from the head and working our way down to the feet.

Hair

Brendan Borrell notes, "We secrete lipids on our scalps at a rate of hundreds of micrograms per centimeter per hour. It's an oil slick on our head. Our hair is on there. It's dark and wet and it's greasy. So it's really a great place for microorganisms to live. The fungus lives by digesting those oils."[4]

Mouth

Humans make ideal hosts and support flourishing bacteria populations which are distributed liberally wherever we go. Lyall Watson reports, "With each 100 spoken words, particularly those with explosive consonants like 't' or 'p', we put 250 tiny droplets into the air. Forty percent of these contain one or more bacteria, usually of the Streptococcus or Staphylococcus types. A single cough is worth 2000 words, wheeling out 5000 potentially dangerous droplets. But a sneeze is the Rolls Royce of bacterial vehicles. With acceleration from a standing start to 400 meters per second, almost the speed of sound, most of them infected. This biological tornado burdens the air with as many bacteria as would normally be dispersed by someone speaking 400,000 words - which would mean talking non-stop for fifty-five hours or reading *War and Peace* out loud."[5]

Volatile organic compounds (VOCs) are of concern because of their potentially harmful effects. As noted in a previous column (May 2008), we create VOCs and expel them via our breath. The major VOCs in the breath of healthy individuals are isoprene (12-580 ppb), acetone (12-1,880 ppb), ethanol (13-1,000 ppb), methanol (160-2,000 ppb) and a variety of other alcohols. Minor components include pentane and higher aldehydes and ketones.[6]

Our breaths give distinctive odors, particularly if we are harboring some diseases. Volatile fatty acids are excreted via the lungs, and fatty diets may also give acidosis or ketoses - resulting in halitosis - resembling the odor of poorly controlled diabetes.[7] Typhoid fever smells of freshly baked brown bread. Tuberculosis carries the sour scent of stale beer. Encounters with yellow fever are reminiscent of visits to a butcher's shop. The breath of some diabetic patients has the sharp odor of acetone. Sufferers from the rare, hereditary brain disease phenylketonuria are distinctly mousy. And even schizophrenia is accompanied by a characteristic sweaty smell.[8]

Then there's saliva and carbon dioxide. We secrete between half a liter[9] to three liters of saliva a day.[10] Lastly, since we all emit carbon dioxide via our breaths, watch out for the Nanny State! The federal government may soon declare our breath to be toxic regardless of its minty freshness. Consistent with a recent Supreme Court ruling that the EPA may regulate carbon dioxide as a hazardous air pollutant, the agency is evaluating how carbon dioxide could be regulated as hazardous substance under its Superfund program.[11]

Poop

... Man's dung, or excrement, hath very great virtues, because it contains in it all the noble essences, viz: of the Food and Drink. - Paracelsus[12]

There's more to poop than most folks realize. The fact that most history comes sanitized means that many of us are not attuned to something essential to our daily lives. From a research point of view, feces provide the best window into the microbial life of the human gut, a subject that is attracting more funding than ever before, so the subject is clearly worth some attention.[13]

For starters, Nick Lane notes, "We owe our most god-like qualities, indeed our very existence, to the primal need for defecation."[14] He gets this from an interesting paper published in *Nature* in 1995.[15] The researchers claim that fecal pellets from the first large animals cleansed the

oceans, paving the way for the Cambrian explosion. Lane notes that the researchers based their arguments on a detailed study of carbon isotopes in molecular fossils. They "found that virtually all the organic carbon produced during the long period of environmental stasis from 1.8 billion to 750 million years ago was not buried in sediments, but was instead broken down again and reused by bacteria lower in the water column. The dead remains of the tiny, almost weightless, bacteria sank very slowly into deeper waters, giving consumers plenty of time to reuse any available carbon."[14]

Human fecal matter typically has the composition shown in Table 1. The amount per person is 0.3 to 0.6 pounds per person per day (136 to 272 grams), wet weight.[16]

Table 1
Composition of human fecal matter*

Organic matter (dry weight)	88 to 97%
Moisture content	66 to 80%
Nitrogen	5 to 7%
Phosphorus	3 to 5.4%
Potassium	1 to 2.5%
Carbon	40 to 55%
Calcium	4 to 5%
Carbon/Nitrogen ratio	5 to 10

*From: J.C. Jenkins, *The Humanure Handbook*, Jenkins Publishing, Grove City, PA, 1994; p. 39.

Urine

Average urine volume per day for an adult is about 1.5 liters. This typically contains: uric acid 0.6 g, bicarbonate ions, 1.2 g, creatinine 2.7 g, potassium ions 3.2 g, sodium ions 4.1 g, chloride ions 6.6 g and urea 25.5 g.[17]

Urinary excretion is probably the most important excretory route for metals.[18] Add caffeine to the list. One of coffee's most notable contributions to global ecology is the presence of caffeine passed with human urine into the world's waterways. Researchers in Switzerland demonstrated that caffeine was a ubiquitous component of Swiss waterways. Lake and river water contained 6 to 250 ng caffeine/L, while for the most remote mountain lakes it was less than 2 ng/L. So noticeable was this contribution of the human race's obsession with coffee that the paper's authors suggested that caffeine could be an excellent anthropogenic marker for monitoring effluent of untreated wastewater escaping into surface waterways.[19]

A failed nuclear-waste disposal law proposed in the Colorado legislature would have made a trip to the restroom a criminal offense since urine is always radioactive with Potassium-40.[20]

Despite making up only 1% of the volume of waste water, urine contributes about 80% of the nitrogen and 45% of all the phosphate.[17] Each human being excretes a minimum of 1.5 grams of phosphorus per day, so that the annual input alone is more than one-half billion pounds of phosphate, as $P_2 0_5$. It was this fact that had led the Soap and Detergent Association to investigate economical treatment techniques for the removal of phosphates from sewage.[21]

Iron

The average person loses approximately 1 mg of iron each day in shed skin, urine, and bile. To remain healthy, adults need to maintain 3 to 4 grams of iron in their bodies at all times. This is enough to provide most adult males and post-menopausal women with roughly 500 mg of iron per liter of blood.[22]

Feet

Skin cells progress through different stages of development until they slough off in a perpetual, silent shower of dead cells and debris. Some two-to three billion cellular remnants are shed daily. Enough comes off the foot alone to add 190 mg of dead cells to a pair of socks.[23] If all this gives you athlete's foot and you want to eliminate it - stomp on grapes. No health and safety inspector would allow this, but Henry Hobhouse reports that it is unexcelled for cleaning the feet and destroying the fungus which causes athlete's foot.[23] Here's a way to work this issue. Make your own wine and as you sit with friends and they tell you how good it is and what good nose it has, only you will know that instead of being aged in oak, it was the product of eliminating athlete's foot from your body. **P&SF**

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