Sick Work!
Sewage Exposure
Stats And Solutions

Everyone knows that sewer work is a “dirty job,” but there are factors – and real-life stories – that suggest the incidence and risk of sickness are rising.

Bedpan contents from quarantined hospital patients, radioactive chemicals, industrial chemicals, human blood from morgues, animal blood from labs — it all ends up in the sewer. Then, of course, there’s the usual: anything and everything that goes down the toilet or drainpipe. Sewer workers are a hardy breed, and they know full well that they’re dealing with some pretty gross … um, stuff. It may be an unwelcome surprise, however, to learn that the “stuff” they encounter is becoming increasingly pathogenic, and that the job is getting ever more dangerous.

Viruses Trending Up

There are approximately 3,000 viruses recognized in nature, but that merely scratches the surface of what exists. As scientists continually seek to identify more, they often visit the sewers, which are both a destination and a breeding ground for viruses. Many viruses are brought in by human and animal feces and urine, plant material, and the insects and rodents that make the sewers their home, but then they proliferate. The viral count expands when the host viruses infect the bacteria, rotifers, amoeba, and fungi that readily (and rapidly) grow in raw sewage. The longer sewage sits, the more viruses are created. Consider that a single bacterium will split, under proper conditions, every 20 minutes; the exponential growth rate amounts to 69 billion in a matter of 12 hours. With today’s water conservation efforts creating less flow and longer retention times — think low-flow toilets and urban sprawl — sewers are virtual petri dishes for new bacteria and viruses.

In 2011, scientists from the American Society for Microbiology (ASM) were among those who took to the sewers searching for viruses. Most of what they found was brand new — at least to the science and medical community. “The ratio (43,381/3,027) of novel to known viral sequence reads is approximately 10:1,” the ASM study concluded. “Our data demonstrate that known viruses represent a small fraction of the viral universe.”

Unknown viruses have equally unknown effects — and some viruses can lay dormant in humans for months or years before surfacing — so there is plenty of potential for unpleasant consequences in the future. But there are also consequences being realized here and now.

The Devil We Know

The ASM study identified 234 viruses of the known variety in its sewer search, 17 of which are communicable to humans. Such viruses included human adenovirus, human papillomavirus (HPV), cholera, typhoid, HIV, and H1N1. Other scary findings from researchers conducting sewer dives include methicillin-resistant Staphylococcus aureus (MRSA) bacteria, poxviruses, herpesviruses, and hepatitis A virus (HAV). The journal Occupational and Environmental Medicine released a study specific to HAV stating that “frequent occupational exposure to raw sewage was a significant risk factor for HAV infection.” The study noted that, “of 50 employees who reported occupational exposure to raw sewage most of the time, 30 (60 percent) had had HAV infection.”

MRSA has even made its way to the treatment plant. From 2009 to 2010, University of Maryland (UMD) researchers tested four water reclamation facilities, taking numerous samples from each throughout the treatment processes. While half of all the extracted samples contained MRSA, only one of the four facilities tested positive for MRSA at the end of treatment. Though that is certainly one too many, it is noteworthy that the plant did not employ tertiary treatment by chlorinating its water regularly. With the rise of water reuse and the potential for direct public exposure to the product, this is a sound lesson for reclamation facilities.

By Kevin Westerling
Meanwhile, the same UMD study revealed that 83 percent of the raw sewage samples coming into the plant contained MRSA, giving indication of its prevalence in sewers. What distinguishes MRSA from most other infections is its antibiotic resistance. Unfortunately, that may not be an exceptional trait for long.

**Stronger Viruses, Weaker Medicine**

As previously mentioned, bacteria split, grow, and form new bacteria. The characteristics of each are continually swapped around, and one such characteristic is antibiotic resistance. In what amounts to survival-of-the-fittest evolution, “superbugs” are created, and antibiotics render diminishing returns. A worst-case scenario paints a grim picture for public health in general — and it has not gone unnoticed by the World Health Organization or the Centers for Disease Control and Prevention (CDC) — but it is especially significant for sewer workers who are at much higher exposure levels and greater risk to bacterial infections and illnesses.

TJ Suiter, a former wastewater worker who now designs safety equipment for the profession, shared with me some stories he gathered during a 10-city tour doing field research for his safety systems. True to what the studies suggest, he encountered two cases of hepatitis and a case of MRSA among the workers he met. Suiter also described two separate incidents where workers suffered cuts — one while working on a lift station, the other in a manhole — and contracted meningitis and cellulitis, respectively. The former is out on lifetime disability, while the latter “was one day away from an amputation.” Both were saved by antibiotics. Current trends dictate, however, that these same antibiotics will soon be obsolete. Not only are antibiotics on the whole becoming decreasingly effective, but they are also being approved at a decreasing rate (see Figure 1). Even vancomycin, which is considered an antibiotic of last resort for the treatment of numerous bacterial infections, has lost much of its efficacy — a problem the CDC labels as a serious threat to public health.5

**How Employees Can Protect Themselves**

The perfect storm of factors conspiring against the health of sewer workers is no doubt distressing, especially since there is little to nothing individual workers can do to reverse the course of the negative trends themselves. The daunting task of keeping medicine a step ahead of evolving strains of bacteria will be one for the science and medical communities to share. In the meantime, there are immediate actions workers can take to better protect themselves.

The number-one defense is still simple hygiene. But simple doesn't necessarily mean typical. While rubber gloves, boots, and protective clothing are thankfully commonplace, safety glasses apparently are not. “It’s very rare, frankly, to see workers wearing glasses,” says Suiter, who has been watching workers in the field for more than 25 years. This particular oversight — or style choice, if that’s the case — is a risky proposition. Suiter explains why: “Your eyeball is a perfect environment for viruses and bacteria to enter your body, simply because it’s a moist, wet, and warm environment where liquid

![Figure 1. Dramatic Decrease In Antibiotic Drug Approvals](image)

Antibiotic development is dwindling.4
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can be readily taken in. It’s the same with your nasal membranes and your mouth; bacteria quickly multiply when they’re in a warm, wet environment.”

Take the note: **Add facemask to go with specs.**

The National Institute for Occupational Safety and Health (NIOSH) has weighed in with its own sanitary guidelines, which include frequent hand-washing with antibacterial soap (be sure to scrub under your nails with a brush, they say) and a particular advisement to wash up before eating, smoking, or drinking.

So simple, it almost sounds childlike (cue flashbacks of mom telling you to wash up for dinner). And yet …

“You go out on any sewer crew and you’re going to find guys who are working in the hot sun, wiping the sweat off their face, and taking drinks of their water with contaminated gloves on,” describes Suiter. “You’ll see them finish up the job, take off their gloves, pick up that very same water bottle — contaminated with feces and every other thing that’s in the sanitary sewer — and carry it into the truck with them. Then they’ll immediately eat a snack, or put some chew in their mouth.”

Sound familiar? If so, it’s more risky business — even for the grizzled veterans of the sewer, many of whom are under the impression that they’ve developed immunity from the dangerous bacteria. While that may be true to a point, it doesn’t pertain to the new strains of bacteria that are continuously developing. All workers need to maintain hygiene awareness throughout their shift in order to stay healthy.

And just so the good health extends to the home, NIOSH adds another warning: Wash your clothing on-site, not at home. Contaminated clothing and boots may expose family members to pathogens. And conventional washing machines don’t reach the extreme heat required to destroy them.

### How Municipalities Can Protect Employees

Beyond setting strict protocol and enforcing it (i.e. babysitting), municipalities can make sure that their workers have the appropriate personal protective equipment (PPE) to look after themselves. That includes Tyvek suits, protective glasses, and facemasks, and it could also include specialized equipment.

One of the most commonly used tools of the trade for sewer cleaning and maintenance is the high-pressure jet hose. Because it travels through the sewer and then goes back on the truck, it is also one of the most contaminated tools. For Suiter, this was an opportunity to synch innovation and sanitization. He invented the Vanguard System, whereby the hose is sanitized with antibacterial-infused water as it travels through a pulley on its way out of the manhole and onto the hose reel. It also features a manual component so workers can spray down other equipment, themselves, and each other.

Personally, I have not seen very much else in the way of innovation with regard to decontamination equipment or PPE, and that may be because we already have the essential tools at our disposal. Even the system described above is a very simple (but smart) concept: It cleans equipment and people, but it makes it easier to do so. If workers in the field are a bit dismissive or nonchalant about following through on proper equipment and cleaning, then a little ease-of-use may promote more compliance. Putting systems in place with proven efficacy may also reduce a municipality’s insurance costs. However you get them there — with updated equipment, training programs, site monitoring, etc. — the buy-in and follow-through from the workers will always be the key to maintaining their safety.

If all else fails, you can also resort to scaring the bejesus out them. Just have them read this article.

**Contaminated clothing and boots may expose family members to pathogens.**

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