TerranearPMC Safety Share

Robert Brounstein

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When people think they are the only one in a public restroom, chances are, they will walk out without washing their hands. And if they do go to the sink after using the bathroom, 95 percent of people fail to wash their hands long enough to kill bacteria. Researchers have found that only two in three people use soap, while 1 in 10 skip the sink altogether; and men get much lower marks for hand hygiene than women.

When germs get onto hands and are not washed off, they can be passed from person to person, spreading disease and making people sick. Handwashing with soap removes germs from hands, which is an effective preventative measure for diarrhea and respiratory infections and may even help prevent skin and eye infections.

Many of us have memories of our parents warning us, "Wash your hands after you play with the dog….you'll get germs!" Germs?!, So what exactly are germs? "Germ" is sort of a generic term that encompasses microscopic bacteria, viruses, fungi, and protozoa that can cause disease. And hand washing remains an important method to control, not just bacterial sources, but also other types of contaminants, such as metals and volatile organics – such materials commonly associated with occupational exposures.

The ingestion route of exposure, when compared to the routes if inhalation and skin contact, has tended to be overlooked. This is probably owing to several factors. For instance, there is the misconception that ingestion of hazardous substances can only occur by intentional means or acts of gross negligence, and hence can be avoided. In addition, there is an erroneous belief that materials, when they are absorbed, are only absorbed in the gut at a very poor rate of efficiency (i.e. they have low bioavailability) and as such, are unlikely to produce toxic effects when swallowed in small quantities. There is also the misconception that ingested materials (contaminants) will be metabolized in the liver and excreted before having the opportunity to exert toxic effects. At the same time, there is a presumption that when a worker is exposed by inhalation, dermal contact and ingestion, the mass of material taken into the body by ingestion is too small when compared with the other routes. Therefore, persons are more apt to focus on controlling inhalation and skin contact exposures.

Work-related ingestion of hazardous substances may occur in one of four ways: (i) clearance of inhaled aerosols deposited within the ciliated airways of the lung, (ii) ingestion of contaminated food or beverages, (iii) transfer of contamination by hand-to-mouth or object-to-mouth contact and (iv) by direct deposition of contaminants around the mouth and into the oral cavity. In the first case, the amount of contamination available for ingestion can be estimated by sampling the coarsest particle sizes as these particles cannot enter the lower regions of the lungs and therefore, must resurface by a mechanism known as the mucociliary escalator. Once these larger particles resurface in the mouth/throat region, they are either eliminated via sputum or swallowed into the digestive tract. In the second case the assessment of exposure is relatively straightforward because the consumption of food is purposeful and predictable, so exposure can be assessed by measuring the amount of chemical contamination in the food and the quantity of food consumed. Contamination via hand-to-mouth, can be controlled by appropriate personal hygiene and segregation of eating areas. However, when considering the specific habits of individuals, quantification of ingestions is not so obvious. Regarding direct deposition of contaminants around the mouth and into the oral cavity, suitable methods to measure this potential have not been fully recognized.

One of the most common ingestion hazards is the metal lead: both from a nonoccupational as well as occupational concern. OSHA even has specific laundry requirements to protect workers from potential

ingestion hazards, where 29 CFR 1910.1025 specifies proper laundering of clothing and maintaining hygiene facilities and practices: all to control ingestion of lead.

Probably the most notable example of nonoccupational lead exposure via ingestion is the recently confirmed story of the great composer, Ludwig van Beethoven, who suffered from lead poisoning. As the story goes, the composer was a wine lover, and wine at the time was known to contain high levels of lead. The reason for this was that lead acetate (aka sugar of lead) was a sweetener and is unfortunately, toxic. Beethoven, like many during his time, drank out of a goblet made partially of lead which could be leached into the drink. Beethoven may not have been exposed to higher-than-normal lead levels when compared to others during his life, however, there is evidence that suggests the composer may have been hyper-sensitive to lead and his body may not have been able to eliminate it as tests performed on Beethoven's hair and bone are strong indicators that lead accumulated within his body at greater concentrations than his contemporaries.

The earliest *confirmed* poisoning by lead acetate was that of Pope Clement II who died in October 1047. A toxicological examination of his remains conducted in the mid-20th century verified centuries-old rumors that he had been poisoned with lead sugar

To sweeten their wines and other foods, the Romans would boil down grapes into a variety of syrups, all of which had one thing in common: they were simmered slowly in lead pots or lead-lined copper kettles. When the recipes were tested in modern days, they produced syrups with lead concentrations of 240 to 1000 milligrams per liter. And one teaspoon (5ml) of such syrup – consumed on a regular basis - would have been more than enough to cause chronic lead poisoning.

People handling hazardous chemicals will not knowingly ingest toxic materials unless there is some intent to self-harm. Exposure to some transition metal elements, such as zinc, nickel and chromium, while having toxic effects by inhalation, are poorly absorbed in the digestive tract and are therefore, not considered to be a serious risk via ingestion. Such is the case for elemental mercury, where in the 19th century was swallowed as a laxative and is poorly absorbed by the digestive tract; however, inhalation of elemental mercury vapors is known to be quite toxic.

Unfortunately, despite our recognition of the risks via ingestion, there has been little systematic research on this topic and so there is no real understanding of the relative importance of this route of exposure. According to the technical guidance document on chemical risk assessment from the European Chemical Bureau (ECB), "There are no accepted methods for assessing exposure by ingestion. It is usually controlled by straightforward good hygiene practices such as segregating working and eating facilities and adequate washing prior to eating (ECB, 2003)."

Nevertheless, with all this uncertainty regarding proper assessment techniques via ingestion as well as understanding the specific mechanism that can cause adverse health effects, as the ECB concludes, the ability for exposure control is available. That is, practicing effective hygiene methods and using proper PPE (i.e. gloves) and cleaning areas that may be potentially contaminated, can be quite helpful to control human susceptibility to the adverse health effects associated with ingestion.

Wherever the art of medicine is loved, there is also a love of humanity

Hippocrates