CONCENTRATION ANALOGIES

Except for the last line under each concentration, this document has been distributed by several anti-environmental "front" groups to "educate" their readers (i.e. Citizens for a Sound Economy, The Reason Foundation, the CATO institute, Junkscience.com, Rush Limbaugh, etc.). Strange that they do not include the last line or a statement explaining that potentially one molecule of carcinogen can induce a cancer-causing mutation, or that many of our own hormones act in the ppb concentration range. One must also ponder the question, do these "conservative" groups care about my health or "conserving" their profit margin. Remember that a life long exposure to low concentrations of mutagen is likely to be more carcinogenic than a brief exposure at rather high levels. This is because our DNA repair enzymes are not upregulated by low concentrations of mutagens. Remember that mutations accumulate in our DNA as we pass through life, that only about 2% of all cancers can be traced to the inheritance of defective genes, and that DNA is a chemical and the only way to modify a chemical is with another chemical.

One Part Per Million

one automobile in bumper-to-bumper traffic from Cleveland to San Francisco
one pancake in a stack four miles high
1 inch in 16 miles
one minute in two years
one ounce in 32 tons
one cent in $10,000
8,000,000,000,000,000,000 molecules of carcinogenic chloroform in a cup of coffee made from chlorinated tap at 1 ppm

One Part Per Billion

one 4-inch hamburger in a chain of hamburgers circling the earth at the equator 2.5 times
one silver dollar in a roll of silver dollars stretching from Detroit to Salt Lake City
one bogie in 3,500 golf tournaments
one kernel of corn in a 45-foot high, 16-foot diameter silo
one sheet in a roll of toilet paper stretching from New York to London
one second of time in 32 years
8,000,000,000,000,000 molecules of chloroform in a cup of coffee made from tap water after diluting a thousand fold with purified water.

One Part Per Trillion

one square foot of floor tile on a kitchen floor the size of Indiana
one drop of detergent in enough dishwater to fill a string of railroad tank cars ten miles long
one square inch in 250 square miles
one mile on a 2-month journey at the speed of light
8,000,000,000,000 molecules of chloroform in a cup of coffee made from tap water diluted one million fold with purified water.

Explanation: There are 30 ml of water in one ounce (oz), so an 8 oz cup of water is about 0.25 L. At a concentration of 0.1 mg/L (0.1 ppm) an 8 ounce cup of legal tap water could contain 25 μgm of trihalomethane (chloroform and related products of disinfection). Remember that a mole of anything contains 6.02×10^{23} molecules.