

White paper  
Chemotherapy and other Hazardous Drugs

First, we need to realize that the words medicine, pharmaceuticals, drugs and chemicals are synonymous. Some drugs, such as chemotherapy drugs, are the most toxic man made chemicals in existence, thousands more times toxic than PCB's or Mercury.

Second, it is important to understand that the EPA has not regulated a pharmaceutical in over 25 years and the regulations on hazardous waste are over 32 years old. In those 32 years, *millions* of chemicals that have been created.

Third, a fact often overlooked is, the human body absorbs only a small percentage (often less than 10%) of the administered drugs (chemicals). The remaining un-metabolized drug (up to 90%) is excreted via the urine, feces, sweat, and breath.

These chemicals are so toxic that the drug companies subcontract the manufacture to reduce liability for exposure to employees. Active Pharmaceutical Ingredients or API's are typically manufactured in small labs to control exposure to workers. The medicine is then packaged in sealed glass vials and shipped to hospital pharmacies. OSHA has written extensive regulations on how to handle Hazardous Drugs (HD) and they have determined that there is *no safe exposure level* for these chemicals. Most of the drugs are known to cause **Cancer** and are also known **Teratogens**. Teratogens **\*\***(a drug or other substance capable of interfering with the development of a fetus, causing birth defects)**\*\***

At the hospital, the pharmacist is required to prepare these drugs in a level 3 biological safety cabinet the same level of protection used to handle **ANTHRAX**. The pharmacist then takes the prepared drugs to the nurses to administer to the patient and tosses the empty vial, syringe and needle in the sharps container, or a residual Chemo container. OSHA states in order to administer a dose of these drugs a nurse must wear special gloves, a protective gown and a splash shield to reduce risk of potential exposure (remember there is no safe exposure level). After the nurse administers the drug to the patient, the used tubing, IV bag and gloves are disposed of as a residual Chemo. If the patient urinates or vomits OSHA guidelines suggest the attending nurse first don protective clothing prior to cleaning up the body fluids to protect him or herself from exposure to the drug that passed through the body. The sheets must also be disposed of as contaminated material. A larger problem arises when the patient goes home and uses the bathroom in their home, the chemicals pass thru the body unchanged and in some cases wipe out the bacteria in the septic system. For patients on septic systems chances are good that you are on a well, so your family will be drinking your chemo drugs. If you are on public sewer the medicine will pass thru the treatment plant unaltered or be concentrated in the sludge. The sludge will be dried and used to make fertilizer (yummy). One of the problems is that the dose of some of these drugs is in the part per trillion range and are in water solutions. That means that even the best incinerator can only guarantee destruction in the part per thousand range. Have you ever looked at a smoke stack on an incinerator the white smoke is steam mixed with particles of chemicals.

The way these chemicals work is by breaking into the blood cell and breaking off the chromosomes in the DNA (high school biology). When the cell splits it is a different cell that has been mutated, the majority of chemotherapy drugs are mutagenic. That means the drugs work on a molecular level and are not dose dependent, that is why OSHA says there is no safe exposure to these drugs, and OSHA should know, as they have been researching this for 20 years.

Some of the more disturbing studies involve nurses who work on the oncology floor at hospitals. [Spontaneous abortions and malformations in the offspring of nurses exposed to anesthetic gases, cytostatic drugs, and other potential hazards in hospitals, based on registered information of outcome. J.Epidem Comm. Health 39:141-7] These nurses had a miscarriage rates or “spontaneous abortion rates” of 4.7, almost 5 times the national average. That study was done in 1985, 23 years ago where is the outrage?

Exposure to Chemo can be shown by testing the urine of the nurses for damage to the DNA of the cell. The first studies of Chromosomal aberrations, or damage to the chromosomes were done in 1979 and showed an increased as the work week went on. A study was commissioned in 2002 to find out if nurses on oncology floors had a higher rate of cancer; this study was canceled and canceled again in 2005.

Cancer will be the leading cause of death in 2010 and will affect 1 in 3 women and 1 in 2 men in their lifetime, that is staggering.

What is the solution? Ban chemotherapy? No. To start, we need to contain the waste and manage it properly. A few easy steps need to be taken and they are as follows;

- Collect all residual vials, syringes, tubes and IV bags and send for treatment and disposal in a secure landfill. Incineration will just put it in the air.
- Collect all gloves, smocks and any other material that has come into contact with the chemotherapy drugs and send for treatment and landfill.
- Collect the excrement from the patients for the first 48 hours following chemotherapy treatment, solidify and immobilize for landfill
- Collect any wastewater the patient generates from showering for 48 hrs and solidify for landfill
- Isolate patients for 3 days, using standard “infection control” precautions, as hospitals now do for patients with antibiotic resistant drug infections. (MRSA, for example)

This may seem a little extreme, but we need to recognize what we are handling and putting into the environment. Going Green may mean more than driving a hybrid car.

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