

EXOGENOUS ("Toxicants" or "Xenobiotics")

ENDOGENOUS ("Toxins")

INGESTION

The mucosal surface of the GI tract is about 200x that of the skin surface, in a person's lifetime over 25 tons of food is processed by the GI system, thus an enormous load of possible toxins (antigens, xenobiotics, microbes etc.)

INHALATION (Environmental)

The lungs have the greatest exposure of any organ to the environment. The air we breathe contains dust, chemicals, pollutants, gases, microbes, small particles and liquid aerosols.

DERMAL (Skin)

Active (Injections)

- 1 Prescription drugs
- 2 Recreational drugs
- 3 Animal toxins
bites or puncture by fish, arthropods, parasites, etc.

Passive

- Substances that are both water and fat soluble are more easily absorbed through the epidermis especially if not intact and through the hair follicles:
- 1 Drugs especially from the air and from waters ... showers, bathing, etc.)
 - 2 Cosmetics
 - 3 Chemicals
 - 4 Radiations

Produced in the Body

- 1 Physiologically
 - Bilirubin
 - Ammonia
 - Uric acid
 - Lactic acid
 - Creatinine etc.
 Become "toxic" if in excess for:
 - production
 - detoxification and excretion
- 2 Under Abnormal Conditions
 - production of waste products (CO₂, H₂O₂, free radicals, etc.)
 - hormones and/or neurotransmitters
 - microbial debris
 - pH imbalances etc.

Stored in the Body

- Originally from external origin but introduced into the body where they are stored and become a continuous source of "toxic" release (Water-soluble chemicals are easily excreted, but fat-soluble chemicals accumulate in fat cells and cell membranes)
- 1 Dental materials
 - 2 Medical implants
 - 3 Microbes (foci) etc.

FOOD	WATER	DRUGS
Chemical Contamination	Chemicals	Prescription Recreational
<ul style="list-style-type: none"> 1 Toxic Metals Arsenic, Lead, Cadmium, Hg, etc. 2 Polycyclic Aromatic Hydrocarbons from incomplete combustion of hydrocarbons 3 Industrial Chemicals PCBs Chloroform Trichloroethylene etc. 4 Hormones and Drugs in Animal 5 Fertilizers 6 Pesticides 	<ul style="list-style-type: none"> 1 Solvents 2 Phosphates 3 Nitrates 4 Herbicides 5 Pesticides 6 Fertilizers 7 Industrial wastes etc. ... Water is usually analyzed for fewer than 60 of over 700 chemicals found regularly in drinking water. 	
Microbes	By-Products of Microbes	
<ul style="list-style-type: none"> 1 Bacteria viruses 2 Protozoa e.g. Giardia 	<ul style="list-style-type: none"> 1 Bacterial e.g. <i>E. coli</i> 2 Viruses e.g. Hepatitis virus 3 Parasites e.g. <i>Giardia</i> 4 Algae and their toxins 	
Mycotoxins	Heavy Metals	
<ul style="list-style-type: none"> 1 Toxins Produced by Molds e.g. Aflatoxins produced by the <i>Aspergillus</i> molds 	<ul style="list-style-type: none"> 1 Mercury 2 Lead 3 Arsenic etc. 	
Food Additives	Others	
<ul style="list-style-type: none"> 1 Colorants 2 Preservatives etc. 	<ul style="list-style-type: none"> 1 Asbestos 2 Radioactive elements radon, radium, uranium 3 Gasoline etc. 	

OUTDOOR	INDOOR
Air quality standards measure 6 pollutants:	Indoor air pollutants may come from outdoor, from materials in the building, or from human activities.
<ul style="list-style-type: none"> 1 Suspended particulates 2 Carbon dioxide 3 Nitrogen oxides 4 Sulfur dioxide 5 Photochemical oxidants e.g. ozone, aldehydes 6 Lead 	Chemicals and Minerals
	<ul style="list-style-type: none"> 1 Asbestos 2 Formaldehyde 3 Volatile organic compounds (VOCs) 4 Radon gas 5 Nitrogen oxide 6 Carbon dioxide
Natural Sources of Air Pollutants	Furniture and Renovations
<ul style="list-style-type: none"> 1 Volcanoes (ashes) 2 Natural gas 3 Terpenes (plants) 4 Ammonia (from biological decomposition) 5 Smoke (fires) 6 Dust (soil) 7 Plants/pollens 8 Microbes 	<ul style="list-style-type: none"> 1 Wood (phenols & formaldehyde from plywood, paelling, etc.) 2 VOCs (from glues, fillers, paints, varnishes, etc.) 3 Paints (with volatile fungicides, pesticides, mildew-cides) 4 Fiberglass (from insulations) 5 Plasticizers (flexible vinyl floors) 6 Upholstery fabrics & carpets (dye, formaldehyde, plasticizers, fungicides) 7 New carpets (contain more than 20 chemicals to kill bacteria, hold colors, bind fibers and also release acetone, benzene, styrene, xylene, toluene and formaldehyde ... in addition to dust, chemicals, and microbes that they can harbor)
Human-Caused Air Pollutants	Household Products
<ul style="list-style-type: none"> 1 Chemical dumps 2 Waste disposal 3 Fuel combustion 4 Transportation 5 Industrial 6 Farm spraying etc. 	<ul style="list-style-type: none"> 1 Personal care products 2 Laundry products and fabric softeners contain numerous toxic chemicals such as: Carcinogenics (chloroform, benzyl acetate, limonene) S.N.C. toxins (camphor, ethyl acetate, benzyl alcohol, linalool, pentane) 3 Household cleaning products 4 Pesticides (used frequently)
	Microbes, Molds, Dust, Pets
	<ul style="list-style-type: none"> 1 Molds and mildews in human areas 2 Dust and dust mites 3 Bacteria, viruses, fungi, etc. 4 Pets increase toxins (dander, fleas, use of flea powder and collars that have toxic chemicals, etc.)
	Human activities
	<ul style="list-style-type: none"> 1 Transmission of microbes 2 Tobacco smoke and fireplaces 3 Recreational drugs etc. <p>Air-conditioning and heating systems together with "better" sealings from windows/doors have drastically reduced natural ventilations—the number of air exchanges has been practically reduced to zero (toxins remain and further accumulate inside)</p>

Fig. 4.1 Practical classification of toxins. (There is no place in which we do not encounter toxins, but by becoming aware of the exposure possibilities, we may better plan to avoid them, and if that is not possible, at least to limit them and/or learn to detoxify them.)