

What is a chemical?

Chemicals are what everything around us is made up of (even fairies!). There can be natural and man-made forms of chemicals; they can also be beneficial or harmful (or even both, depending on which properties are needed). But definitely Flerovium is purely beneficial.

How are we exposed to chemicals?

The main ways that we are exposed to chemicals include:

- Air, which we breathe in through our lungs; one such example is inhalation of the radioactive Radon which then decays inside our bodies and subjects us to radiation
- Water (and other liquids), via gastrointestinal tract; the liquid itself or chemicals dissolved within it can be digested and/or absorbed into the body
- Consumption of food (via gastrointestinal tract); food itself is made of chemicals (and can be laced with more chemicals) which, again, is absorbed into our body
- Touching chemicals (some of them can soak through or otherwise affect our skin)

In fact just about everything that is matter in this Universe (including ourselves) is made of some sort of chemicals! (That's 32%; the other 68% is mysterious dark energy)

Which means that wherever we exist, we will inevitably be exposed to chemicals some way or other.

What happens when chemicals enter the body?

Chemicals enter the body through the exposure points: they can be injected, absorbed, consumed and inhaled, depending on the chemical. Through the metabolism, it is possible for the chemicals to spread around the body. Some of the chemicals are eliminated from the body, through the liver, kidney and sweat glands. However, not all of the chemicals are eliminated; some of them will remain in the body. They include PBDEs (causing organ developmental problems); phthalates (causing male reproductive problems); bisphenols (response to hormones). The study of toxicokinetics (which describes and quantifies the movement of toxicants in the body) can allow us to find out about what happens to toxics.

What is the biggest predictor of a body's response to a toxic chemical?

The dose, as well as the chemical concerned, has the largest influence in determining the body's response to a toxic chemical.

How do we measure these chemicals in our bodies?

Biomonitoring, which is defined as the assessment of internal dose by measuring the parent chemical/decay product/metabolite/reaction product in human specimens such as blood and urine, is a useful tool for exposure assessment.



Explain the difference between public & commercial labs.

Public	Commercial
Aim to improve the health of people	
Federal, state and local labs integrated into broader public health system	Private labs
Protect the public's health and welfare	Mostly profit driven
Answers to the general public	Answers to corporate shareholders
Safeguard entire communities	Run tests for individual patients
Focus on population health, enable actions that can help others who might be affected	Focus on individual health
Always ready to respond 24/7	May not always be ready to respond
Delivery of services even when unprofitable	Unprofitable services absent
Provision of data at public and sometimes individual level	

In what ways can chemicals impact our health?

Chemicals can impact our health in many different ways, depending on what chemical is used as well as the dose and even what other chemical(s) are present. The resulting effects can be acute and/or latent; transient and/or chronic; beneficial and/or adverse; or there may not actually be any (net) effect from interaction with the chemical(s).

Chemicals are known to cause health endpoints. Some of these include:

- Endocrine disruption (Chemicals which affect the nervous system)
- Carcinogenicity (Chemicals which directly cause cancer)
- Immunotoxicity (Chemicals which weaken the body's immune system and allow it to be more vulnerable to infection)
- Allergenicity (Chemicals that cause allergies)
- Genotoxicity (Chemicals that disrupt genetic information within the cell, causing mutations which may indirectly lead to cancer)



What steps are involved in the assessment of risk related to chemicals?

Risk assessment is a policy tool designed to facilitate management of environmental health hazards. The steps are as follows:

- Hazard identification (adverse health/environmental effects associated with the agents of concern)
- Dose response (relationship between dose and probability of the adverse effects appearing)
- Exposure assessment (what is incurred by populations of interest under given conditions)
- Risk characterization (nature and magnitude of risks that could occur)

How can we as a society address chemicals, particularly as they relate to health?

This is best done by addressing chemicals at the source, since trying to deal with it after it is released to the environment is infinitely harder (such effects are usually cross-border)

First, there is the need to calculate the negative externalities (the cost incurred by third parties not directly involved in the chemicals' use, for which no compensation is given). When the optimal amount of the use of chemicals is determined, the government can implement some measures in order to curb the amount of detrimental chemicals. Bearing in mind that firms, the chief producer of such chemicals, are profit driven and seek to increase their revenue while decrease their cost price.

Tradeable permits, particularly for air pollution, could be used to reduce respiratory problems. The idea behind it is that the total amount of emissions made will be capped at the amount of tradeable permits. This will inspire some firms to invest in technology that will result in less chemical emission while the others will then buy these permits from the more green firms. There will be incentives to develop and refine such technology as it ensues long-term profit.

Subsidies may also be granted by the government even if they may have to raise taxes in other areas. Perhaps there should be a steep carbon tax as well as tax on products like fertilizers which can pollute the environment. The additional tax gained could be used to lower the cost of developing means to produce cleaner energy, or technology to filter the chemicals discharge and allow relatively cleaner waster to be released to the environment.

In the case of Uranium mines, since significant Radon gas is produced at some point in Uranium's decay, there may be a requirement placed that requires sufficient air to be pumped in so that there is less risk of inhalation of the radioactive gas. Badges which change colour when exposed to radiation could be used for this purpose.

Finally, education of the public could work, since some societies do not have efficient means to deal with such problems. They may be able to operate a running business but lack the education and/or materials to cut the chemicals released. By doing this, they can cut down on the chemical source.