

### **Basic Premises**

- 1) All living organisms have genomes that are subject to the influence of the environment.
- 2) Many of the toxic compounds in our environment ultimately damage our DNA.
- 3) Things we commonly use aren't necessarily safe because they are offered for sale.
- 4) Everyone needs to learn about things for themselves. (Knowledge cannot be acquired simply by osmosis.)
- 5) Informed choices need to be made, for hope of a better future for our society and world.

### **Specific Facts**

- 6) Genetic changes explain a great many diseases, like cancer and autism, with many target genes implicated. Personal risks from different chemical exposures are also modified by various genetic factors, like metabolic enzymes.
- 7) Prevention is very often more successful than attempts at cures.
- 8) Outright cell death from toxic compounds is potentially less dangerous than survival of a cell with the wrong mutation(s).
- 9) DNA repair is crucial, but is also generally error prone, fixing mutations in the genome.
- 10) Ingredients of personal care products which have been shown to be mutagenic back in the '70s (and even include compounds that are carcinogens of cigarettes) may seem a minor worry, in comparison to radiation or toxins or even alcoholism (which also damages DNA! indirectly, but clearly, via aldehyde production is the current hypothesis), but not only could these contribute to exponential increases in certain diseases (cancer, autism) with a genetic basis, but are something that we choose, like alcohol or cigarettes, to use.

### **Current Situation**

- 11) Use of personal care products containing ingredients suspected of causing damage to DNA continues to increase, also for men and in particular children.
- 12) Most of the chemicals eventually end up going down the drain, in some cases resulting in potential environmental impact(s). Use of tanning beds, also damaging DNA, at least does not have this collateral damage on others.
- 13) Cosmetics are currently becoming subject to regulations, but few people are aware of this; and actually outlawing something is very difficult, with discussions about warning labels still ongoing.
- 14) European laws, for instance, one against the use of hair dyes (since about 2009, in Switzerland, but a similar law is in force in Germany) by young people (below the age of 16) are rarely enforced and are primarily based upon allergic sensitization rather than concerns about genomic integrity.
- 15) Different opinions about risks of various pollutants and their mechanisms of action are gradually being subjected to experimental tests, but research funding is necessary.

### **Future Prospects**

- 16) Identifying a reliable quantitative measure of DNA damage, suitable for controlled experiments, for instance, via biomarker or perhaps newer technologies, such as 'next generation' sequencing, which might provide the basis for molecular demonstration of DNA lesions (before mutations are fixed), is a key aim for AGiR's proposed research arm.
- 17) More awareness of the genetic basis of disease and the pollutants we add to the environment can be fostered, via the proposed information arm of the association, to perhaps result in changed attitudes and behavior.
- 18) Better understanding of risks from small molecules could induce society try more actively to limit their use or avoid them when unnecessary...

#### Definitions:

*Genome*: the total genetic content of a cell. (DNA is considered the stable store of genetic information, passed down through the generations, but RNA is also very important.) Genomes have integrity when their particular 'patchwork' of mutations allows cells and organisms to function correctly

*Mutation*: a permanent change to the DNA sequence. Mutagenic compounds cause mutations.

*Carcinogens*: compounds which cause cancer. (Not all mutagens are necessarily carcinogens...)

*Metabolic enzymes*: proteins that modify molecules during metabolism (for instance, produced in the liver or in other cells)

*'Next generation' sequencing*: a sensitive 'flow cell' method of sequencing DNA.