Social drivers to adopt Safe-by-Design

SbD4Nano
SAFE BY DESIGN FOR NANO

Beyond the obvious societal advantages of avoiding adverse health impacts from the adoption of Safe-by-Design (SbD), there are more nuanced social drivers.

Impact of health effects beyond the individual

The use of products and production of waste that contains hazardous substances can have an easily observable impact on individual humans. However, it can also have wider societal impacts.

Use of Lead in Petrol linked to criminal behaviour

- Tetraethyllead (TEL) was used in petrol as an anti-knocking agent to make engines more efficient.
- TEL causes chronic toxicity to the brain, kidneys and cardiovascular system, and may be carciogenic.
- Lead started to be phased out from petrol in the 1980s.
- A meta-analysis of studies has suggested that the reduction of lead in petrol accounted for 25% of the reduction of homicides in the US since 1980.

Endocrine Disruptors (ED)

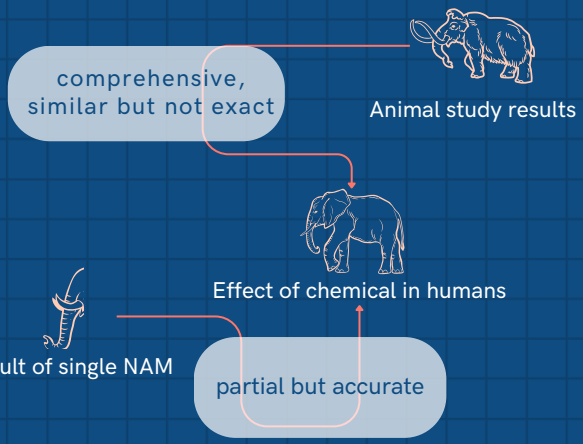
- EDs are chemicals that interfere with the activity of hormones in the body.
- Linked to reduction in fertility, obsesity, and behavioural disorders, which could lead to a society with a falling birth-rate, lower life expectancy and higher crime.
- EDs have been tentatively linked to disruption of the ratio of sexes in fish and amphibians, potentially resulting in a falling population.

The implementation of SbD could avoid such unfortunate societal impacts

Help towards the integration of New Approach Methodologies (NAMs) in regulation

NAMS are hazard assessment approaches that do not use new animal studies. Currently, animal studies form the backbone to most regulatory hazard assesments. Where animal studies show health effects on the whole animal, NAMs examine steps in a biological mechanism. This difference means a 1-to-1 replacement is difficult.

Animal studies vs NAMs elephant analogy:
If human health effects = an image of an elephant

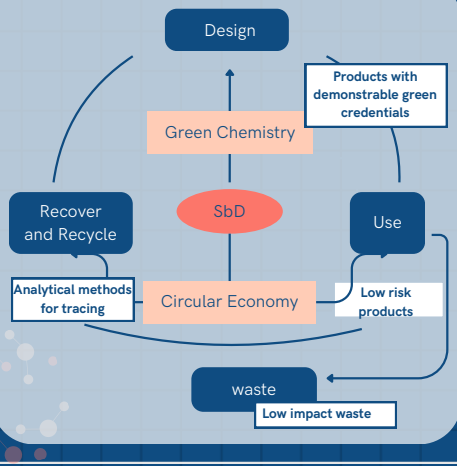


- Regulators need to have confidence that use of NAMs instead of animal studies would not reduce safety.
  - Requires extensive validation of NAMs to understand their accuracy, sensitivity and applicability, meaning a lot of data and a lot of resource.
- SbD has less stringent quality requirements.
  - Non-validated NAMs can be used to reach SbD decisions (the user must still have confidence in the results=valid, but not necessarily validated, methods should be used).
- If SbD data were communicated to regulators, validation and acceptance of NAMs could be easier and quicker.

To replace animal testing in regulations, not only does a NAM need to be valid but several relevant ones need to be linked correctly. For complex endpoints like chronic toxicity they may need to describe the whole zoo!

The SbD4Nano e-infrastructure can guide users to appropriate NAMs for their particular nanomaterial and how the results can be reported in a transparent manner for use by interested parties.

Implementation of Green Chemistry (GC) and the Circular Economy (CE) principles



- GC and CE are fundamental building blocks of the EU Chemical Strategy for Sustainability.
- Large chemical manufacturers, such as Unilever, Johnson Matthey and Croda, have committed to accelerating innovation in GC.
- Retailers, such as Walmart, are starting to ask suppliers to adopt GC practices.
- Transparency and traceability are key to establishing a global circular economy.
- Recycling
- Legacy additives can make recycling plastics difficult (e.g. phthalates in PVC).

Application of SbD can compile and collate the data needed to implement the principles of GC and CE.

Conclusion

Implementation of SbD can have positive impacts beyond providing economic dividends for industry.

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