

## Nanostream: Medical Surveillance for nanoworkers with the semiconductor industry as an example

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### Introduction

Nanoelectronics has a huge transformative potential for the society. The pace of innovation is very fast bringing a variety of new materials functionalized at the nanoscale into everyday life. However, the knowledge about the health and safety aspects of nanomaterials does not seem to follow the rapid pace of innovation. This is recognized as a shared concern by the industry.

Therefore, NanoStreeM, a European Consortium within the semiconductor industry, proposes a template for medical surveillance for nano-workers

### Methods

A survey about the current practices of medical supervision of persons handling nanomaterials has been conducted in 6 international semiconductor industrial companies.

A literature search for existing guidelines, reports and articles about occupational exposure and medical surveillance concerning all sorts of nanomaterials was performed.

### Results

Survey: Registration of employees working with nanomaterials takes place in only one company. Because of differences in legal requirements per country and the fact that nano-workers are mostly followed for exposure to chemical risks rather than for nano-materials, medical follow-up is not well established and there are differences between the considered companies for the medical follow-up for nanomaterial.

Literature search: 17 guidelines/reports and 19 articles could be retained. All were published between 2008 and 2016. Nanoparticles have several characteristics that play a role in the toxicity of nanomaterial. The evaluation of the toxicity is very complex but there is evidence to conclude that awareness is needed. IARC has classified one industrial process as group 1 and certain particles as group 2A or 2B.

### Discussion

There is insufficient evidence for nanospecific surveillance, however exposure registries and general medical surveillance as early warning system are recommended. These are not always performed though.

We propose a precautionary approach when dealing with nanoworkers because of the possible health effects. Therefore we developed a 4-step method for occupational health physicians as an approach for medical surveillance of workers exposed to nanomaterial based on the most recent guidelines and scientific articles on nanomaterials and nanotoxicology.

### Conclusion

A literature study showed that there are reasons to be concerned about the toxicological properties of nanomaterials. The need for a guideline for medical surveillance on nanomaterials was demonstrated in a small group of enterprises in the semiconductor industry.

A 4-step method was developed for occupational health physicians