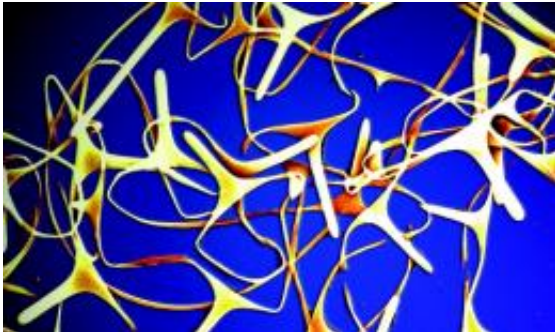


# Ten years of research on nano materials

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In the past decade numerous projects on the risks associated with nanomaterials have been initiated and carried out. In general, they dealt with the subject of how nanomaterials could be used without representing a danger to the environment and human health. However a lack of specialists is preventing further urgently needed studies in the field of nano(eco)toxicology from being undertaken. In addition there are numerous gaps – some quite large – in our knowledge of this subject. These are the conclusions drawn in two reports recently made public, in both of which Empa nanotoxicologist Harald Krug was significantly involved.

There are hundreds of products based on nanotechnological manufacturing processes available on the market today, ranging from sun cream and pigments all the way to clothing. Right from the early days these developments were accompanied by research into the safety

aspects of nanoproducts. Harald Krug, a toxicologist at Empa has, after a decade of research in the field of nanosafety, come to the following (provisional) conclusion: "To date no specific risks are known to exist in association with the use of nanoproducts – or rather free nanoparticles." But even if there are no concrete indications of serious problems with synthetic nanoparticles, Hug says that this is not a general "all clear". Companies wishing to market a new nanoproduct should carefully consider its entire life-cycle, from manufacture through use of the item all the way to its final disposal or possible recycling.

## **Plenty of work for nano(eco)toxicologists**

To better understand the interactions between nanoparticles with other materials and the environment, and to learn how they might affect [human health](#), calls for a comprehensive knowledge of toxicology. There is one aspect that particularly worries Harald Krug. "Because in recent years in Europe a large number of environmental toxicological institutes have been closed down there are now not enough experts and specialists in the field of the environmental nanotoxicology." Consequently, in countless scientific publications in the field the rules of toxicology are not being followed, usually through lack of knowledge. "And as a result there are these horror stories which create a great deal of uncertainty and unease."

## **The safe use of nanomaterials**

A 60 page report recently published by the German Society for Chemical Engineering and Biotechnology (DECHEMA) and the Chemical Industry Association (VCI) offers an overview of research projects conducted during the last decade on the subject of nanosafety. It covers six Swiss, 40 German, one US and 25 EU projects. In one of these projects Empa, together with the Cantonal Hospital of St Gallen,

investigated whether nanoparticles can pass through the human placenta and enter the circulatory system of an unborn baby. Toxicologists from Empa's «Materials meet Life» laboratory studied human placentas (donated by mothers immediately after giving birth) to evaluate how good a barrier they represent. Their experiments showed that particles with diameters of less than 200 to 300 nm could pass through into the fetal bloodstream. The question is, does this damage placental tissue or possibly have an influence on the development of the unborn child? At the same time, looking on the positive side, it is possible to imagine the transport of nanovehicles through the placenta as a means of delivering targeted treatment to the baby while it is still in the womb.

In another report (to which Krug was also a significant contributor) which was recently presented in Brussels, the European Academies Science Advisory Council (EASAC) drew attention to the gaps in our scientific knowledge in this field and indicated very clearly the topics which need to be researched in the coming years in order that [nanomaterials](#) can be directly utilized without risks to our environment or to human health. "Looking at these results, I really wish that in future we would invest more in education and training in environmental [toxicology](#). Only then is it possible to undertake responsible research in this field, and only then can we guarantee the sustainable development of these new technologies," says Krug.

Provided by Empa

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