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Risks and benefits

With more than 350 nanoproducts already on the market, it is time for a programme of research that fully addresses concerns about the safety of nanotechnology.

Although fears that nanotechnology could become the 'new GM' have been around since the start of the decade, little has been done to avert this possibility since then. Even in the US, where one might expect the regulatory capacity to be in place, and in the UK, where the government commissioned a panel of experts to produce a report that has been widely cited since it was published in 2004, the response has been slow. This is frustrating because there are many reasons why these concerns must be addressed, including the need to prevent health and environmental risks, gain public acceptance, and maintain the confidence of investors.

The Project on Emerging Nanotechnologies, an independent group based at the Wilson Center in Washington DC, has been active in pushing this issue up the agenda. In July the project's chief science advisor, Andrew Maynard, published a strategy for addressing the environmental, health and safety implications of nanotechnologies, and last month Maynard and 13 colleagues from the US, UK and Germany identified a series of five 'grand challenges' to ensure the development of safe nanotechnologies (*Nature* **444,** 267–269; 2006). "The science community needs to act now if strategic research is to support sustainable nanotechnolgies, in which risks are minimized and benefits maximized," they wrote. "If the global research community can take advantage of these circumstances and rise to the challenges we have set, then we can surely look forward to the advent of safe nanotechnologies."

The five challenges, which come with time scales but no budgets, look achievable. However, the first challenge — to develop instruments to assess exposure to engineered nanomaterials in air and water, within the next 3–10 years — illustrates the complexities involved. It is not just size and composition of particles that are relevant — shape, surface chemistry, solubility and various other factors must also be considered. Moreover, monitors that can detect airborne nanoparticles will not work in water, and *vice versa*. That said, recent and imminent advances in technology, including nanotechnology, should be able to crack these problems.

A small selection of the many nanoproducts that are already on the market.

The second challenge — to develop and validate methods to evaluate the toxicity of engineered nanomaterials — is similar to the first, but with the added difficulty that the various tests that emerge from this work will have to be adopted across the globe to be effective. The third and fourth challenges are related in that they call for models that can predict the impact of engineered nanoparticles on the environment and human health, and methods that can evaluate the impact of nanoproducts over their entire life cycle. In many ways these two challenges are the most important. The long-term goal is not to develop methods that can predict and measure the health and environmental impact of every possible nanoparticle and nanomaterial. Rather, it is to design nanoproducts that are guaranteed to be safe from initial manufacture right through to disposal.

Given the magnitude of the first four tasks, the final challenge — to develop strategic programmes that enable relevant risk-focused research, within the next 12 months — might seem modest, but it is vital if the whole endeavour is to succeed.

Maynard and co-authors also highlight the need to communicate the results of research on risks and benefits to decision-makers and consumers. Indeed, research has already started in this area and on page 153 Steve Currall and co-workers report the results of the first large-scale empirical study of how consumers view the risks and benefits of nanotechnology. The message from this and other similar work is that consumers are more willing to accept risks if the technologies brings real benefits, which should be good news for nanotechnology.