

NANO - Role Play

Nanoparticles to detect food freshness

The food we eat, its source and its contents, can often be a contentious area. The consumer demands high standards but at an economical price. Producers are always searching for new cheaper methods to produce and to preserve food.

One such idea is to have embedded sensors in sealed food or pharmaceutical packages that provide visible information on the status of the content, its freshness, if the package has been kept at the appropriate temperature throughout the supply chain, or has spoiled, etc.

For instance, the presence of oxygen in a fresh food package usually has a detrimental effect on the food it contains. Oxygen reacts with the fresh food, causing mould, rancidity, and bacteria thrive in the presence of oxygen. Therefore the ability to detect the presence of oxygen within packages, at the earliest stage, is very important.

Some technologies already exist that combine the plastic of the package with a dye which changes colour in the presence of oxygen, thereby visually alerting the consumer that the package is compromised long before there are visible signs of spoilage. Latest advancements consider the use, of nanomaterials in combination with the dyes, such as nanoparticles, or nanofibres, embedded in the inner side of the plastic. Nanomaterials have the advantage of being very reactive, and can be functionalised in order to detect specific chemical species, like oxygen, and provide a fast response. Nanoparticles could be used to detect other chemicals that indicate food spoilage, like ethanol, or even the presence of bacteria. This nanosensor could be even engineered to wireless communicate the status of the product to the manufacturer continuously.

The use of nanosensors to monitor food quality and freshness during its storage and retail could be an exciting development with obvious health benefits. However the toxicity of nanoparticles is still not fully known. The nanomaterials used in these sensors are not in direct contact with the food, so direct contamination would be unlikely, but nevertheless there could be the possibility of accidental release due to damage to the package. Another issue is the disposal of the package after food consumption, since it is not clear if nanomaterials can have negative environment effects once they enter the waste system.

The Dilemma is :

Should nanoparticles be used in our food or pharmaceutical packages to detect freshness, when we still do not know the full ramifications of the using them?

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Stakeholder : Food producer

* Read the text on your card and share your opinion with the group

You represent a company that has developed the "food nanosensors" and is seeking to begin using them.

Your primary motivations are:

- To provide safer, healthier, and tastier food products to the public.
- To generate profit for company.

It is our main agenda to keep our food products reaching our customers at the highest standard possible. The freshness, taste and quality of the products are all important concerns for us.

We would support any technology which could help with these goals and nanotechnology sensor devices would be no different. This product comes after years of research, and has proven to be extremely efficient and reliable. It was designed after a consumer consultation where we asked them what advancement they would like to see in the packaging industry, and the response was "systems or devices to increase the shelf life and safety of fresh products". We have decided to use nanotechnology after evaluating other technologies, and found that this was the best option. We support research programs in our region to perform toxicology tests on the nanoparticles used in these packages and so far we have not received any evidence that they are toxic. We will continue to support such research programs in the future.

• Share your opinion with the group

I think.....

• Note: you may come up with additional ideas, don't feel limited by the information above.

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Stakeholder : Consumer

* Read the text on your card and share your opinion with the group

You represent the consumers seeking a reliable and safe product.

your primary motivations are:

- Making sure you receive healthy non toxic food..
- Making sure that you can purchase fresh and high high quality food.

I enjoy living in a country where the health and safety of the food I buy is considered. I would like to think that the food producers would thoroughly investigate using any kind of technology that might have risks attached to it before including it in the food we buy. I certainly want to buy food that is packed using materials that preserve the quality of the food and that are fully tested before being used. I don't want to worry about whether the package used is safe or not: I believe it this should be the responsibility of the manufacturer first and ultimately of my government.

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Stakeholder : Environmentalists

* Read the text on your card and share your opinion with the group

You represent a civil group that is concerned protecting the environment.

Your primary motivations are:

- Clean water for every one.
- Preserve the ecology system.
- Avoid the use of engineered materials in the farm and food industry

Using Nanomaterials for food products really worries me, as it is my understanding that it is not fully known if the use of nanomaterials is safe. What happens when the package is thrown away and reaches the waste system? Are the nanoparticles included in the plastic of the package biodegradable, or would the present a hazard for the ecosystem? Our ecosystem is very complex, we cannot introduce something such as engineered nanoparticles without having done a complete life cycle analysis of these new materials, and ensure that they are safe for our health and our environment.

• **Share your opinions with the group**

I think.....

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Stakeholder : The government

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You represent the government which can make and enforce laws preventing uses of certain products, and on the other hand, fund agencies and university research in order to understand the benefits and risks of using nanomaterials in food packages

Your primary motivations are:

- Protect the citizens from health risks.
- Promote science and technology innovation to facilitate industrial growth which is essential for any prosperous nation..

The safety of food is always a concern for any government. As population grows, so does the amount of food that has to be produced, transported and distributed, and at each step food safety is a priority. Packages used nowadays are already made of engineered materials, like nylon, polyethylene, and so on, but they are only containers. We are now making a progress towards even more smart packages. A nanosensor device in food packaging could monitor the quality of the food it contains along the entire supply chain, informing the producer of any problem at an early stage, so to minimize consumer exposure to contamination and ensure freshness of the produce. This is the best way to ensure the safety of packaged fresh products.

There are always initial risks with any new technology but as long as the risks are properly managed then the benefits often outweigh the concerns. We will continue funding research programs to study the health and environmental safety of these nanomaterials, and will inform consumers if any unwanted effect is found, and take action accordingly.

• **Share your opinions with the group**

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Stakeholder : Organic farmer

* Read the text on your card and share your opinions with the group

You represent a group of farmers that grows organic products and opposes all engineered materials in food production. Your primary motivations are:

- Grow organic food that taste better and is healthier.
- Preserve the ecology system.
- To generate profit.

I spend my working life producing food which is organic that means that none of it contains anything which has been artificially engineered. Guess what? It tastes fantastic! The thought of then packaging this food with a a nanosensor that contains nanoparticles , for example seems completely wrong. People aren't stupid, they know how long food lasts or if it looks or feels fresh. Why do they need a sensor to tell them what they can already work out for themselves? Especially a sensor which could contain something possibly toxic to them or the environment or both? I think food production needs to be made simpler rather than more complicated. There is no place for nanotechnology in the farm yard!

• Share your opinions with the group

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Stakeholder: Child (you)

What is your opinion?