Nanocarriers, the drug delivery from a science fiction movie

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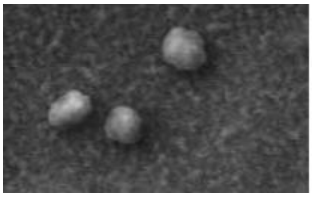
Nowadays, taking medicine is almost a daily task. The range goes from aspirin for a harmless headache to more serious drugs for chronic diseases. But is the entire pill of aspirin going to be used by the body to relive you from the headache? Or is just a small portion going to be used? A lot of the substances that make medicine effective are lost along the way to its main target, that is why when you take a pill the dose can be a lot higher than necessary. It is like if you take a can of motor oil and pour it over the engine of your car, some of it will get in to the right spot but the majority of it is wasted and some of it can be harmful. That is why it is important to make drugs and their delivery systems more efficient.

A more efficient drug delivery system can be achieved by using small particles called nanocarriers for delivering the drugs to the correct site in the body and protecting them from substances that regulate the rate of chemical reaction in the body during the process. Nanocarriers are small particles often made of fat molecules called lipids, that range from a couple to hundreds of nanometres in size. Nanocarriers can make drugs more effective by targeting them thus making them more specific so the medicine is only released in distinct sites. This is made possible by attaching ligands to the surface of the nanocarriers. Ligands are definite substances that bind only to specific site in the body. Those ligands are going to interact only with receptors of the cells or bacteria that have to be attacked. The nanocarriers are also able to protect the drug from different agents in the body, such as enzymes or white blood cells that have as mission to demolish any foreign substance in the body this is made possible by specific ligands that are attached to the surface of the nanocarriers that make them "invisible". Furthermore, it is possible to control the drug release ratio, so that one pill or one injection is sufficient for a longer time by destroying the nanocarriers with sound waves or light pulses when they have reached the designated area in the body. By using this new knowledge that scientists have learned, it is possible to use nanocarriers to make already existing drugs more efficient without the need to invest more money to produce new drugs.

NANOPARTICLE Order of 10^{-7}



SOCCER BALL Order of 1

EARTH Order of 10^{7}

To understand how small nanocarriers actually are, it may help you to think like this: If you take a 100 nanometres particle and increase it to the size of a soccer ball that size increase is the same as if you would increase a soccer ball to the size of earth.

More information

Malmsjö V. 2017. Nanocarriers som nytt läkemedelsadministreringssystem. Independent project in biology, Uppsala University.