

Gold specs considered in pregnancy research

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While Professor Keelan's research looked at GNPs for use in delivering drugs in pregnancy, he says they have many other potential uses such as diagnostic imaging and in heat-based therapy. Credit: iStock

The biodistribution and toxicity of gold nanoparticles (GNPs) in pregnant mice has been explored to gain a further understanding of how maternal or placental conditions might be treated without causing foetal side effects.

A study, supported by the Women and Infants Research Foundation, also investigated whether gestational age and [particle size](#) had an [effect](#).

GNPs were surface-modified with the chemical PEG (polyethylene glycol), commonly used to change their charge and extend their half-life in circulation.

UWA Professor Jeff Keelan, one of the study's authors, says it was already known that GNPs of various sizes accumulate in several organs of the body to different extents.

"Here we wanted to look specifically at pregnancy, since it is known the uptake and elimination of drugs is altered by pregnancy," he says.

"The formation of the placental barrier in mid-pregnancy greatly affects the ability of GNPs to reach the foetus so we wanted to see whether gestational maturity and placentation had effects on the biodistribution of the GNPs in maternal tissues."

Researchers expected a general trend towards some difference in organ accumulation with increasing particle size.

While expected lung effects were observed (GNPs were greater than 13 nanometres, showing enhanced accumulation), 4.5 nanometre GNPs differed from smaller and larger particles in terms of their accumulation in the liver and kidney.

Prof Keelan says the reasons for this are unknown.

"We also expected some modest differences in renal or hepatic accumulation between pregnant and non-pregnant animals but actually found very little pregnancy-related differences," he says.

"We did not expect to see any toxicity in the lungs.

"So far, no effects on foetal health, growth or reproduction have been

found, so our findings of lack of an effect on foetal characteristics such as weight are consistent with the well-known safety of GNPs."

While Professor Keelan's research looked at GNPs for use in delivering drugs in pregnancy, he says they have many other potential uses such as diagnostic imaging and in heat-based therapy.

"GNPs are generally safe and non-toxic, so our findings suggest that caution is warranted if they are given to subjects in subsequent clinical trials," he says.

"Future toxicity studies must include an analysis of lung function after administration.

"We are conducting further tests of the safety and effects of the GNPs on the foetus, using rodent models, and are exploring the use of GNPs to deliver drugs to the placenta to treat placental conditions in [pregnancy](#)."

More information: Hui Yang, Libo Du, Xin Tian, Zhenlin Fan, Cuiji Sun, Yang Liu, Jeffrey A. Keelan, Guangjun Nie, "Effects of nanoparticle size and gestational age on maternal biodistribution and toxicity of gold nanoparticles in pregnant mice," *Toxicology Letters*, Volume 230, Issue 1, 1 October 2014, Pages 10-18, ISSN 0378-4274, [dx.doi.org/10.1016/j.toxlet.2014.07.030](https://doi.org/10.1016/j.toxlet.2014.07.030).

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