

Inhaled nanoparticles deliver potent anticancer cocktail to lung tumors and block resistance

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(PhysOrg.com) -- An ideal treatment for lung cancer would be one that could be inhaled deep into lung tissue where it would deliver tumorkilling agents that would then largely stay in the lungs, avoiding the toxicities that limit the effectiveness of today's lung cancer therapies. Now, researchers at Rutgers, The State University of New Jersey, have developed an inhalable porous silica nanoparticle that not only delivers potent anticancer drugs only to non-small cell lung tumors, but also delivers agents that prevent the development of drug resistance.

Reporting its work in the *Journal of Drug Targeting*, a research team headed by Tamara Minko showed that a targeted silica nanoparticle was effective at getting a cocktail of drugs into lung tumors in animals and triggering cancer cell death. The inhaled nanoparticles largely remaining in the lungs, with a small amount accumulating in the liver and kidneys, the organs that are typically involved in excreting nanoparticles and other administered compounds.

Minko and her colleagues began this project by first developing mesoporous silica nanoparticles that could effectively deliver a mixture of traditional <u>anticancer drugs</u> and siRNA molecules specifically to <u>lung</u> <u>cancer cells</u>. The investigators chose mesoporous silica nanoparticles for two reasons - their <u>pore size</u> makes them ideal for delivering large loads of different types of molecules and they are biocompatible.



The researchers chose the anticancer agents doxorubicin and cisplatin, used today to treat lung cancer, as the primary tumor killing agents. They then designed two siRNA molecules to stop the development of drug resistance that develops during conventional anticancer treatment. One siRNA molecule would block tumor cell production of a drug pump that they use to expel anticancer agents, while the other siRNA would limit production of a protein that tumor cells use to prevent the programmed <u>cell death</u>, or apoptosis, that doxorubicin and cisplatin normally triggers.

To target the nanoparticles to <u>lung tumors</u>, the researchers added a molecule known as LHRH to the surface of the nanoparticle. LHRH binds to a receptor that is produced at high levels by many types of cancers, including lung cancers.

Tests with non-small cell lung tumor cells demonstrated that this complex formulation was highly effective at killing the cells and preventing the expression of the two types of <u>drug resistance</u> responses normally seen. Tests in animals showed that nearly three quarters of the inhaled nanoparticles remained in the lungs and were taken up by tumor cells. In this study, the researchers did not measure efficacy in killing tumors in the animals.

This work, which was supported in part by the National Cancer Institute, is detailed in a paper titled, "Innovative strategy for treatment of lung cancer: targeted nanotechnology-based inhalation co-delivery of anticancer drugs and siRNA." An abstract of this paper is available at the journal's website.

More information: <u>View abstract</u>

Provided by National Cancer Institute



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