Aerosolized nanoparticles show promise for delivering antibiotic treatment

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Aerosol delivery of antibiotics via nanoparticles may provide a means to improve drug delivery and increase patient compliance, thus reducing the severity of individual illnesses, the spread of epidemics, and possibly even retarding antibiotic resistance.

Delivery of antibiotics via nanoparticles has shown promise as a drug delivery mechanism, particularly for controlled release or depot delivery of drugs to decrease the number of doses required to achieve a clinical effect. The effectiveness of this delivery mechanism has not been confirmed directly either in infection models or in patients, but according to new data to be presented on Tuesday, May 19, at the American Thoracic Society's 105th International Conference in San Diego, this delivery technique appears indeed promising.

Carolyn L. Cannon, M.D., Ph.D. from Washington University School of Medicine, and colleagues from the Center for Silver Therapeutics Research at the University of Akron in OH investigated the efficacy of nanoparticle-encapsulated silver-based antibiotics for treating pulmonary infections in a mouse model of pneumonia. Treatment with antibiotic-laden nanoparticles effectively eliminated respiratory infections in mice that had been inoculated with Pseudomona aeroginosa, a common bacterial species that often infects the respiratory tract in humans, particularly immunocompromised patients, ventilated patients or those with cystic fibrosis.

Infected mice that inhaled aerosolized nanoparticles encapsulating silver

carbene complexes (SCCs), a novel class of silver-based antimicrobials with broad-spectrum activity, showed a significant survival advantage over the control mice that received nanoparticles without the SCCs. Treated mice also had decreased lung bacterial burden and spread, compared to the control mice. Moreover, the treatment with nanoparticles occurred once every 24 hours, a regimen that is known to increase compliance in human patients, versus the usual dosing interval of inhaled antibiotics for P. aeruginosa, which is twice daily.

"We were surprised and thrilled to see a 100 percent survival advantage in mice treated daily with SCC22-loaded nanoparticles at doses significantly lower than those used to achieve a similar survival advantage in twice-daily dosing of unencapsulated SCC22. During a 72 hour period, all of the infected control mice died, whereas all of the mice that received just two doses of SCC22-loaded nanoparticles spaced 24 hours apart survived."

"My collaborators, Wiley Youngs, Ph.D., and Yang Yun, Ph.D., and I are eager to complete toxicity studies that would enable us to start clinical trials," said Dr. Cannon. "While the mouse studies are tantalizing, the goal that propels our research is realizing the promise of these novel antibiotics and delivery mechanisms through an analogous survival advantage in patients."

Source: American Thoracic Society (news : web)

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