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[American Chemical Society](#)

Needle-free, inhalant powder measles vaccine could save thousands of lives

WASHINGTON, Aug. 16, 2009 — The first dry powder inhalable vaccine for measles is moving toward clinical trials next year in India, where the disease still sickens millions of infants and children and kills almost 200,000 annually, according to a report presented here today at the 238th National Meeting of the American Chemical Society (ACS).

Robert Sievers, Ph.D., who leads the team that developed the dry-powder vaccine, said it's a perfect fit for use in back-roads areas of developing countries. Those areas often lack the electricity for refrigeration, clean water and sterile needles needed to administer traditional liquid vaccines.

"Childhood vaccines that can be inhaled and delivered directly to mucosal surfaces have the potential to offer significant advantages over injection," Sievers said. "Not only might they reduce the risk of infection from HIV, hepatitis, and other serious diseases due to unsterilized needles, they may prove more effective against disease."

"Many serious infections, such as the measles virus, can enter the body through inhalation. Measles vaccine dry powders have the potential to effectively vaccinate infants, children and adults by inhalation, avoiding the problems associated with liquid vaccines delivered by injection," he added.



IMAGE: Scientists have developed the first dry powder inhalable vaccine for measles. The inhaler is easy to use.

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Although made for developing countries, the technology eventually could become the basis for a new generation of inhalable — and ouchless vaccines — in the United States and elsewhere. So far, an inhalable vaccine is available for only one disease. It is a wet mist vaccine for influenza.

Sievers, once an atmospheric scientist and who now is with Department of Chemistry and Biochemistry and Center for Pharmaceutical Biotechnology, University of Colorado, Boulder, took inspiration for the new vaccine from research on how people inhale tiny airborne droplets of air pollutants.

To create an inhalable vaccine, Sievers and his team of students and researchers developed a patented process known as the "Carbon Dioxide-Assisted Nebulization with a Bubble Dryer," called CAN-BD. The weakened measles virus is mixed with "supercritical" carbon dioxide — part gas, part liquid — to produce microscopic bubbles and droplets, which then are dried to make an inhalable powder.

The powder is puffed into a small, cylindrical, plastic sack, with an opening like the neck of a plastic water bottle, and administered. "By taking one deep breath from the sack, a child could be effectively vaccinated," Sievers said.

In animal tests, the inhaler has been just as effective in delivering measles vaccine as the traditional injection, the researchers say. They now are working on an inexpensive dry powder inhaler that would deliver measles or influenza vaccines to developing nations and could be used elsewhere. In replacing injections, the new method also would help reach those who refuse inoculations because of their fear of needles. The researchers say that the vaccine could be produced for about 26 cents a dose.

If the inhaler passes final safety and effectiveness tests, the Serum Institute of India Ltd. expects a demand growing to 400 million doses of measles vaccine a year, according to Sievers.

"Human clinical trials are expected to begin next year in India, after animal safety studies are completed this year," Sievers said. "About two-thirds of the world's deaths due to measles occur in that nation. Worldwide, several hundred people die every day from measles-related disease," he added.

In earlier research in the 1980s in Mexico during a measles outbreak, 3 million children received a measles vaccine by inhaling a wet mist aerosol and those who took part in the test had a lower rate of developing measles than those who received a vaccine by injection, according to Sievers.

"The problem with that method," he said, "was that the wet mists required power or batteries to generate the aerosol and the liquid vaccines had to be freshly made up and kept on ice and the nebulizer that delivers the dose had to be cleaned. The new, inexpensive dry aerosol dispenser doesn't need to be cleaned and doesn't require power," he said.

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The study has been conducted with a grant from the Foundation for the National Institutes of Health as part of the Grand Challenges in Global Health Initiative of the Bill and Melinda Gates Foundation.

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