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## News Release

### **NOVEL TECHNOLOGY MAY PAVE WAY FOR NEXT GENERATION VACCINES**

*Liquidia Technologies Presents Data Supporting Use of PRINT<sup>®</sup> Technology for Vaccines*

**Research Triangle Park, NC – April 28, 2009** – Liquidia Technologies today presented data at the National Foundation of Infectious Disease (NFID) Annual Meeting which supports new insight into a technology that could provide more safe and effective vaccines for a wide variety of diseases. Results of the study show that the desired immune response elicited by a vaccine can be enhanced up to 10-fold when the vaccine protein is linked to nano-particles of a particular size and shape. The discovery may lead to a new generation of vaccines that could provide faster immunity to disease and potentially minimize the need for multiple vaccinations or “booster shots.”

“It has long been known that virus and bacteria come in a variety of sizes and shapes and that the human body responds very differently to each one of these disease causing agents,” said Joseph DeSimone, Founder of Liquidia Technologies and Chancellor’s Eminent Professor of Chemistry at University of North Carolina – Chapel Hill. “This data may help us better understand how to use the characteristics of naturally occurring pathogens to create vaccines that are more effective and require less product exposure for the patient.”

Current vaccination methods utilize weakened or deactivated pathogens (disease causing agents) to elicit an immune response in the body without the symptoms of the actual infection. Subsequently, if a person is exposed to others with that particular disease their immune system can quickly respond and more effectively fight off the infection. This study suggests that an even greater immune response may be generated when the same weakened pathogens are attached to extraordinarily small particles that are well tolerated by the body.

“The immune system is very sensitive to the size and shape of foreign bodies introduced into the body,” said Neal Fowler, CEO of Liquidia Technologies. “Having insight into the role of these characteristics when mounting an immune response is a very significant step toward finding safer and more effective ways of administering vaccines to patients.”

The particles used in this study were created using a proprietary method known as PRINT<sup>®</sup>, which stands for **P**article **R**eplication **I**n **N**on-wetting **T**emplates. The PRINT Platform leverages the precision of micro-electronics to create rationally designed nanoparticles with absolute control over particle size, shape, composition and surface chemistry in a controlled and scalable manufacturing process. In developing particle technologies for vaccines, each of these variables can be optimized for a specific immunogenic response allowing for an unprecedented level of design control compared to other delivery systems. In addition to controlled co-delivery of antigens or other pharmacological agents that can increase or aid their effect, the PRINT platform allows the exploration of the impact of non-spherical particle shapes on biological response.

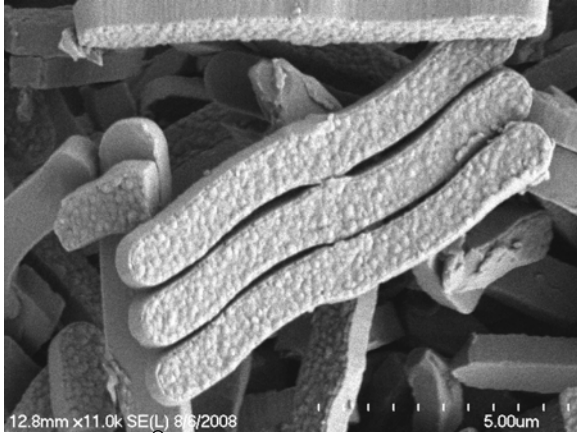


Photo: PRINT<sup>®</sup> particles mimicking the size and shape of bacteria may improve the safety and efficacy of vaccines.

### About the Study

Immunogenicity studies were performed with a variety of cross-linked poly(ethylene glycol) particles of different sizes and shapes produced using PRINT technology.

The effect of particle size on a monovalent vaccine was performed using the Wyoming/3/2003 H3N2 influenza A protein, which was then attached to the surface of these particles. Two micrograms of the protein associated particles was injected into BALB/c mice, and antibody response was monitored using an Enzyme-Linked Immunosorbent Assay (ELISA). Soluble Wyoming/3/2003 H3N2 influenza A protein was used as a control.

At 5 weeks post injection, it is found that microparticles with higher aspect ratios (ratio of its longer dimension to its shorter dimension) have significantly higher antibody titers than particles with an aspect ratio of 1 or soluble protein. It was found that particles with a long axis of 10 micrometers did not inhibit the evolution of a strong immune response with the 1 x 10 x 1 micrometer particle.

An adjuvant effect was also observed with a high aspect ratio 80 x 360 nm particle using the Novartis Fluvirin<sup>™</sup> trivalent influenza vaccine. This vaccine contains equivalent amounts of A/Brisbane/59/2007 (H1N1), A/Uruguay/716/2007 (H3N2), and B/Florida/4/2006. Immunogenicity studies were performed with 80 x 360 nm particles. BALB/c mice were injected with 1 microgram of total protein (0.33 microgram each), and antibody response was monitored by ELISA. Injections were performed at days 0 and 21.

After a single injection, the particle delivery of the vaccine proteins provided a 10-fold increase in antibody titer over the injection of the vaccine product alone. After a second injection, the antibody titers increase significantly. The trends remain similar to the initial injection with particles showing a 10-fold increase over the soluble vaccine product.

**About Liquidia** - Liquidia Technologies Inc. is a privately-held nanotechnology company that designs, develops, and manufactures precisely engineered particles and films for a variety of life and materials science applications. Within life sciences, Liquidia is focused on developing novel vaccines and Engineered Drug Therapies<sup>™</sup> for nucleic acid delivery and inhaled therapeutics. The company was founded in 2004 on the discoveries of Professor Joseph DeSimone and colleagues at the University of North Carolina, Chapel Hill and is located in Research Triangle Park, North Carolina. [www.liquidia.com](http://www.liquidia.com).