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A DNA-based vaccine shows promise against avian flu

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(PhysOrg.com) -- Though it has fallen from the headlines, a global pandemic caused by bird flu still has the United States' Centers for Disease Control and Prevention on high alert. Yet, to date, the only vaccines that have proven even semi-effective are produced in chicken eggs, take five to six months to prepare and act against a single variant of the H5N1 virus, which mutates incredibly quickly. Now, new research by scientists in New York and Taiwan has led to a vaccine with the potential to stop most strains of H5N1 flu viruses in their tracks.

David D. Ho, Rockefeller's Irene Diamond Professor and scientific director of the Aaron Diamond AIDS Research Center, together with his colleagues at Taiwan's Academia Sinica, has built a vaccine that stimulates immunity to a broad range of H5N1 viruses in mice by using DNA rather than dead virus particles grown in eggs. Such a vaccine, which consists of plasmid DNA that's been genetically modified to elicit specific immune responses, is much easier to rapidly modify and produce — critical advantages when racing to prevent an epidemic.

Ho and his collaborators first had to address virus specificity: Because H5N1 viruses are incredibly diverse, and mutate fast, the researchers created a consensus sequence that incorporated all of the conserved parts of the gene encoding the virus's outer protein. Then they had to figure out how to deliver it.

This is where DNA vaccines often fail. They aren't very good at making sure the DNA gets where it needs to go. To solve this problem, Ho and

his colleagues turned to electroporation, a technique that is just beginning to gain traction in the vaccine world and that, according to preliminary studies, helps increase uptake of the vaccine. By combining their consensus-sequence vaccine with a small electric stimulus, the researchers found that their mouse subjects responded with an incredibly broad immune reaction.

“The immune responses directed to our DNA vaccine seem to be very broad,” Ho says. “It could be that the vaccine in its current form could protect against most of the H5N1 viruses out there.” And even if it can’t, he notes, if a different strain of H5N1 begins to circulate, it should only take a few days to obtain its genetic sequence and adapt the existing vaccine to fight it.

A version of the consensus vaccine is already being produced, Ho says, so that it can move into human clinical trials as quickly as possible. And a separate electroporation study is under way at The Rockefeller University Hospital, this one examining the effectiveness of electroporation combined with a DNA vaccine against HIV.

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