

Could camel antibodies protect humans from MERS?

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MERS coronavirus particles (green) on camel epithelial cells. Credit: NIAID in collaboration with Colorado State University.

Antibodies from dromedary camels protected uninfected mice from



Middle East Respiratory Syndrome (MERS), and helped infected mice expunge the disease, according to a study published online March 18th in the *Journal of Virology*, a journal published by the American Society for Microbiology. MERS, which emerged in humans last year in the Saudi Arabian peninsula, causes severe respiratory disease, with a high mortality rate of 35-40 percent. No specific therapy is currently available.

"Our results suggest that these antibodies might prove therapeutic for MERS patients, and might protect uninfected household members and healthcare workers against MERS," says corresponding author Stanley Perlman, MD, PhD, a professor in the Departments of Microbiology and Pediatrics, the University of Iowa, Iowa City.

Passive immunization, a procedure where you inject a former patient's antibodies into a new patient to fight the disease, has been used in the past, including last year in a small number of cases of Ebola, but in the case of MERS, few former patients are available to donate antibodies. Additionally, their antibody titers are often too low, and many former patients are not healthy enough to donate.

Suspecting that humans and dromedaries were likely infected by the same virus, first author Malik Peiris, D. Phil., Professor of Medical Science, School of Public Health, the University of Hong Kong, SAR, China suggested that camel sera might be used to combat MERS. The vast majority of dromedaries on the Arabian peninsula are infected, and many have high antibody titers. The investigators decided to test dromedary antibodies against virus taken from humans. They tested the antibodies in mouse models infected with the latter virus.

The study, a successful proof of concept study, showed that prophylactic or therapeutic treatment with high titer MERS immune camel sera diminished weight loss and pathological changes in lung tissues, and



cleared the infections in the mice.

Along with their availability in the Arabian peninsula, the site of all initial human infections thus far, camel sera have several additional advantages. The part of an antibody that binds to the antigen is the variable region, said Perlman. The camel antibody's variable region—which is the part of the antibody that recognizes antigen—is longer than most species' antibody variable regions, so camel antibodies can detect structures missed by conventional (human) antibodies.

"The antibody will work in humans if delivered in sufficient quantities," said Perlman. "The main hurdle is purifying the antibody and making sure that it is safe to administer to humans."

Camel antibodies would also be relatively easy to use as the initial source to develop a recombinant, humanized antibody, said Perlman, explaining that while human antibodies have four chains, <u>camel</u> antibodies have a single chain. Recombinant, humanized <u>antibodies</u> could then be grown in bacteria.

More information: Passive Immunotherapy With Dromedary Immune Serum In An Experimental Animal Model For MERS Coronavirus Infection. *J. Virol.* JVI.00446-15; Accepted manuscript posted online 18 March 2015, <u>DOI: 10.1128/JVI.00446-15</u>

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