Plasma treatment zaps viruses before they can attack cells

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Researchers test a pre-emptive anti-viral treatment on a common virus known to cause respiratory infections.

Adenoviruses can cause respiratory, eye, and intestinal tract infections, and, like other viruses, must hijack the cellular machinery of infected organisms in order to produce proteins and their own viral spawn. Now an international research team made up of scientists from Chinese and Australian universities has found a way to disrupt the hijacking process by using plasma to damage the viruses in the laboratory environment, before they come into contact with host cells.

The researchers prepared solutions containing adenoviruses and then treated the samples with a low-temperature plasma created by applying a voltage to a gaseous mixture in a syringe. The strong electric field energized electrons that collided with molecules in the gas, generating charged particles and highly reactive species such as oxygen atoms that likely etched away the protein shell of the viruses and damaged or destroyed the viral DNA. When the virus solutions were later added to colonies of embryonic kidney cells, the plasma-treated samples showed much less viral activity, as measured by the amount of a florescent virus protein the infected kidney cells produced. If the virus solution was covered during treatment to maximize plasma-virus interactions, more than 99 percent of the viruses could be deactivated in eight minutes. The technique is described in a paper accepted for publication in the AIP's journal Applied Physics Letters.

Adenoviruses pose life-threatening risks to patients undergoing stem-cell therapy, so the anti-viral plasma treatment may help pave the way to safer therapies, the researchers write. Because plasma jets have multiple biomedical applications, the team is also developing a portable device that generates plasma by using a 12 V battery to decompose and ionize air, says Dr. XinPei Lu at the HuaZhong University of Science and Technology in China and leader of the team. The device might be used in rural areas and battlefields, according to Lu.

More information: "Room-temperature, atmospheric plasma needle reduces adenovirus gene expression in HEK 293A host cells" is accepted for publication in *Applied Physics Letters.*

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