New research shows how viruses use 'good' gut bacteria to bypass immune system

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(PhysOrg.com) -- Two new studies demonstrate how viruses, such as the one responsible for polio, use good bacteria in the human (or mouse) gut to evade detection by the immune system.

In one study, Sharon Kuss and her colleagues from the University of Texas Southwestern Medical Center, show that the poliovirus, as they write in their paper in *Science*, is able to latch onto large molecules on the surface of good bacteria and ride around in the gut. Those large molecules make up lipopolysaccharide (LPS) which is a chemical that sets off the production of interleukin-10, a chemical that serves as a signal to the immune system to tell it that it's a harmless bacteria, thus no need to attack. Meanwhile, Melissa Kane from the University of Chicago, and colleagues, have been doing similar work with the Mouse Mammary Tumor Virus (MMTV), which also rides the LPS molecules on bacteria to escape detection. They have also published their results in *Science*.

As most people are aware, the human body is loaded with bacteria, most of it good. Some types help ward off disease, others help to keep us clean. The largest population by far though, lives in our guts, which includes our stomachs, intestines and other organs. In addition to helping digest food, they also manufacture nutrients that help us survive. Without such good bacteria, its likely humans, and most other animals, would soon perish.

To show what is going on with viruses using good gut bacteria for their

own benefit, both teams take roughly the same approach. They insert massive amounts of antibiotics into the gut of a mouse to kill off virtually all of the bacteria residing there, then test to see how susceptible the host is to infection from the virus they are testing. Kuss et al showed that in addition to getting a free ride on the backs of the good bacteria, the viruses also tend to get better at being infectious agents as a result of their stay on the bacteria. In one test, the poliovirus became twice as good at infecting the host in just two hours time.

In addition to showing that the MMTV receives the same advantages from good bacteria as the poliovirus in the first study, Kane and her team showed that baby mice that are born to mothers with sterile guts, who themselves then wind up with sterile guts as a result, are virtually immune to the virus, which is transferred from mother to baby after birth via breast milk. When good bacteria is introduced to their guts however, they then fall prey to the virus.

Both of these studies show that the more that is learned about the relationship between our own cells, the various kinds of bacteria that live inside of us (both good and bad) and viruses, the more we come to see how complex and interrelated the whole system is. Findings like these show that simply swallowing antibiotics to quash an errant bacteria, or perhaps in some cases to kill off a virus that is getting a free ride, may not be as simple as it once seemed.