HIV Virus Atomic Structure Fully Mapped

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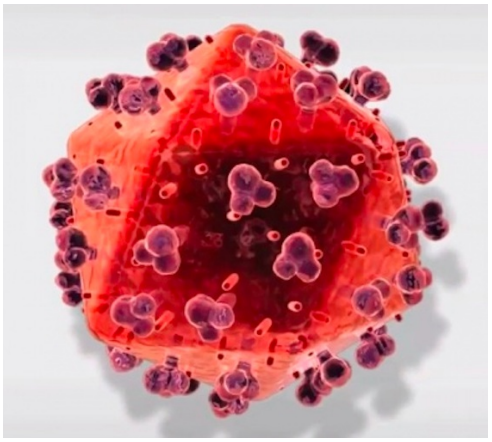
Researchers at the University of Illinois at Urbana-Champaign made a big step in fully understanding the HIV virus by fully mapping the atomic structure of the viral capsid. Professor of physics at U of I, Klaus Schulten, led the research, and was assisted by Juan Perilla, a post-doctoral researcher, and James Phillips, a senior research programmer. The team synthesized data from crystallography, NMR spectroscopy, and electronic microscopy using the Blue Waters supercomputer.



The research reveals the viral capsid to be made up of 64 million atoms, and knowing the structure could have significant clinical consequences. The capsid is the outer covering of the virion, its function is to both protect and expose the genetic material, in the case of HIV RNA. Think of the capsid as the candy shell of an M&M and the genetic material the chocolate. The coating keeps the chocolate from melting for the most part, but once you eat it, you want to get through the candy shell to get to the chocolate. While overly simplistic, it is similar to HIV's entry into a cell. The capsid serves to protect the viral RNA outside of host cells, but once inside a cell, the informationcapsid must burst open to allow release of the genetic material required for replication. The timing of this process is very important, if it happens too early or too late, the genetic material may be compromised and the virion will be unable to replicate.

Researchers have known for a while now that a cellular protein found in Old World Monkeys, TRIM5alpha, makes them resistant to HIV infection by causing the viral capsid to open too soon upon cell entry, allowing viral RNA and enzymes to be degraded. Scientists have long wanted to try to use this knowledge as an anti-viral treatment but without knowing the molecular model of the capsid, they could not decipher where TRIM5alpha bound to the capsid o where else the capsid may be vulnerable. This discovery allows researchers to determine this and opens up even more research opportunities that could close the gap between treatment and a cure.

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