Turning to Stock-Market Math in Search of an HIV Cure

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A mathematical model usually employed to predict the behavior of the stock market may help identify a critical weakness in HIV, according to a *Wall Street Journal* blog report. This finding, the researchers say, not only offers a new target for treatment and cure research, but also highlights a model that may lead the way toward overcoming substantial obstacles to finding a preventive vaccine.

We've long known that HIV's ability to alter its genetic structure can potentially render the most potent antiretroviral (ARV) drugs largely useless against the virus. This mutability is also a factor that has prevented researches from developing a preventive or treatment vaccine capable of igniting an effective immune response against the virus.

Now, however, a mathematical model used to help financial analysts explain the behavior of individual stocks—a model called random matrix theory—has been applied to HIV's structure to help pinpoint a portion of the virus that doesn't easily mutate.

The researchers—Arup Chakraborty, PhD, from the Massachusetts Institute of Technology in Cambridge, Massachusetts, and Vincent Dahirel, PhD, from the Université Pierre et Marie Curie in Paris—found that sector 3 of the Gag protein was one of the least mutable regions of the viral genome. It is responsible for helping build the honeycomb-like structure of the internal capcid that holds HIV's genetic material intact. If sector 3 mutates, the structure can't be built and HIV is rendered useless.

Chakraborty and Dahirel then collaborated with Bruce Walker, MD, from Harvard University in Boston to determine whether the immune systems of the group of elite controllers—HIV-positive people whose bodies naturally control the virus without the help of meds—were primed to target sector 3. They found, indeed, that the elite controllers had remarkably strong responses to sector 3, while people with HIV who aren't elite controllers have much weaker responses.

"This is a wonderful piece of science, and it helps us understand why the elite controllers keep HIV under control," said Nobel laureate and longtime HIV researcher David Baltimore.

Because sector 3 exists within HIV, it will likely be more useful as a target for a therapeutic vaccine or drug strategy in people already living with HIV, or as an adjunct to an antibody vaccine

that targets external HIV proteins. To that end, Chakraborty is teaming up with antibody vaccine experts at the Salk Institute in La Jolla, California, to use the same technology to help design a new preventative vaccine.

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