How viruses insert themselves into our DNA

Each year, billions of people get infected with viruses–with common ones like influenza and cold viruses, and rarer ones like polio and Ebola. The viruses don't stay all that long inside of us. In most cases, our immune systems wipe them out, except for a few refugees that manage to escape to a new host and keep their species alive. In some cases, the viruses kill their unfortunate hosts, and end their own existence as well. But in some exquisitely rare cases, viruses meld with the genome of their hosts and become part of the genetic legacy their hosts pass down to future generations.

Scientists know this melding has happened because viruses have distinctive genes. When scientists scan the human genome, they sometimes come across a stretch of DNA that bears the hallmarks of viruses. The easiest type of virus to recognize are retroviruses, a group that includes HIV. Retroviruses make copies of themselves by infecting cells and then using an enzyme to insert their genes into their host cell's DNA. The cell then reads the inserted DNA and makes new molecules that assemble into new viruses.

Most of the time, retroviruses behave like other viruses, jumping from host to host. But sometimes a retrovirus will end up in the genome of an egg or sperm. If it then ends up in a new embryo, the embryo will carry a copy of the virus in every single cell–including its own egg or sperm. And on and on, from parents to children to grandchildren.

If the virus DNA remains intact, it still has the capacity to multiply. It may produce new viruses that break out of a cell, and even leap into a new host. But over the generations, the virus DNA may mutate and degrade. It may no longer be able to escape its own cell. But the virus may still have a bit of life left to it: it can make new viruses that insert their genes back into the genome at a new location.

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