

VIRUSES

If you think a big, scary

monster is dangerous, wait until you find out what a tiny, little VIRUS can do to you. Take EBOLA VIRUS—something that makes grown men shake with fear. Within seven days of exposure, it will have destroyed most of the body's blood vessels. People bleed to death through every opening in their bodies, even their eyeballs. The disease has been limited to remote areas in Africa, and the happy news is that this particular virus is not a good traveler.

OUTBREAK!

No doubt about it. Viruses are troublemakers, big-time. There are more than 4,000 of them, and they bring us colds, the mumps, AIDS, and even some cancers when they invade our bodies. And it's hard to figure out a way to combat them, since they're slippery little devils—able to mutate slightly, always changing just a little bit—enough to evade our efforts to outsmart them. How do they do their dirty work? Let's get "up close and personal" with a virus!

INVASION OF THE BODY SNATCHERS

They're airborne, almost-invisible chemicals coated with protein. They can sneak into your cells, grab the plans to that cell's structure, and start changing things. Instead of working normally, the cell starts making copies of the enemy invader. It's kind of like sneaking over to the photocopier and making a thousand copies of your science teacher without his toupee, then circulating it all over school.

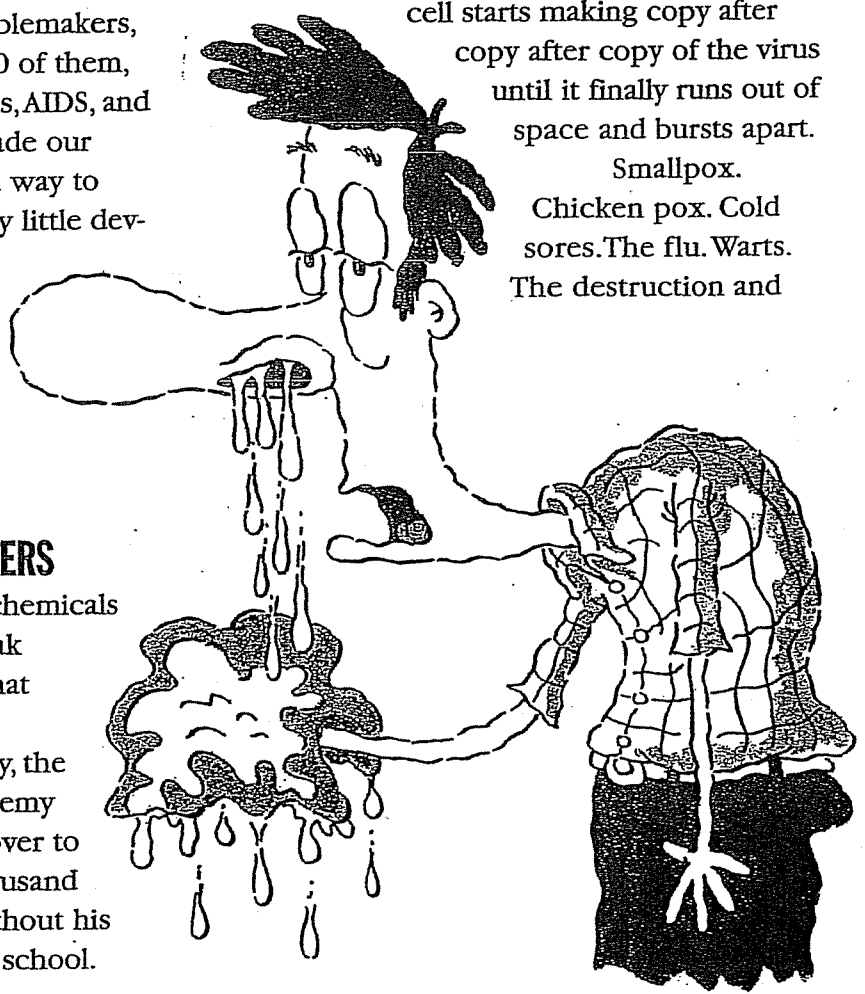
Think of the chaos! Think of the pain when you get caught! That's a virus for you!

If you took 2 million viruses and told them to stand in a straight line, they would take up less than a half inch! They need help to do mischief, though—help that comes when they move into another living cell. You might say they're freeloaders, using up the host cell's food and energy.

Each virus has a coat made of protein, called a VIRAL CAPSID. Inside the protein coat is a dab of nucleic acid that holds the virus's genetic material. The virus sneaks into our bodies through one or more of our handy "openings" (mouths and noses mostly). Once inside, the virus spears healthy cells and injects its nucleic acid, which is used as a blueprint for building more virus. Then, like that out-of-control copying machine, the captive cell starts making copy after

copy after copy of the virus until it finally runs out of space and bursts apart.

Smallpox. Chicken pox. Cold sores. The flu. Warts. The destruction and



vandalism never stop when you are a virus! If you touch someone with a wart, chances are you'll find that virus has hitched a ride onto *your* body and soon you might have a wart. But you don't have to make direct physical contact to become infected. One sneeze from a person with a cold and millions of virus particles go spraying into the air. (If you don't believe me, see page 161.) You might find yourself with a cold, too. Animal and insect bites can deliver hefty doses of viruses that can kill, such as RABIES and YELLOW FEVER. And viruses such as HEPATITIS can hang out in shellfish we eat. So how *do* you stop them?

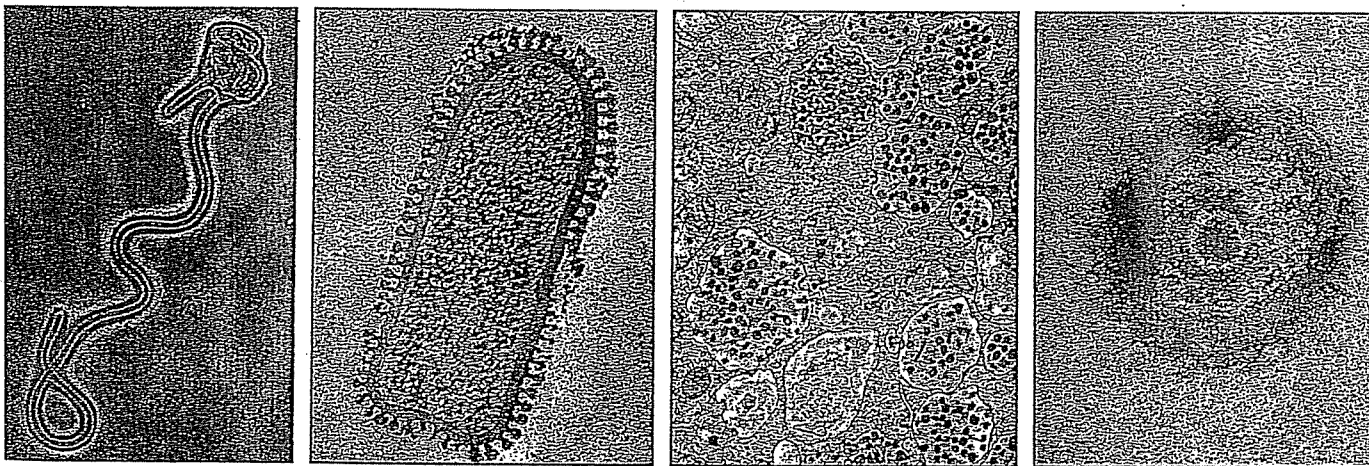
FIGHT! FIGHT! FIGHT!

Our bodies aren't going to take an invasion like that without a struggle. This is war! So the body's immune system calls up a bunch of natural defenses. Out march the ANTIBODIES, which are produced by the white blood cells. These specialized killers rip the virus apart or blast the infected host cells. With nowhere to live, the virus finally dies.

Our bodies have another protecting-trick up their sleeves. Once certain viruses have done their dirty work in a body, they'll never be let back in again. It's called IMMUNITY

(*im-you-nit-ee*) and it's why we get chicken pox only once in a lifetime. Let's say that a big, ugly dog moves in next door. The first time you try to pet it, it snarls like a banshee and tries to take a small chunk out of your rear end. So the next time you have to walk past that growling hunk of foul fur, you are prepared. You blow a dog whistle that sends him cowering into his doghouse with his paws over his ears. You fight back because you recognize danger when you see it. Your body works the same way. It recognizes an evil virus the second time around, knows it will cause trouble, and attacks it before it has a chance to do its cellular mischief again.

So why do we get the "common cold" over and over (and over)? Because that runny nose and tingling throat is not caused by just one virus, but by one of at least 200 very different viruses. So you'll never get sick from exactly the same cold virus twice. Still, even though they're very different, when you're blowing your raw, red nose for the umpteenth time in a day, it doesn't feel very different. Our only lucky break in the war against viruses comes from the fact that viruses tend to have trouble surviving in dirt or dust and can't live for more than about 48 hours without a host cell.



THIS WILL ONLY HURT FOR A SECOND

Annual checkup time. The doctor is coming at you with a needle the size of the Empire State Building. But inside that vial lies something that will keep certain viruses from ever taking hold in your body. VACCINES provide the same immunity you would develop if you'd had a disease already. But they provide it *before* you ever get the disease. A vaccine delivers a slightly modified version of the virus—different enough to keep us from getting sick, but similar enough so our bodies will go into “attack” mode the next time something like it appears. Our bodies can now fight off those deadly invasions.

Luckily for us, several of the nastiest viruses have been conquered by vaccines. POLIO, which can cause paralysis and make the muscles waste away, has been almost completely eliminated from human populations. SMALLPOX, which wiped out three-quarters of the Native American population when they were first exposed to it no longer exists in the world (except for some heavily guarded samples that are kept for research by the U.S. and Russian governments). Measles, mumps,

Gross but Good

Genetic engineers hope that very soon they may be able to send special, genetically altered and “improved” cancer-killing viruses into the body to attack cancer cells. The plan is that these viruses will invade the cancer cells but leave healthy cells alone. Armed with new instructions, the cells will produce more cancer-killing viruses until the cancer is eliminated. Maybe bad guys can become good guys!



Guch! Vaccinations may hurt, but they can protect us against many viruses. No pain, no gain!

and rubella, commonly thought of as “childhood diseases,” are now also, for the most part, a thing of the past, thanks to vaccines. And even though these diseases are not life-threatening, in most cases they’re not much fun, either. Doctors are trying to develop a vaccine for the dreaded disease AIDS (Acquired Immune Deficiency Syndrome). It’s caused by a virus called human immunodeficiency virus (or HIV, for short), which attacks the body’s natural defense system. In its weakened state, the body can’t fight off diseases caused by bacteria, fungi, or other viruses. But doctors are working hard to find drugs that will make the immune system stronger. New treatments are offering hope for an almost-normal life to people living with the disease.