



This is a paper model of the **MS2 virus**.

MS2 is a nanoscale virus that lives in the human gut. It is benign and doesn't interfere with us. A virus, it attaches to a host cell that it identifies using protein markers on its exterior. Once attached, it injects its RNA genetic material into the cell. This material then co-opts the cell's metabolism to produce copies of the virus, which the cell releases back into the organism's tissues.

Researchers have found that this mechanism has potential as a treatment for cancer. Using large scale methods, MS2 viruses can be broken up into pieces. The RNA is removed from the MS2 soup, and replaced by chemotherapy medications. The shells of the virus reassemble themselves containing the drug instead of their RNA. Proteins designed to target specific cancer cells are attached to the virus shells, and the modified virus is introduced to the patient's bloodstream. All of this is performed on a test tube scale, biology is minding the nano details.

The modified viruses travel around the patient's tissues dormant until they recognize their cancerous cell target. At this point, they behave like a virus, attaching themselves and injecting the drug into the cell. This kills the cell and the remains of the virus shell disintegrates normally.

Chemotherapy drugs are designed to attack cells that are reproducing rapidly. The human body has many tissues that have cells that reproduce rapidly, and it is difficult to make drugs that distinguish between these healthy cells and cancerous cells. Researchers hope that MS2 therapies will help them around this problem.

**One cause of diabetes** is an auto-immune reaction in which a person's immune system attacks the islet cells in her pancreas that should be producing insulin in response to high levels of blood sugar. Researchers are experimenting with structures that might contain islet cells and have nanoscale pores small enough to allow the passage of nutrients, waste, sugar, and insulin molecules, but too small to allow leucocytes, immune system cells, to discover and attack the islet cells.