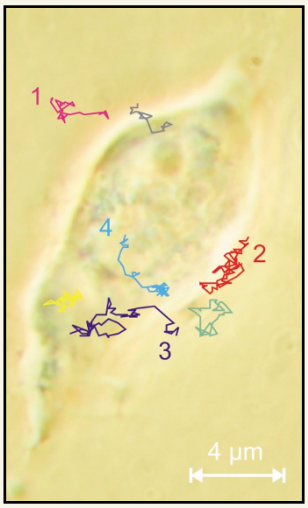
Fast-track virus



The infection of cells by viruses has been observed previously by electron or fluorescence microscopy, but individual infection events had not yet been "caught on film." Now, Christoph Bräuchle and colleagues at the Ludwig-Maximilians-Universität (München, Germany) have used single-molecule fluorescence microscopy to watch a single viral particle infect a HeLa cell (*Science* **294**, 1929–1932, 2001). The team labeled adeno-associated virus with the dye Cy5, attaching only a single molecule of dye to each virus to minimize disruption of its physiological behavior. The researchers then watched viruses slow down as they approached a cell, bouncing off the membrane four or five times before either successfully penetrating the cell or being rebuffed. Once inside the cell, most of the successful viruses drifted around the cytoplasm at random, but some took a fast track to the nucleus, running along microtubules, the cell's transport system. Many viruses also adopted fast, straight trajectories once they reached the nucleus. In the future, the team plans to label the capsid and viral DNA with different dyes, displaying the processes of viral disassembly and nuclear processing. Such insights may provide clues for the development of novel antiviral drugs or ways to deliver gene therapies directly to the nucleus. *PM*

Cloned cattle healthy

Cloned cows and pigs are healthy and have normal genetic characteristics according to a study published in *Science* (**294**, 1893–1894, 2001). Previous studies on animals generated through nuclear transfer generated concerns that the resulting animals would harbor metabolic, physiological, and genetic abnormalities. Robert Lanza of Advanced Cell Technologies (Worcester, MA) and colleagues monitored 30 cattle cloned from somatic cells. Although six died soon after birth, the rest were thriving four years later. Not only were the animals physically healthy, but two gave birth to healthy calves following artificial insemination. Several of the cloned calves had pulmonary hypertension and respiratory distress at birth, and fever following vaccinations at four months. However, other drastic abnormalities—such as genetic defects, immune deficiencies, and gross obesity, which have been reported in other cloned animals—were not observed. The researchers concede that more studies are needed to determine whether the abnormalities occur in other species or could be due to differences in the nuclear transfer technologies used. *LF*

Research Briefs written by Liz Fletcher, Christopher Martino, and Peter Mitchell.

Peptide protector for diabetics

Israeli company Peptor (Rehovot) has announced that its experimental peptide DiaPep277 stalled the progression of type 1 diabetes during phase 2 trials (*Lancet* **358**, 1749–1753, 2001). Type 1 diabetes results from an autoimmune reaction against the proteins such as the 60 kDa heat-shock protein (hsp60) expressed by insulin-producing β-cells of the pancreas. Scientists at Peptor and the Weizmann Institute identified an immunomodulatory component of hsp60, called p277, which rescued β-cell function in mice genetically predisposed to type 1 diabetes (*Lancet* **343**, 704–706, 2001). The peptide p277 shifted the immune response profile from a pro-inflammatory response to an anti-inflammatory response. Now, Peptor has shown that the same peptide slows the progression of diabetes in humans. Just three injections of DiaPep277 (a formulation of p277 suitable for subcutaneous injection) over a period of six months prevented the reduction in levels of C-peptide, a clinical marker of the progression of diabetes and the efficacy of treatments. Elias Dana, vice president of research and development at Peptor and lead author, says that although patients will likely need treatment for life, "we expect the optimal dosing to be four to six injections per year." Type 1 diabetes is fatal without daily injections of insulin. *LF*

Tough-actin' actinium

Researchers at the Memorial Sloan– Kettering Cancer Center (New York) have developed a antibody conjugate that can enter cancer cells and deliver a lethal radioactive punch (*Science* **294**, 1537–1540, 2001). David Scheinberg and colleagues attached a radioactive actinium atom to an antibody that targets specific cancer cells. After being internalized, the actinium releases a single alpha particle, a small high-energy particle that destroys the cell. In addition, as actinium decays, it creates three "daughter" atoms, each of which releases an alpha particle. The tiny dose of radioactivity has few toxic side effects, and internalization of the nanogenerator prevents the daughter atoms from roaming and damaging healthy tissue. By using different antibodies, the researchers killed human leukemia, lymphoma, breast and ovarian cancer cells with extremely small doses, and with larger doses prolonged the life of mice with lymphoma and prostate tumors. The half-life of actinium is 10 days, so antibodies could be manufactured in a central pharmacy and shipped around the world. The lengthy half-life also enables penetration of larger tumors. The team hopes to begin clinical trials next year. *CM*

Cancer cleared by bacteria

Frequently, the rate at which a cancer grows outstrips its blood supply, resulting in the creation of pockets of poorly oxygenated tissue. This dead or dying tissue is resistant to standard chemotherapies and ionizing radiation, whose actions depend on an adequate blood and oxygen supply, respectively. Now, researchers at Johns Hopkins Oncology Center and the Howard Hughes Medical Institute (Baltimore, MD) suggest that anaerobic bacteria could be used to destroy this recalcitrant tissue. Bert Vogelstein and colleagues screened 26 strains of anaerobic bacterial variants, injecting spores into mice bearing colon cancers and melanomas (*Proc. Natl. Acad. Sci. USA*, 27 November 2001, early edition; PMID 11724950). Two of the strains—*Clostridium novyi* and *Clostridium sordellii*—germinated, spreading extensively through avascular regions of the tumors. A variant devoid of endotoxin-producing genes, *C. novyi-NT*, was generated to circumvent the fatal release of endotoxin. A combination of chemotherapies and *C. novyi-NT* rapidly eliminated the tumors in half of the mice. The researchers say that they must next determine which types of cancers will best benefit from combination therapy: for example, small metastatic tumors lacking necrotic centers may not respond to the combination therapy. *LF*