Biology

Bacterial chromosomes run to the poles

Over the years, biologists have developed a detailed picture of how dividing eukaryotic cells—cells with a nucleus—copy their chromosomes and parcel identical sets to the resulting pair of cells. Crucial to this dance of chromosomes is the mitotic spindle, an elaborate skeleton of proteins that segregates the threads of DNA appropriately (SN: 8/31/96, p. 140).

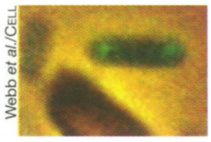
An unanswered question is whether bacteria—which, unlike human cells, don't have a nucleus—contain a spindle or some other cellular machinery to segregate chromosomes when they divide. Investigators probing this issue have been stymied because bacteria are so small and their chromosomes are more difficult to view than those of their eukaryotic counterparts.

Two research groups, both with reports in the March 7 CELL, now offer some promising insights into how bacteria divvy up their chromosomes. Dane A. Mohl and James W. Gober of the University of California, Los Angeles describe how two recently discovered proteins, ParA and ParB, may help partition chromosomes in a dividing bacterium.

The researchers show that after a bacterium makes a copy of its single chromosome, the two proteins both gradually shift from the interior of the organism to opposing poles of the cell. Since ParA and ParB bind to specific DNA sequences on a chromosome, their movement hints that they may be part of the machinery that guides a pair of bacterial chromosomes to opposite ends of the cell before it splits in two. Indeed, when the scientists added extra ParA and ParB to dividing bacteria, they frequently disrupted the normal segregation of chromosomes.

In the other report, Chris D. Webb of Harvard University and his colleagues have made use of a method that induces specific bacterial DNA sequences to fluoresce. The scientists used this technique to label an area near the origin of replication, a well-known site on bacterial chromosomes. They then took snapshots of bacteria that had just copied their chromosomes. The pictures showed that the two chromosomes' origins of replication were usually at opposite ends of a dividing bacterium, implying that this region is involved when the bacterial chromosomes pull away from one another.

The next step in this research is to make "movies" that show how the origins move during a single cycle of bacterial division, says Webb. —*J.T.*


Webb *et al.*/CELL

Specific regions (green) of the two chromosomes of a dividing bacterium localize at opposite ends of the cell.

Pig virus raises xenotransplant alarms

As interest in using animals as a source of donor organs rises, some researchers warn that this strategy, known as xenotransplantation, may introduce dangerous new viruses into the human population (SN: 11/4/95, p. 298). Those fears received some support in the March NATURE MEDICINE, where Robin A. Weiss of the Institute of Cancer Research in London and his colleagues report the first discovery of a pig retrovirus that can infect human cells.

Among viruses, retroviruses are particularly troublesome. Since they normally infect cells by integrating their genes into a host genome, these viruses can trigger cancer-causing mutations. Moreover, this integration means that, unlike other pig viruses that infect people, porcine retroviruses may be difficult to eliminate from herds intended for xenotransplantation.

"Public health officials should resist the transplant community's clamor for animal organs in light of this new data," cautions virologist Jon Allan of the Southwest Foundation for Biomedical Research in San Antonio, Texas, in a commentary accompanying the report. —*J.T.*

Biomedicine

From New Orleans at the Experimental Biology '97 meeting

Making clot-resistant coronary grafts

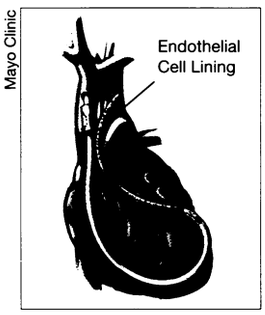
Last year, almost 20 percent of the 300,000 coronary bypass operations in the United States were performed to replace earlier bypass grafts fashioned from plastic or from patients' veins, notes surgeon Michael R. Phillips of the Mayo Clinic in Rochester, Minn. Phillips reports a new procedure for preparing synthetic grafts that may not only extend the useful life of such plastic tubes but even make them preferable to grafted veins.

Most grafted veins tend to clog up within 10 years, Phillips says, probably because they harbor the same fatty deposits that had clogged the original artery. Surprisingly, life-threatening fatty blockages also can develop in plastic grafts.

In an effort to get around these problems, Phillips is adapting for use in the heart a hybrid graft now being tested in human leg arteries. Unlike all-plastic grafts, the inside of this semipermeable tube is "sodded" during surgery with a uniform covering of epithelial cells, which occur in a range of tissues, including the inner surface of natural blood vessels, and seem to inhibit plaque formation.

Phillips harvests the cells from nonvascular tissue at the beginning of the operation. After bathing the interior of the plastic with blood serum, he injects these cells into the tubing. "The trick," he says, "is to apply pressure—some 3 to 5 pounds per square inch for about 7 minutes." The cells then adhere and begin secreting chemicals that maintain their health.

To further inhibit plaque deposits, Phillips bridges segments of dog hearts with his graft in a way that promotes unusually high volume and high velocity flow. He's shown in nine dogs that their epithelial lining remains healthy for at least 5 weeks. —*J.R.*



Mayo Clinic

Heart bypass graft lined with epithelial cells.

Scanning for Gulf War syndrome

Many U.S. veterans of the Gulf War suffer from such neurological symptoms as headaches, forgetfulness, or mood disorders. During 1994 and 1995, doctors referred 81 such vets to one regional medical center for brain scans. Almost 60 percent of the men and women showed reduced blood flow, "predominantly in the cortical region of the brain," reports Fazle Hosain of the University of Connecticut School of Medicine in Farmington. Hosain, who performed the computerized tomography (CT) scans, notes that the vets' symptoms had not previously been traced to any biological cause.

Because the scans were performed as a series of routine lab tests, Hosain inspected the blood flow reductions visually. He would now like to go back and quantify them.

Though many soldiers have worried that their symptoms might trace to exposures to chemical weapons, Hosain notes that the changes he saw could also reflect head injury or exposure to other neurotoxic agents. He believes CT scans may offer a tool to probe in animals any link between lasting changes in blood flow in the brain and compounds to which Gulf War troops were commonly exposed. These include insect repellants (SN: 11/30/96, p. 347) and pyridostigmine (SN: 12/14/96, p. 375), to protect them from chemical weapons. —*J.R.*


Hosain

Low blood flow (blue) is normal at center and edge of cortex but not at 2-o'clock position. Flow there should be higher (yellow).