Biology

Breeding fleas: It's a dog's life

This dog doesn't bark. It doesn't bite. It doesn't even scratch. However, this "artificial dog" does provide a home for thousands of bloodthirsty fleas.

Who needs fleas? Researchers, for one. Scientists need a supply of live fleas to learn more about the physiology of *Ctenocephalides felis,* the flea species that causes so much misery for dogs, cats, and their human owners. In addition, pharmaceutical firms use dead fleas to produce solutions used to diagnose people who are allergic to the critters.

Jay R. Georgi of Cornell University believes his artificial dog will provide enough fleas to keep real dogs and cats out of the flea-breeding business. In the past, researchers had to collect flea eggs shed from the coats of laboratory animals. That method involved the painstaking plucking of tiny eggs from the debris at the bottom of an animal's cage, Georgi says.

The artificial dog can produce about 12,000 fleas per day, the same amount produced by 25 severely infested dogs, Georgi told scientists attending an August meeting of the American Association of Veterinary Parasitologists, held in Boston.

The artificial dog is actually an acrylic box some 16 inches square, containing 25 circular flea cages. Each cage holds about 300 fleas. An aluminum cylinder filled with cow's blood and covered with a skin-like membrane rests on top of each cage. The hungry fleas insert their mouthparts into the membrane and suck out a fresh supply of warm blood.

These flea factories are already giving scientists an intimate look at the life of a flea. Before the artificial dog, scientists had to design complicated experiments to measure the amount of blood consumed by a flea. Now, determining blood ingestion is as simple as measuring the amount present before and after a feeding session. Georgi says that female fleas drink about three times as much blood as their male counterparts, in part because females produce eggs every day.

Turtle's cold water survival strategy

When fishermen netted a 500-pound leatherback turtle off the coast of Rhode Island early this month, they called leatherback expert James Spotila. The phone call gave Spotila, a biologist at Drexel University in Philadelphia, the opportunity to conduct tests on this endangered turtle.

Drexel Univ.

A leatherback turtle lays its eggs on the beach.

Previous research conducted by Spotila's team showed that leatherback turtles swimming in the warm waters off Costa Rica have very low metabolic rates. However, the 5-foot-long turtle was snared in the cold waters of the North Atlantic, and Spotila wondered what its metabolic rate would reveal.

Most reptiles are cold-blooded. In a frigid environment, their metabolic rate drops and their body temperature adjusts to match that of the surrounding air or water. Mammals, by contrast, rev up their metabolic rate in a nippy environment to keep their body temperature toasty.

Spotila espouses a theory that leatherback turtles and some other large animals survive through "gigantothermy" (SN: 4/28/90, p.263). He believes these large creatures survive in cold climates by restricting blood flow to the extremities, a method that keeps their massive body core warm.

Preliminary data from his team's examination of the turtle captured off Rhode Island support that hypothesis. The researchers discovered that the turtle's body temperature was 27.8°C, about 8°C warmer than the surrounding water. In addition, the metabolic rate of the turtle was not very different from the rate measured in turtles swimming in warmer waters.

Biomedicine

A kinder cut for gallbladder surgery

Removing a diseased gallbladder through a small, video-camera-guided tube called a laparoscope is just as safe and effective as extracting the organ through a large abdominal incision, a panel of surgeons concluded last week.

Moreover, the panel – convened by the National Institutes of Health in Bethesda, Md. – agreed that laparoscopic cholecystectomy, or gallbladder removal, involves less postoperative pain and a shorter hospital stay than do traditional open-surgical techniques. Because the new procedure requires only tiny incisions, patients who undergo laparoscopic cholecystectomy recover faster and go back to work sooner than those who undergo open surgery, the panel found.

The panel added, however, that only patients with symptomatic gallstones – who experience nausea, vomiting, or recurring bouts of severe pain in the upper-right abdomen – should undergo any type of gallbladder removal. Physicians should first try to dissolve the stones of patients who have only occasional symptoms, either with oral bile acid medications or with shock-wave lithotripsy, a technique that shatters gallstones with sound waves, the panel said.

The panel reached its conclusions during a NIH Consensus Development Conference.

Mutation primes colon cells for cancer

Cancer researchers have found additional evidence that a mutation in a recently discovered gene is the first misstep in the series of genetic stumbles that leads to colorectal cancer.

The researchers, led by Kenneth W. Kinzler of the Johns Hopkins University School of Medicine in Baltimore, examined genetic material taken from the tumors of 16 patients who had benign colorectal polyps and from 25 patients who had various stages of colorectal cancer. Kinzler and his colleagues report in the Sept. 17 NATURE that roughly 60 percent of each group of patients had a mutation in the adenomatous polyposis coli (APC) gene, known to cause an inherited predisposition to cancer-prone colorectal polyps.

Because of the similar incidence of APC mutation in the two groups, the researchers conclude that this mutation may be the initial event that triggers a normal cell to become cancerous. In contrast, they report, other genes thought to play later roles in the process of cancer development – such as p53 – show an elevated mutation level in more advanced cancers.

Last year, Kinzler's group and an independent team of researchers led by Ray White of the University of Utah Health Sciences Center in Salt Lake City simultaneously reported the discovery of the APC gene (SN: 8/10/91, p.86).

To copy genes, or not to copy genes

The cycle of cell division consists of four steps: a gene-copying phase, a pause, actual cell division, and a second pause. Most body cells repeat this cycle over and over again during the lifetime of an individual.

Four years ago, cell biologists discovered that an on-off interaction between two proteins determines when a cell rouses itself from the first pause and starts dividing. Now, another group of researchers has found that a similar interaction between two other proteins serves as the wake-up call that shakes a cell from its second pause and prompts it to copy its genes.

In the Sept. 18 SCIENCE, a team led by James Roberts of the Fred Hutchinson Cancer Research Center in Seattle reports that human cells about to copy their genes have high levels of two proteins – cyclin E and cyclin-dependent kinase 2. Roberts and his colleagues found that these proteins – which usually exist independently within cells – stick together as cells enter the gene-copying phase of the cell cycle. This suggests that the proteins act as molecular switches, Roberts says.