Power to the whale's tail


Sea World

Blubber, the fatty layer that insulates warm-blooded sea animals, also may be a vital part of their skeleto-muscular systems. Zoologists now suggest that blubber and underlying connective tissue act as a drive shaft linking an animal's motor—the powerful muscles surrounding the body cavity—with its propeller—the tail.

"When a whale 20 meters long swims, only the last 5 meters bend up and down. but the 10 meters ahead of that contains solid locomotor muscle," says Stephen Wainwright of Duke University in Durham, N.C.

In sharks and other fish, the skin acts as the drive shaft, Wainwright reports. It contains a specialized structure of connective tissue fibers, made of collagen, the same material that forms mammalian tendons. Layers of collagen fibers wrap helically around the shark's body, and muscles attach directly to this skin, as well as to bones. When body muscle pulls on the skin, the skin pulls on the tail, making the tail move. The fibers also keep the skin taut as the shark bends.

Recently Wainwright observed the dissection of a dolphin beached in Florida. "When they took off the blubber, there was a set of fibers helically wound over the muscle," he says. "This was really a surprise to us."

In addition to this binding of fibers, there is a complex fibrous structure within the blubber of sea mammals, reports Wainwright's colleague, Lisa S. Orton. She finds that blubber of sperm whales and of harbor porpoises is composed of 50 percent fat and 50 percent collagen fibers in an organized array. In addition, whales, unlike sharks, have tendons that run the length of the body. Blubber, fibrous binding and tendons may all contribute to the powerful swimming motion.

To work out the mechanics of sea mammal movements, the scientists recently filmed swimming killer whales and a dolphin at the Hubbs-Sea World Institute in San Diego. "These results will soon be used in creating a mathematical model of the whale in action," Orton says, "and may eventually lead us to a better understanding of the graceful motions.

—J.A. Miller

Kosher pig? Hold the bacon


P.F. Coffey/NAS

Reports of a cud-chewing pig, suitable for table of Jew, Moslem and Gentile alike, appear to be exaggerated. Wild swine that eat leaves, berries and grubs in the forests of a few Indonesian islands were highlighted as a species with "agricultural promise," especially for developing nations, by a National Research Council (NRC) report published last year. In the current issue of its magazine HORIZONS, the U.S. Agency for International Development, which funded the NRC report, says, "The babirusa stands out among pig-like animals because of its unique stomach, similar to a ruminant's [cud-chewing animal's] ... This may make the babirusa a more efficient meat producer than the pig in some environments. In addition, cultures that do not eat swine might accept the babirusa."

These statements, picked up last week in a wire service story, have brought a flood of calls to the Jewish Theological Seminary in New York City asking for rabbinical opinion on whether such a pig would be considered kosher. A kosher animal must chew its cud and have cloven hooves. A seminary spokesperson said rabbis would need to dissect the babirusa to make sure it is a ruminant.

But Warren Thomas of the Los Angeles Zoo, home of this country's only babirusas, says he has been chuckling at the news reports of a kosher pig. "The babirusa has a slightly modified, a sacculated, stomach, a little different from other pigs, but it is not a ruminant," he says. "I'm sure they don't chew their cud." The NRC based its description of the babirusa on a 1940 autopsy report that said the stomach "presents striking similarities to that of a relatively simple ruminant such as the domestic sheep."

Thomas says he cannot imagine the babirusa as a meat animal, in part because it reproduces so much more slowly than domesticated pigs. But the NRC report asks whether animal husbandry techniques can overcome such disadvantages. Fuller Bazer of the University of Florida in Gainesville, in collaboration with Indonesian scientists, is planning to use a herd of a dozen babirusa in an Indonesian zoo to study the species' reproductive patterns.

—J.A. Miller

Building a better rabies vaccine

Using something old and something new, scientists at Wistar Institute of Anatomy and Biology in Philadelphia, along with colleagues at two labs in Strasbourg, France, have developed an experimental rabies vaccine that may prove cheaper and more effective than the current variety. The researchers applied the new, seemingly ubiquitous techniques of recombinant DNA to the harmless vaccinia virus, the key component of the vaccine that several years ago eradicated smallpox. The new rabies vaccine could eventually have its greatest impact on third world countries, where rabies is a serious problem. The researchers report their results in the Nov. 8 NATURE.

Taking a lead from scientists at the New York State Department of Health, who last year similarly created synthetic vaccines against hepatitis B, herpes simplex and influenza (SN: 11/5/83, p. 302), the researchers chemically inserted a rabies gene into vaccinia. The foreign gene directs the virus to make rabies glycoprotein, the surface molecule that elicits production of infection-fighting antibodies. These genetically engineered vaccines have not yet been tested in humans.

According to Tadeusz Wiktor, one of the Wistar investigators, a recombinant vaccine may be less expensive than the current vaccine — and particularly practical for poorer, underdeveloped nations — because it employs a live virus. The current vaccine, which requires three doses to preventively immunize a person, or five doses for treating a bite, is essentially a concentrated dose of dead rabies virus. A live virus, in contrast, reproduces and requires fewer and smaller doses for successful inoculation, Wiktor points out, and it is easier to handle.

The United States typically records only one to five cases of human rabies a year, Wiktor notes, since pets are vaccinated. But in India, where inoculation expenses are coupled with cultural taboos against killing animals, "infected cows and dogs are fairly commonplace," he says, "and rabies kills up to 100,000 people a year."

Last week scientists and officials from the World Health Organization, the U.S. Public Health Service and the National Institute for Biological Standards and Control in London met in Bethesda, Md., to discuss the future of the rabies and other gene-spliced vaccines. While no specific decisions were made, conference chairman Gerald Quinnan of the U.S. Center for Drugs and Biologics says, "There's a lot of enthusiasm, and it's likely that some of these vaccines will be used in clinical trials within the next few years. But right now, more animal studies need to be done before we can consider testing in humans."

—S.I. Benowitz