Does strep trigger movement disorders?

Streptococcal bacteria can lead to a host of health problems that may erupt months or even years after an initial infection has subsided. A new study suggests that these bugs may also be responsible for certain movement disorders that afflict children.

One of the hazards of childhood is strep throat, an illness caused by a type of *Streptococcus.* If left untreated, some children with strep throat go on to develop rheumatic fever, an inflammatory illness that can cause progressive damage to the valves of the heart. In some cases, rheumatic fever leads to Sydenham's chorea, a severe movement disorder in which the arms and legs flail about rapidly and uncontrollably.

Now, a team of Rhode Island researchers suggests that some children develop other types of movement disorders after a bout with *Streptococcus.*

Pediatrician Louise S. Kiessling of Brown University School of Medicine in Providence, R.I., and her colleagues saw that several of their patients developed tics – involuntary muscle spasms – soon after a strep infection. The researchers knew that *Streptococcus* can cause Sydenham's chorea and wondered if the bacteria might also play a role in less severe movement disorders.

The team first analyzed blood samples taken from 83 children being evaluated for hyperactivity, behavioral disorders, or learning disabilities. Forty-five of the 83 had some type of movement disorder, including tics of the face or neck. None had been diagnosed with rheumatic fever prior to the study.

The researchers discovered that the kids with movement disorders were more likely than the other kids to have strep antibodies. This suggests that children with movement disorders were more likely to have had a strep infection.

More significantly, the blood of children with movement disorders contained another type of antibody, one that appears to affect the central nervous system. The Rhode Island team found that kids with movement disorders were four to five times more likely than other children in the study to have such antibodies.

Kiessling believes that a piece of the strep membrane resembles cells in the central nervous system. Because of this similarity, she says, the body continues to make antibodies in the mistaken belief that the strep bug is still causing havoc, even after the infection has run its course. Previous research has suggested that such antibodies set off the writhing dance of Sydenham's chorea.

The new results indicate that the same or similar antibodies trigger less severe movement disorders. Kiessling speculates that such antibodies travel to the brain, where they attach to receptors on certain neurons, somehow causing motor or vocal tics.

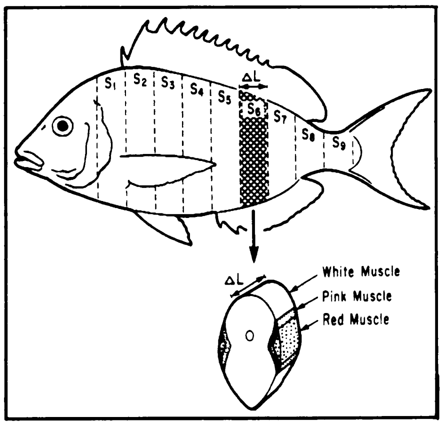
Some of the children in the study recovered from their tics. However, a few suffer from Tourette's syndrome, a chronic disorder that periodically causes involuntary muscle spasms as well as an overwhelming urge to utter strange noises or obscene words.

Kiessling believes that certain children may inherit a tendency to develop Tourette's syndrome or other movement-related problems. At the same time, environmental factors such as strep infection may trigger the disorder, she says.

Because the children in this study were being evaluated for hyperactivity or learning disabilities, they do not represent the general pediatric population, Kiessling says. She notes, however, that children with movement disorders often have trouble sitting still in school and can be labeled poor learners.

Do strep infection and a subsequent movement problem underlie some cases of hyperactivity or other behavioral problems in childhood? Perhaps. But the link between strep infection and movement disorders remains preliminary, Kiessling cautions. Furthermore, hyperactivity and other such disorders are likely to be caused by multiple factors, she notes. – *K.A. Fackelmann*

How fish swim: Study solves muscle mystery



Rome

Researchers have figured out how scup – also known as porgy – use "red" muscle during steady swimming. In contrast, "white" muscle provides bursts of speed. "Pink" muscle is intermediate between the two.

Bolting like startled gazelles to avoid predators or trekking across oceans on seasonal migrations, fish use different kinds of muscles for different kinds of locomotion. Now, researchers have shown for the first time how fish use one of those muscle types to cruise as effortlessly through water as a hawk riding a canyon updraft.

The new study contradicts a widely accepted theory of how fish convert muscle contractions into steady-pace swimming, says biologist Lawrence C. Rome of the University of Pennsylvania in Philadelphia. Scientists have come up with theories to explain how fish swim, he says, "but nobody had done the definitive experiment."

It comes down to power: where in its musculature a fish generates swimming power and how this power is transmitted to the tail. Fish use two strips of blood-rich "red" muscle – one on either side of their bodies – to power the wavy motion of steady swimming.

Conventional wisdom holds that contractions in the front part of red muscle generate a fish's cruising power. The middle and rear portions function much like the rigid driveshaft of a truck: They transmit power from the engine (the front of the red muscle) to the rear wheels (the fish's tail).

Rome says he has disproved this theory by making the first direct measurements of where and how fish generate swimming power. His experiments show that most of the locomotive power for steady swimming comes from the fish's driveshaft – the area of the red muscle nearest the tail. Rome and colleagues report their findings in the July 16 SCIENCE.

The researchers first monitored the mechanical motion and electrical activity of red muscle in scup (porgy) swimming in an aquatic "treadmill." They used this information to set up a laboratory simulation of red-muscle motion with actual scup muscle tissue. This enabled the team to attach a force-measuring device directly to the red muscle, which cannot be done in a whole, living fish.

Although some biologists find the physiology of fish locomotion fascinating in its own right, Rome has bigger scientific fish to fry. His research could help resolve a 50-year-old puzzler known as Gray's Paradox: The horsepower of a fish's muscle "engine" is consistently less than calculations indicate the creature needs to cruise the deeps so fast and far. For instance, a 200-pound ocean tuna can swim steadily at 20 knots and reach 40 knots in a pinch – with only one-half horsepower of muscle power.

Mark A. Grosenbaugh, a researcher at the Woods Hole (Mass.) Oceanographic Institution, is part of a team of scientists building a mechanical tuna to test their theories of how marine creatures propel themselves through water so efficiently. In designing this "tuna sub," as some wags have nicknamed it, the team will use Rome's research to make sure the device swims in a truly fish-like manner, says Grosenbaugh. – *D. Pendick*