

What makes Touretters tic?

A bizarre mix of jerks, grimaces, noises, imitations, and compulsions generally classified as "tics" characterizes Tourette's syndrome (TS). TS sufferers may feel compelled to continually readjust their glasses and throw back their heads, shout obscenities, or thrust their hands near fans and other spinning objects (SN: 6/21/90, p.42).

Many researchers consider vocal and body tics to be largely involuntary behaviors sparked by a loosely connected flood of ideas and associations. But a new survey indicates that people with TS often create tics voluntarily as a means of satisfying intense mental or physical urges. In fact, these urges sometimes create more distress than their accompanying tics, report psychiatrist James F. Leckman of Yale University School of Medicine in New Haven and his colleagues.

A total of 135 TS sufferers from seven states responded to a questionnaire devised by Leckman's team. Participants ranged in age from 8 to 71 years. About one-fifth of the sample received follow-up telephone calls to clarify their responses.

Regular sensations or urges to generate a tic occurred among 123 volunteers, the researchers report in the January *AMERICAN JOURNAL OF PSYCHIATRY*. Most of them described the resulting tics as partly or completely voluntary actions that relieved mental pressure or physical aching. Urges to tic focused mostly on the palms, shoulders, stomach, and throat. Other common tics, such as frequent eye blinking, usually occurred spontaneously.

The frequent emergence of tics following urges among individuals with TS resembles the appearance of ritual behaviors, such as hand-washing, following recurring thoughts and fears among people with obsessive-compulsive disorder, Leckman and his associates contend. Similar, poorly understood brain defects may underlie both conditions, they suggest.

Amphetamine, cocaine: New brain link

A brain structure largely ignored by drug addiction researchers may play an important role in producing the similar ill effects of amphetamine and cocaine binges, including hallucinations and gradually worsening paranoia, according to a report accepted for publication in *BRAIN RESEARCH*. If the findings hold up, they may lead to a new theory of how disturbances involving the chemical messenger dopamine promote various types of psychosis, asserts psychologist Gaylord Ellison of the University of California, Los Angeles.

Prior animal research has found that taking amphetamine for several days damages dopamine-rich cells in a brain area called the caudate, while comparable cocaine intake leaves the caudate unscathed. However, these studies often rely on daily drug injections that fall far short of the "speed runs" of human addicts, who may consume cocaine or amphetamine every few hours for days, Ellison notes.

He and his co-workers developed slow-release silicone pellets that, when implanted under the skin, deliver continuous doses of either amphetamine or cocaine for five days.

Rats implanted with amphetamine pellets, but not those bearing cocaine pellets, display caudate damage by the third day, based on staining and microscopic analysis of their brains. However, both groups suffer extensive damage to a structure near the center of the brain, the habenula, and its cell connections to a related region, Ellison contends.

Anatomical studies indicate that the habenula helps to regulate dopamine transmission by slowing its release elsewhere. The habenula also maintains connections to cells that produce serotonin, a chemical courier involved in hallucinations, Ellison holds. Destruction of cell pathways linking the habenula to other brain structures may at least partly cause amphetamine and cocaine psychosis, he proposes.

Beyond zeolites: Mesoporous materials

If bigger is indeed better, then a new kind of molecular sieve may soon outshine zeolites, porous crystals now commonly used in refining petroleum and for absorbing specific substances from air or water. In zeolites, aluminum or silicon atoms form rings that link to make channels and cages up to about a nanometer in diameter. Although scientists have increased the size of these channels (SN: 8/3/91, p.77), new molecular sieves dwarf even the largest zeolite pores, says Jeffrey S. Beck, a chemist at Mobil Research and Development Corp. in Princeton, N.J.

He and his colleagues have created a new class of aluminum-silicate compounds called MCM-41. In these materials, the channels form a honeycomb, the Mobil team reports in the Dec. 30, 1992 *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*.

To make MCM-41, the scientists first mix a solution containing surfactant — molecules with an organic tail and a polar head. In this solution, the surfactant molecules bunch up — with the tails pointing inward and the heads facing out — to form rods. The rods align in a honeycomb array, and dissolved aluminum silicate crystallizes around them, says Beck. The scientists then burn off the surfactant, leaving the silicate scaffolding behind as a sieve. By using surfactants with longer tails, the researchers can make larger pores.

Unlike microporous materials such as zeolites, these mesoporous materials have channels up to 10 nanometers wide. This enables them to provide 700 or more square meters of surface area per gram, the researchers report. Some of these sieves are almost 75 percent empty space.

As a result, mesoporous materials offer more surface to facilitate chemical reactions and more space to contain ever larger molecules absorbed from various media, they add.

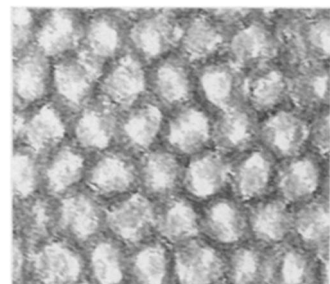
A high-powered aluminum battery

As part of the continuing quest by electrochemists to add more spark to batteries, researchers have paired aluminum with an iron-cyanide compound to make one that generates more than 2 watts per square centimeter, 100 times more than most D batteries, says Stuart Licht of Clark University in Worcester, Mass.

Typically, chemists keep ferricyanide, in which an iron atom attaches to six cyanide side groups, as far as possible from aluminum; otherwise, a vigorous chemical reaction could lead to excess heat, even an explosion, Licht explains. But he has brought these two energetic materials close together, configuring the battery in such a way that the electrons transfer too fast for a chemical reaction to occur, he adds.

Licht dissolves the cyanide compound in a water-based solution, then flows that solution over aluminum and a porous nickel plate. Alkaline additives help keep the cyanide dissolved and speed the loss of electrons from aluminum, he reports in the December 1992 *JOURNAL OF THE ELECTROCHEMICAL SOCIETY*. By changing the solution's chemistry, he finds he can enhance the oxidation of aluminum and the transfer of electrons.

"It's more of a model system," says Licht. "But it can reach very high current at very low costs." He thinks that this small, thin prototype battery suggests new lightweight possibilities for electric cars. Toward that end, he is working on other combinations of chemicals that may prove easier to handle and recycle.



Micrograph of MCM-41's 10-nanometer-wide pores

Mobil R&D Corp./© Am. Chem. Soc.