

Mushrooms: Probing the gift of GABA

Studies of a "sacred mushroom" have led to the development of drugs that eventually may treat diseases, such as epilepsy and schizophrenia, thought to be characterized by malfunctions of GABA, a transmitter system of the brain.

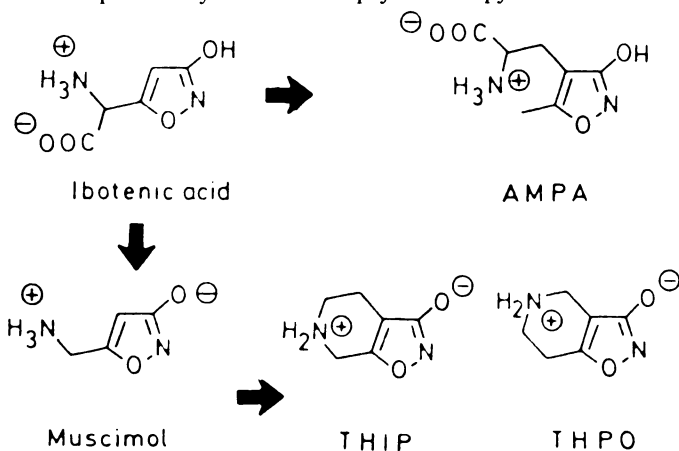
Nerve cells synthesize and release a variety of chemicals that serve as transmitters — they carry impulses from neuron to neuron, across synaptic gaps. One such neurotransmitter, GABA (gamma-aminobutyric acid), has been identified as a "brain brake," or major inhibitory compound in the mammalian central nervous system. GABA may be responsible for an analgesic effect and therefore may play a major role in the process of pain. In fact, researchers have found that the effects of barbiturates are mediated by the GABA receptors. In addition, malfunctions in the GABA system have been linked with epilepsy, schizophrenia and spasticity.

Povl Krogsgaard-Larsen of the Royal Danish School of Pharmacy in Copenhagen has been using mushroom ingredients as model compounds to probe these various functions of GABA. Specifically, the researcher has found that muscimol and ibotenic acid (see diagram)—two compounds from the toxic Fly Agaric or *Amanita muscaria* (SN: 8/2/80, p. 77), a mushroom used for thousands of years in tribal religious ceremonies — interact with the GABA system. Straight from the mushroom, these compounds are extremely toxic and non-specific in their action, so Krogsgaard-Larsen set out to synthesize less toxic, more specific-acting chemical cousins of the mushroom constituents. Now he reports the synthesis and testing of three such compounds.

One of the compounds, THIP, has "proved to be unexpectedly potent as an analgesic compound," Krogsgaard-Larsen reports, and THIP now is being tested in patients suffering with pain. Although THIP is equipotent to morphine when taken orally, studies indicate that its mechanism of action is different, and the researcher says this could be a sign that THIP may not be cursed with the strongly addictive property of morphine.

Close to THIP in structure is THPO, a second mushroom-related chemical Krogsgaard-Larsen has synthesized and studied. In epilepsy research, THPO has been shown to inhibit seizures in animals. Also in the animal-testing stage of research is the ibotenic acid derivative AMPA—a compound that shows a powerful excitatory effect on neurons. While AMPA's therapeutic significance still is not clear, researchers have hypothesized that certain neural exciters eventually may be an effective treatment for schizophrenia.

While most of his studies are in their preliminary stages, Krogsgaard-Larsen says all "have disclosed a number of structural factors which have to be considered in rational drug design in these potentially new areas of psychotherapy."



Soot, soot, sooty, goodbye

A grime fighter at Brookhaven National Laboratory in Upton, N. Y., is trying to do away with the villain of diesel fuel engines — soot.

Diesel power has several advantages — a barrel of oil yields more diesel fuel than gasoline, diesel fuel requires less refining than gasoline, cars running on diesel get 20 percent better mileage than those using gasoline — and one serious disadvantage — diesel engines emit about 13 pounds of soot per 10,000 miles, or 50 times that emitted by gasoline engines. Thus soot, the carbon-containing pollutant that has been linked with emphysema and other respiratory troubles, is the spot on an otherwise clean record for an alternative to gasoline engines. Although several methods have been investigated for attacking this soot situation, all are designed to control the problem after soot has formed, says Richard Sapienza of Brookhaven. Sapienza decided to investigate a preventive technique — one aimed at trapping soot "seeds," or precursors.

Sapienza first considered the mechanism of soot formation. "There is ample evidence to suggest that soot is formed in combustion processes both homogeneously (in the gas phase) and heterogeneously (on the walls of the combustion chamber)," he explains, so his soot-preventing research involved both the homogeneous and heterogeneous breeding grounds for soot. Sapienza added alcohol to the fuel to trap soot precursors in the gas phase and coated the engine with platinum to prevent soot formation on the combustion chamber walls.

"The results showed about 40 percent reduction in soot with alcohol addition and about 40 percent soot reduction due to the platinum coating," Sapienza reports. Because the two effects are additive, an 80 percent reduction in soot is achieved. However, the method is not without its snags — the platinum detaches from the walls, for example, after an eight-hour run.

From the peanut gallery

It all started with a peanut conversation between a geneticist and Robert L. Ory of the U. S. Department of Agriculture's New Orleans office. White-skinned peanuts — as opposed to the familiar red-skinned variety used for whole-nut products, peanut butter and confections — popped into the discussion. Ory was intrigued, but the geneticist advised him to forget the rarely grown white breed, because it is devoid of flavor and smell. Ory was still intrigued.

Now Ory is in the kitchen with white-peanut flour, testing its use in foods such as grapefruit juice, pancakes and hot dogs. Lack of taste is this nut's forte, not its shortcoming, says Ory, because the high (55 percent) protein flour can fortify without altering the taste of food products.

The white-skinned peanut is one of several plant proteins attracting the attention of food chemists. Such proteins are cheaper than those from animal sources — eggs, meat and milk — and generally are considered more healthful since they do not contain saturated fats and cholesterol.

Seeing-eye chemical apparatus

Richard Hartness demonstrates a recently developed laboratory apparatus by putting one of its probes in his cup of coffee. "Thirty-four point two, thirty-four point one," announces a monotone voice from the apparatus. Hartness, of East Carolina University in Greenville, N. C., is blind, and his talking instrument has just read a temperature for him. Designed by Alger Salt of ECU, the talking instrument also can announce weights, voltages, pH and drip rates, providing laboratory assistance for the visually handicapped.