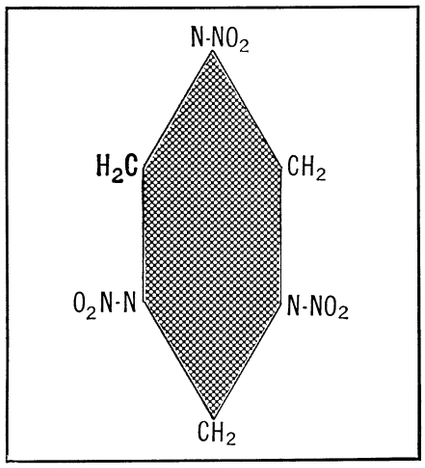
VIETNAM PROBLEM

## Highs from an explosive

One of the headaches that has plagued Army authorities for years is the enthusiasm with which their recruits experiment with new drugs, mostly marijuana. Now the men have a new, military way to get high. In many cases, these soldiers become quite seriously ill.

Word has been passed around that eating or inhaling a plastic explosive known as C-4 will produce intoxication similar to that from ingesting ethyl alcohol. The result is that each military hospital in Vietnam has had patients ill from the effects of C-4. Two of them tried out the novel intoxicant their second day in Vietnam.




*RDX: Explosive causes intoxication.*

Composition C-4 is widely used for clearing land and destroying enemy bunkers. It is a putty-like material that explodes when detonated by an electric spark. It is comparatively safe to carry and store. Because it burns without exploding, it can be used for cooking fuel. In demolition kits and Claymore (antipersonnel) Mines, it is readily available, particularly to combat soldiers. But along with all these advantages, C-4 produces intoxication and, even in small quantities—about 25 grams—can cause a serious convulsive disorder in many individuals.

**Generalized seizures,** such as those that occur in attacks of epilepsy, bring the C-4 victims to the hospitals. These convulsions are frequent, sometimes almost continuous. They last one to two minutes. Between seizures, the men are stuporous or lethargic. For about a week they are disoriented and confused, with loss of memory and headaches. Impaired memory is the most lasting effect of the C-4 syndrome and the patient who took the largest amount, 180 grams, still had some memory difficulty when he left the hospital one month later. All patients suffered from some degree of renal failure and two men required the use of an artificial kidney for more than a week. Another C-4 victim needed mechanical assistance to breathe for awhile.

So far there have been no fatalities from eating or inhaling C-4. Dr. James H. Knepshield, now at the Walter Reed Army Medical Center in Washington, D.C., says this may be because care is more available in Vietnam. "They are at a hospital, receiving treatment, in 25 or 30 minutes."

No one knows the extent to which C-4 is used or tried, since physicians see only those men who become ill. Sometimes intoxication is accidental, due to cooking with C-4 in a bunker or closed building. One patient came to the hospital with seizures after he and three other field soldiers used C-4 to cook popcorn they had received from home. In fact, field manuals suggest the use of C-4 for cooking fuel when nothing else is available. Dr. Andre J. Ognibene, reporting in the July MEDICAL ANNALS OF THE DISTRICT OF COLUMBIA, says that present manuals which describe it as a relatively harmless compound are being modified to indicate harmful effects.

Doctors are not sure what is responsible for the intoxicating properties of C-4 and its effects on the central nervous system. The main component of C-4 is RDX (cyclotrimethylenetrinitramine), which is similar to TNT. Since RDX is highly insoluable in water, but reduced in ethanol, some clinicians in Vietnam thought that the worst reactions from C-4 occurred in men who were drinking. Five Army physicians tested RDX's solubility in beer, bourbon, gin, vodka, scotch, gastric juice and water, as well as combinations of these. It failed to dissolve in any of the liquids, indicating that liquor is not the reason for the adverse effects of C-4. The seriousness of C-4 intoxication seems instead to correlate with the amount ingested. The RDX did dissolve in cottonseed oil, which may mean that it is selectively absorbed by tissues with a high lipid content. This includes those tissues in the central nervous system and cell membranes in kidney tubules.

**Revising** the field manual and issuing warnings will reduce the accidental instances of C-4 intoxication and sickness, but, as Dr. William J. Stone of the Nashville, Tenn., Veterans Hospital points out, "Warnings have not reduced the use of marijuana, or even heroin and other drugs." For the most part C-4 intoxication is a special case of the worldwide problem of drug abuse, one that will not be immediately or easily solved. □

CYCLAMATES

## Metabolism in the gut

Legally, the fate of cyclamates, now under a partial ban, is uncertain. Though totally barred from use in soft drinks, cyclamate foods are still being phased off the market and there is some question whether they will continue to enjoy the status of over-the-counter drugs. By fall, a newly established cyclamate review committee of the Food and Drug Administration will issue yet one more edict on the subject (SN: 7/4, p. 7).

**Biologically,** the fate of cyclamates is no more certain than it is legally, though continuing research is turning up some indications of what happens when the artificial sweeteners are ingested. Reports of work by Dr. R. T. Williams of St. Mary's Hospital Medical School in London were prepared for presentation at last week's conference on Drug Metabolism in Man sponsored by the New York Academy of Sciences.

When an individual ingests a drug or chemical, such as a food additive, his body will handle it in one of three ways. It may be excreted unchanged. It may undergo spontaneous reactions with substances in the body without the intervention of enzymes. Or it may be metabolized or broken down into other compounds.

Often, metabolism is performed by liver enzymes. It may also, Dr. Williams observes, be carried out by intestinal flora—bacteria in the gut. Such is the fate of cyclamates, sometimes.

With regard to the safety of cyclamates, metabolism is the crucial issue. If the chemical sweetners are excreted unchanged, there is no problem. But if they are converted metabolically to cyclohexylamine, some hazard exists. Cyclohexylamine clearly causes tumors in rats and is a suspected carcinogen in other species.

Dr. Williams gave three grams of cyclamate daily to three adult men who previously had been on a cyclamate-free diet. Initially, none of them metabolized cyclamates to cyclohexylamine. After about seven days, however, one of the three began converting up to 17 percent of his cyclamate dose. But after abstaining from cyclamates for a week, he lost the ability to convert to cyclohexylamine.

This history suggests, to Dr. Williams that intestinal *enterococci,* in effect, learn to metabolize cyclamates. It is not an inborn talent. The other two subjects, even after a steady diet of cyclamates for 30 days, failed to develop the capacity to metabolize even one percent of the cyclamate they ingested.

Dr. Williams, a biochemist, also studied cyclamate metabolism in three animal species—rats, guinea pigs and