



Argonne National Laboratory

Dr. Eliezer Huberman, director of Argonne's biological and environmental research division, examines a protein map that reveals the individual proteins in blood. Huberman's work showed that active ingredients in marijuana keep blood cells from maturing, thereby reducing the body's ability to fight disease.

cells, making them useless for studying cell maturation.

By exposing the relatively uniform population of immature cells to the different cannabinoids and then studying changes in appearance and function, as well as a number of biochemical markers, the researchers were able precisely to evaluate the effect of the different chemicals on maturation of the cells. The three compounds evaluated were THC (the psychoactive ingredient in marijuana), and cannabinol (CBN) and cannabidiol (CBD), two other components of marijuana that closely resemble THC.

After inoculation with one of the three cannabinoids, the cells were cultured for from one to six days and then examined. Although the cannabinoid-treated cells showed several markers characteristic of maturing monocytes, three physical characteristics marked them as developmentally arrested. First, their size and shape were that of *promonocytes*, an immature, non-functional cell. Next, the cannabinoid-treated cells did not attach to glass as mature monocytes would do. Third, the treated cells continued to divide, unlike mature monocytes.

On the other hand, the treated cells did show biochemical and immunological evidence of maturation from more primitive forms. Thus, although THC appeared to initially stimulate development of the leukemic cells, this development was subsequently arrested before the cells became fully mature and functional. This, again, is the phenomenon known as *maturation arrest*.

These changes occurred at concentrations of THC that have been found in the blood plasma of humans who have smoked marijuana cigarettes.

There are two major consequences

# How Marijuana Destroys The Immune System

by John Grauerholz, M.D.

For all the pleadings of the decriminalization advocates that marijuana is a harmless "recreational substance," the fact remains that the principal active chemical in marijuana, tetrahydrocannabinol (THC), is a highly toxic substance with a number of serious side effects. Although this compound is now being touted as a treatment for glaucoma and as a painkiller, among its effects is suppression of the body's immune defenses, making marijuana smokers more susceptible to disease.

How this suppression occurred was unknown until recently. Now scientists at Argonne National Laboratory have shown that THC, and a number of related chemicals called cannabinoids, arrest the development of at least one group of white blood cells. These white blood cells, known as

monocytes, are a key part of the body's immune defense system. When these cells fail to mature properly they cannot perform their necessary disease-fighting functions. The technical name for this condition is *maturation arrest*, which literally means a failure to grow up and function normally.

### The Experiments

A research team headed by Dr. Eliezer Huberman used immature monocytes derived from human leukemia cells to study the effect of various cannabinoids on cell maturation. Leukemic cells were used because they represent a fairly uniform population of immature cells of a single type. In contrast, cells from normal human bone marrow represent an entire spectrum from primitive, undifferentiated forms to fully mature functional

of maturation arrest of white blood cells. The first, and most obvious, is that such arrested cells are nonfunctional and therefore ineffective in helping the body fight disease. In the case of monocytes, depressed function can cause a number of problems. In the bloodstream, mature monocytes ingest foreign organisms and present them to the T and B lymphocytes for further processing and antibody production. In addition, monocytes secrete a number of chemicals called *lymphokines*, which activate other immune cells.

The second consequence of maturation arrest relates to the fact that the arrested cells still possess the capacity to divide. When the body responds to an infection, for example, a number of substances are produced that stimulate the proliferation of different white blood cells from their primitive precursor cells in the bone marrow. If there is a lack of functional white blood cells because of maturation arrest, the body, sensing the lack of mature cells, will continue to stimulate the bone marrow to produce more cells.

As a result, there will be a buildup of large numbers of immature white blood cells in the circulation. If the maturation arrest is severe enough, this defines the condition of leukemia; that is, an excess of immature white blood cells in the circulating blood.

#### Society's 'Maturation Arrest'

These findings, along with studies that indicate that THC causes disturbances in both T and B lymphocytes, as well as reduced resistance to cancer growth and infections by viruses and bacteria, certainly call into question the judgment of those clamoring for decriminalization of marijuana.

Many of these same people are also the most vocal opponents of effective measures to control the spread of the AIDS HIV virus, another agent with profound effects on monocytes and T lymphocytes.

The human immune system is a marvelously designed mechanism for promoting human survival. However, it may have finally met its match in the systematic, suicidal stupidity of our society. Unless we deal with the "maturation arrest" of our present culture, the monocytes are not the only organisms that have a problem.



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