of hexagonal packing) and prove to be significantly different.

TABLE I

	Diam. of fibrils in Å.
Canadian chrysotile	195
"harsh" chrysotile (U. S. A.)	250
"soft" chrysotile (U. S. A.)	226
Chrysotile (Italy)	218

It seems possible that the explanation of the variations in mechanical properties of the chrysotiles can be explained on the basis of the differences in their low angle scattering (and consequently on differing fundamental fibril diameter). An extensive survey of asbestos-like materials is now in progress.

DEPARTMENT OF CHEMISTRY
POLYTECHNIC INSTITUTE OF BROOKLYN
BROOKLYN, NEW YORK
I. FANKUCHEN
M. SCHNEIDER

RECEIVED JANUARY 28, 1944

GLIOTOXIN, THE ANTIBIOTIC PRINCIPLE OF *GLIOCLADIUM FIMBRIATUM*[1]

Sir:

We find that the antibiotic substance gliotoxin is produced by at least three different organisms.

Professor Harold Raistrick of the London School of Hygiene and Tropical Medicine has isolated from a species of *Penicillium* (as yet not completely identified) a crystalline substance which appeared to be identical with gliotoxin from *Gliocladium fimbriatum*.[1] He had independently reached the conclusion that it should be represented by the formula $C_{13}H_{14}N_2O_4S_2$ (private communication to J. R. J., London, October 11, 1943). Professor Raistrick has kindly furnished us a sample of his crystalline material and a comparison with our gliotoxin has shown that the two substances are identical.

The sample from Professor Raistrick on examination with a polarizing microscope was monoclinic hemimorphic, crystallizing as flattened rods elongated parallel to the "b" axis. It showed the forms: basal pinacoid, 001; orthopinacoid, 100; hemiclinodomes, 011 and $01\bar{1}$, and hemiprisms, $\bar{1}10$ and 110. The crystallographic angle β is 79° with the interfacial angle, $011:01\bar{1}$, equal to 109°. The optic axial plane is perpendicular to 010 with α, the obtuse bisectrix, 34° from "a" in the obtuse angle β. The optic axial angles are $2V = 53°$ and $2E = 90°$. The refractive indices are α, 1.644 ± 0.001; β, 1.658 ± 0.001; β' (component of β in the plane 100), 1.655 ± 0.002; and γ, 1.708 ± 0.001. This description agrees in every respect with the previously published crystal structure of gliotoxin[1]; hence Professor Raistrick's material is identical with gliotoxin.

Determination of the decomposition point[2] showed 218° (uncor.), and a mixed decomposition point with gliotoxin, melting with decomposition at 219°, was 218°. In a determination of specific rotation, a very characteristic constant of gliotoxin, 6.1 mg. of the sample in 1 ml. of chloroform gave $\alpha = -1.71 \pm 0.06°$, $[\alpha]^{20}D$ $-280 \pm 10°$. This is in reasonably good agreement with the values previously found for gliotoxin: $[\alpha]^{19}D$ -239 (C, 0.51 in $CHCl_3$)[2]; $[\alpha]^{26}D$ $-255 \pm 15°$ (C, 0.103 in $CHCl_3$).

Furthermore, identification of gliotoxin as a product of the fungus *Aspergillus fumigatus* has been accomplished by Dr. O. Wintersteiner.[3]

Since gliotoxin has been isolated from cultures of *Gliocladium fimbriatum*, *Aspergillus fumigatus* and a species of *Penicillium* not yet identified, it may prove to be an antibiotic product of still other fungi.

BAKER LABORATORY OF CHEMISTRY
CORNELL UNIVERSITY
ITHACA, NEW YORK
JOHN R. JOHNSON
WALTER C. MCCRONE, JR.
WILLIAM F. BRUCE

RECEIVED FEBRUARY 9, 1944

(1) Johnson, Bruce and Dutcher, THIS JOURNAL, **65**, 2005 (1943).

(2) Weindling and Emerson, *Phytopathology*, **26**, 1069 (1936).

(3) In press; private communication to W. F. B., March, 1943.