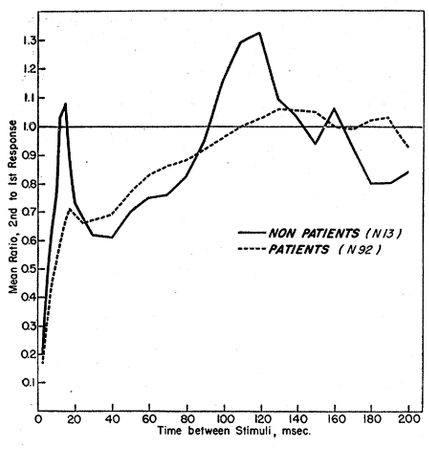

Fig. 3. Mean reactivity cycles of patients and nonpatients. A ratio of 1.0 indicates full recovery of responsiveness.

sponse by subtracting the changes at corresponding times subsequent to an unpaired stimulus. It may be noted in Fig. 2 that the second response increases until it is as large as the first at a separation of 17.5 msec. A subsequent brief period of response greater than normal is then followed by diminished responsiveness until the second response is again greater than the first, at 110 msec. This biphasic pattern characterized the recovery curves of all nonpatients, as indicated in the mean curve (Fig. 3).

Figure 3 also shows the mean reactivity cycle for the patients. Although the biphasic pattern was also the predominant one in the individual curves of most of the patients, this is not clear in the mean curve because the amount of recovery was less than in nonpatients and there was greater dispersion in timing. The greatest difference between patients and controls was in the amount of recovery by 20 msec. All nonpatients, except one with a peak recovery ratio of 0.95, showed full recovery by 20 msec. Only 27 patients (29 percent) showed full recovery—a highly significant difference ($P < .001$). It may be noted that two-thirds of the patients whose recovery ratios overlapped those of the controls were diagnosed as psychoneurotic, whereas for psychotics there was almost no overlap. The greater reactivity of nonpatients from 100 to 120 msec was also statistically significant ($P = .03$). Reliability, on retest, of the measure of peak recovery by 20 msec was 0.78 in 17 subjects. No significant age or sex differences were found.

The mean time for initial recovery of reactivity in the nonpatients was 12.5 msec. This is more rapid than the recovery time reported for any animal and suggests that initial recovery time may be phylogenetically determined. It is also of interest that the major differences between patients and nonpatients in cortical reactivity occurred during this early phase of recovery. The differences in findings for patients and for controls indicate that research designed to determine factors governing the cortical reactivity cycle may be of great importance to psychiatry. Information about the anatomical locus and neurohumoral mechanisms underlying the cycle may help to clarify the pathophysiology of disturbed behavior. As the reactivity cycle is easy to determine in animals, relevant experimentation with implanted electrodes, with drugs, and with surgery may readily be carried out (*5*).

CHARLES SHAGASS
MARVIN SCHWARTZ
Department of Psychiatry, College of Medicine, and *Psychopathic Hospital, State University of Iowa, Iowa City*

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21 July 1961

Choline Sulfate in Higher Plants

Abstract. Choline sulfate, the sulfate ester of choline, is widely distributed in plant species and tissues. It constitutes up to one-third of the labeled metabolic products of radiosulfate uptake by roots of sulfur-deficient corn, barley, and sunflower plants. This neutral, nonabsorbed zwitterion appears to be a useful reservoir for sulfur in plants.

O-Choline sulfate has previously been identified in mycelia and conidiospores of certain fungi (*1*), in a genus of lichens (*2*), and in a red alga (*3*). The analogous choline phosphate occurs in higher plants and is involved in phosphorus transport by the sap (*4*).

In this study (*5*) corn (*Zea mays*), barley (*Hordeum vulgare*), and sunflower (*Helianthus annus*) were grown in water or in sand with either a complete Hoagland solution or one lacking sulfate. The roots were cut at different times, allowed to take up radiosulfate during periods of several hours, and extracted with hot 80-percent ethanol. Two-dimensional paper chromatography (*6*) and autoradiography revealed a major radioactive product ($R_F = 0.89$ in phenol and water [100 : 40 wt./wt.]; $R_F = 0.37$ in *n*-butanol, propionic acid, and water [142 : 71 : 100 vol/vol]). It was identified as choline sulfate by cochromatography with synthetic choline sulfate-S^{35}, by the identity of the hydrolysis rates of the natural product and synthetic choline sulfate-S^{35} (half-time for hydrolysis is 33 minutes in 1.0*N* HCl at 100°C), and by repeated cocrystallization with synthetic choline sulfate (*7*).

In order to ascertain that the formation of choline sulfate was not due to microorganisms associated with the plant roots, corn and barley were grown on agar under sterile conditions. Choline sulfate-S^{35} was formed as before.

Choline sulfate was the major labeled compound formed by roots of sulfur-deficient plants, constituting up to one-third of the incorporated S^{35}. In leaves of the deficient plants as well as in normal roots and leaves of all the higher plants examined, choline sulfate constituted 5 to 15 percent of all the soluble sulfur compounds.

The large amount of choline sulfate formed in roots of sulfur-deficient plants suggests its function as a major sulfur reservoir. Its neutral nature and high solubility in organic solvents suggest that it functions as an effective transport agent and that choline-containing membranes mediate in the transport mechanism.

PER NISSEN
A. A. BENSON
Department of Agricultural and Biological Chemistry, Pennsylvania State University, University Park

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9 August 1961