Fossil Basidiomycetes

R. L. Dennis writes [*Science* **163**, 671 (1969)], "The presence of clamp connections and saprophytism are thought to be features of advanced Basidiomycetes," and cites G. W. Martin [*Mycologia* **37**, 527 (1945)] as authority. On the contrary, Martin writes (p. 532), "The Tremellales [mostly saprobic, and with clamp connections in many species], more than either the Uredinales [parasites, without clamp connections] or Ustilaginales (parasites, rarely with clamp connections) retains the largest number of primitive characters." The whole argument and conclusions of the author cited are opposed to the statement for which, in an otherwise excellent paper, they are cited as support.

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Intramuscular Chlorpromazine and Creatine Kinase: Acute Psychoses or Local Muscle Trauma?

Meltzer (*1*) found an increase of serum creatine phosphokinase (CPK) and aldolase activities in acutely psychotic patients. He suggested that disruption of the functional integrity of the central nervous system produced mental symptoms and the endogenous process or agent which causes the increased activity. He stated that neither physical exertion nor the administration of phenothiazines was related to the increased enzyme activity.

We assayed serums from 58 patients (successive admissions) for creatine kinase activity (*2*) (normal values, 12 to 58 I.U./liter). Five of the 25 acutely psychotic patients had CPK levels higher than 60 I.U/liter; three of the five had received intramuscular chlorpromazine within 72 hours before the assay. Of the 33 who were not acutely psychotic, two had CPK levels higher than 60 I.U./liter, although neither had received the drug intramuscularly. Of the 51 patients with CPK levels below 60, only one had received the drug in the preceding 72 hours. None of the patients had received intramuscular injections of any other drugs.

These observations suggested that intramuscular injection of chlorpromazine might cause the elevated CPK activity in serum. We, therefore, did the following study. Six rabbits received the drug intramuscularly, three received physiologic saline intramuscularly, and three received an intramuscular injection of the vehicle of a commercial chlorpromazine preparation. All CPK activity was shown to be of the muscle type by gel electrophoresis (*3*).

After the injection was given, the mean CPK activity of the group injected with chlorpromazine was significantly greater than the means for the other groups and the means of all groups before injection (Table 1). There were no significant differences between the means of all groups before injection, or between the means of the saline group before and after injection. The increase in CPK activity after injection was attributed to the intramuscular effect of chlorpromazine because there was no significant difference between the means of the saline and vehicle groups after injection ($P > .15$) even though there was a small but significant increase in the mean of the vehicle group after injection. The mean CPK activity of the chlorpromazine group returned to normal (84 ± 13) in 6 days, and this group was again given chlorpromazine (0.5 ml intramuscularly). The mean activity obtained as soon as 18 hours later (967 ± 163) was again greater ($P > .001$) than the activity before injection.

This increase in CPK activity after injection of chlorpromazine is therefore due principally to the drug. Patients have been reported to have elevated serum CPK concentrations after exercise (*4*) and after needling for electromyography (*5*). Chlorpromazine causes local irritation (*6*), and injection of irritating drugs can elevate serum CPK (*7*). Bengzon *et al.* found that elevated CPK concentrations in acutely psychotic patients returned to normal when the patients were started on phenothiazine therapy (*8*). Although their findings seem contradictory with ours, they did not state in their paper that any of their patients had received phenothiazine intramuscularly. Another recent report (*9*) states that alcoholics treated for acute withdrawal had elevated CPK, but whether intramuscular injections were given to these patients is not mentioned. Since intramuscular phenothiazines may cause high serum CPK concentrations in some patients, this source of enhanced serum enzyme activity needs further evaluation before interpretations of elevations in serum enzyme activities in patients can be made.

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Table 1. Elevation of the serum CPK activity in rabbits (New Zealand strain, males, 2 to 3 kg) injected with chlorpromazine. Creatine phosphokinase activity (*2*) is expressed in international units (I.U.) per liter. The CPK activity before injection was determined on each of the 3 days immediately before treatment, and CPK activity after injection was obtained 18 hours after treatment. All injections were given intramuscularly. One group received 0.5 ml of a commercial preparation of chlorpromazine hydrochloride (Thorazine, 25 mg/ml); another received 0.5 ml of sodium chloride (U.S.P., 9 mg/ml); and a third received 0.5 ml of the aqueous vehicle which is used for the intramuscular injection of chlorpromazine (ascorbic acid, 2 mg/ml; sodium bisulfite, 1 mg/ml; sodium sulfite, 1 mg/ml; sodium chloride, 1 mg/ml; benzyl alcohol, 2 percent); Cpz, chlorpromazine.

Treatment	Rabbits (No.)	CPK activity before injection	(Mean ± S.D.) after injection
Cpz	6	88 ± 29	1092 ± 260*
Saline	3	95 ± 48	77 ± 35
Vehicle	3	118 ± 58	408 ± 280†

* Significantly higher than the mean before injection ($P < .001$; two-tailed *t*-test). † Significantly greater than the mean before injection ($P < .01$; two-tailed *t*-test).

References and Notes

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Warnock and Ellman imply that the increase in creatine phosphokinase (CPK) and aldolase activity in acutely psychotic patients (*1, 2*) could be due to intramuscular injection of phenothiazines rather than its being a curious and significant manifestation of the acute psychotic process in some psychotic patients of all diagnostic types.

I too have noted that some patients