MENTAL EFFICIENCY, CARBOHYDRATE METABOLISM AND NUTRITIONAL HYDRATION

Various investigators[1] have called attention to the value of insulin in the treatment of some cases of schizophrenia, but a satisfactory explanation of the results does not seem to have been arrived at. The possibility does not appear to have been considered that the mental improvement noted in schizophrenics may primarily be a physiologic improvement in mental efficiency, such as Glaze observed in presumably normal subjects after fasting.[2]

As one of the subjects for Dr. Glaze's study at the University of Chicago, I fasted 33 days. For a study of hunger during this fast,[3] blood-sugar determinations were made upon me by Dr. Larson at the College of Medicine of the University of Illinois. On the ninth day of the fast, the blood-sugar level was down to 0.043 per cent. After that, the level was somewhat higher, but the final determination made during the fast was so low that it was thought best to discard the result in the absence of further confirmation. Unfortunately, I already broke the fast before another determination could be made, but increasing weakness and difficulty with air-hunger suggest that a blood-sugar level lower than 0.043 per cent. may actually have been reached. In any case, the accepted data indicated that the blood-sugar level was substantially below normal throughout this fast, and Lennox, O'Connor and Bellinger reported similar observations.[4] This makes it evident that the improvement in mental efficiency which was noted by Glaze followed periods in which the blood-sugar level was kept low by fasting, just as the mental improvement in some schizophrenics seems to be a consequence of hypoglycemic states induced by insulin.

A less obvious parallelism is indicated by the fact that the insulin treatment of schizophrenics does not bring about improvement in some apparently uncomplicated cases and fasting likewise does not always lead to mental and/or physical improvement in so-called normal subjects. In fact, the results of fasting at different times may vary widely in the same individual. This conclusion is based mainly upon a personal evaluation of the results of various fasts undertaken by me during the past thirty years. Thus, I have sometimes noted a striking improvement in general well-being, including a brief period of elation with increased self-confidence and sociability, after a fast of only one day or a few days, while the result of my longest fast (41 days) proved to be one of the greatest disappointments. In my estimation, the differences in the results were chiefly due to variations in the degree of hydration experienced after fasting. Post-fasting edema may indeed be severe enough to completely obscure any possible benefit from fasting. An inadequate protein intake and an excessive carbohydrate intake after fasting increase hydration,[5] and this raises the question whether the administration or ingestion of excessive amounts of carbohydrate following the use of insulin in the treatment of schizophrenics may not also, in some cases, counterbalance any possible benefit.

It is still a question whether the favorable results of the insulin treatment of schizophrenics will be more or less permanent and, similarly, some may wonder whether the possible benefits of fasting are worth the price. Obviously, the benefits of fasting have not been cumulative in my own case. Anything that may be gained by fasting can be lost again by an unsuitable food intake after fasting. My opinion of the value of fasting is perhaps best reflected by the fact that, after having previously fasted altogether over 500 days, I have not fasted a single day during the past five years. The chief reason for this, however, is that I have been increasingly impressed with the importance of nutritional and post-fasting edema. Besides this, I never liked fasting and would welcome a practical substitute, such as the insulin treatment may be in some cases of schizophrenia and the ketogenic diet seems to be in some cases of epilepsy. My impression, nevertheless, is that no simple and entirely satisfactory substitute for fasting will be found, although repeated short or modified fasts may prove to be adequate and practical substitutes for prolonged fasts.

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[1] Among others: H. E. Himwich, K. M. Bowman, J. Wortis and J. F. Fazekas, SCIENCE, 86: 271, 1937; J. Steinfeld, *Jour. Amer. Med. Assn.*, 108: 91, 1937; H. M. Smith, *ibid.*, 108: 1959, 1937; D. E. Cameron and R. G. Hoskins, *ibid.*, 109: 1246, 1937; and C. A. Rymer, J. D. Benjamin and F. G. Ebaugh, *ibid.*, 109: 1249, 1937.

[2] J. A. Glaze, *Am. Jour. Psychol.*, 40: 236, 1928.

[3] F. Hoelzel and N. Kleitman, *Arch. Internal Med.*, 39: 710, 1927.

[4] W. G. Lennox, M. O'Connor and M. Bellinger, *Arch. Internal Med.*, 38: 553, 1926.

THE GERMINATION OF LETTUCE SEED STIMULATED BY CHEMICAL TREATMENT

PREVIOUS investigations have been reported showing that the germination of dormant lettuce seed is influenced by temperature, light, oxygen and the CO_2 content of the surrounding atmosphere. In investigating various methods of treating such seed to promote prompt germination it was found that the percentage of germination of certain lots of lettuce seed could be greatly increased by treating the seed with weak solutions of certain chemicals. Many lots of lettuce seed of the varieties Grand Rapids and Hubbard Market have been found to germinate poorly on damp filter paper in Petri dishes in darkness at 25° C., whereas other lots germinated very well when the paper in the

[5] F. Hoelzel, SCIENCE, 86: 399, 1937.