THE BASAL METABOLIC RATE IN CONSTITUTIONALLY INFERIOR CHILDREN*†

A PRELIMINARY REPORT

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During the past decade the relation of basal metabolic rates to various clinical conditions has received considerable attention. The work of Benedict and his group along the line of perfecting the methods and of establishing standards, of DuBois, in early clinical investigations and establishing a simpler procedure for determining the surface area, and of Means and Boothby in their investigations in thyroid conditions have done much to place this procedure in our hospital clinic. Basal metabolism affords a valuable aid in diagnosis and treatment of disease. Boothby has advocated the classification of diseases according to whether they showed an increased, normal or decreased basal metabolic rate, this classification resting, therefore, on the alteration of a fundamental factor, namely, heat production. At present, cases may be grouped on this basis, the mild cases showing up to 25% increase, the moderately severe 50%, and the severe 75% and upwards. The subnormal cases show a decrease from 10 to 40% below normal. The normals vary from minus 10% to plus 10%.

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Improvement in clinical conditions is shown by the approach toward normal rate. Variations from these normals have been pointed out in apparently normal individuals but in clinical procedure the unaccountable alterations in established normals are very infrequent. Especially in children from 10 to 18 years of age there is surprising agreement to the standards now in use.

The routine use of basal metabolism in the clinic of to-day has been adopted only for thyroid cases which, in association with clinical findings, permit the classification referred to. Hyperthyroidism is considered as the clinical syndrome resulting from an excess of thyroxin in the body. Thyroxin has been identified by Kendall as the active principle of the thyroid gland. Hypothyroidism is considered as the opposite of hyperthyroidism. This distinction is made on a quantitative rather than a qualitative basis. The relationship of thyroxin to heat production can account for all the phenomena in hyperthyroidism as due to a sustained elevation of basal metabolism. We, therefore, can make use of the basal metabolic determination in differentiating those conditions due to variation in the activity of the thyroid gland from those due to nervous and other conditions in which the clinical resemblance is marked.

The symptoms of thyroid involvement have been extremely unreliable as a guide to toxicity and since thyroid functional alteration has been assigned empirically as a prominent factor in etiologic relationship to these conditions, we have carried out these observations. In many of the preparations recommended indiscriminately for backward children, thyroid substances have been the active ingredient. In the series presented, an endocrinopathy was suspected as a significant factor in the symptom complex of the constitutionally inferior.

The cases which we have selected presented manifestations of physical or mental variation, or both. They have been chosen to point out the value of basal observations as a guide both to diagnosis and to control of therapy, and fall into three groups, namely: group I, normal basal metabolism; group II, increased basal rate; and group III, decreased basal rate.

In the first group we have selected two cases with normal rates but presenting indefinite symptoms pointing to hypothyroidism. One case (E. F.) was a young girl, aged 14 years; obese, weighing 186 pounds, with irregular and scanty menstruation; showing emotional instability and mental retardation. The basal metabolism was normal. Thyroid extract was given, producing marked irritability and nervousness. The obesity in this case strongly suggested an endocrine basis but with a normal rate, and the reaction to thyroid therapy serves to call attention to the pernicious habit of this procedure as a general measure for obesity. As Means points out, it relieves one evil by creating another. The reaction in this case shows how easily one can produce the hyperactive symptoms in an individual with a normal rate. It is well to point out here that the
hypopituitary as well as hypothyroid conditions show a decreased rate.

D. M., the second case in group one, is a young male aged 13½ years, well formed physically but unable to make proper progress in school. He shows mental retardation, nervous instability and past history of convulsive attacks from ages of three to six years. Basal metabolism was normal. This patient under thyroid therapy had shown a marked aggravation of his symptoms.

These cases in group I serve to show the reaction attendant upon the administration of thyroid extract to patients with normal basal metabolism. Although many of the symptoms are indefinite and many point to apparent hypactivity of the thyroid gland the reaction obtained tends to confirm the basal observations as the more reliable.

Group II shows an increased metabolic rate. One case (J. R.), aged 13½ years, shows tremor, over-active physical make-up, mental retardation with skeletal overgrowth and presence of supernumerary toes on each foot. Basal metabolism increased.

The third subdivision which we present consists of those cases showing a decreased metabolic rate. E. F., female, aged 18 years, showed the classical signs of cretinism in childhood. Has had thyroid therapy since five years of age. First examination six months ago showed her to be sluggish mentally and physically. Basal rate 16% decrease. Thyroid therapy begun. One month later basal rate normal and patient improved. Two months from first examination pa-

tient was extremely sluggish mentally and physically and the basal rate was 18% decrease. The thyroid dosage was doubled and the basal rate of August 1 and September 1, 1921, was normal, with very noticeable mental and physical improvement. This case serves to illustrate the value of these observations as a guide to therapy in a quantitative manner.

The second case in this group (S. C.) was aged 8 years, showing attacks of petit mal since three years of age, mental instability, adiposity with supraclavicular deposits of fat and chloride retention. The basal rate was 15% decrease and under thyroid therapy favorable progress has been noted.

While not belonging to this group, we wish to report on results in adolescent goitres. The observations have shown normal basal rates and in three very marked enlargements small doses of iodine have been given with frequent observations on the rates. The clinical results have been satisfactory and the cases are checked frequently, with basal rates as a guide to therapy.

The children observed were from eight to eighteen years of age. The observations were made with the Benedict closed circuit apparatus. No difficulties were encountered with children failing to cooperate. The determinations were made in the Metabolic Department of the Mercy Hospital, the cases coming in from outside, resting one-half hour on the couch, and triplicate observations being obtained. We have not attempted to carry out these observations in many
children under ten years of age, thus limiting our series.

We have realized that the determination of normal standards at the ages in this series might be open to question. Each of the cases presented has shown a definite point in regard to the value of the procedure and we have been convinced that it is the most reliable method, in conjunction with the clinical findings and the results of therapy. The utilization of this method would tend to prevent "the giving of thyroid when in doubt," which tendency was emphatically pointed out by one of us. It would also serve to regulate the dosage.

Conclusions: Basal metabolism affords a means of classification of the cases and serves as a guide to therapy.

DISCUSSION

Dr. Edward L. Bauer (Philadelphia): Dr. Pollock said that there is still room for a great deal more work in metabolism in endocrinology. Indeed that is true; the surface has hardly been scratched, and I might say that this is also true of the work we have had an opportunity to do in Philadelphia along this same line. I hope that this subject will be developed more rapidly than at present.

Dr. Pollock's work in regard to basal metabolism substantiates ours very well, and not only in the hypothyroid but also in the hypopituitary cases. Dr. Streccher, of this city, with whom I am not, however, associated, has found that he is up against a stone wall in regard to sugar tolerance. I am rather in the same predicament, and I should like to know if Dr. Pollock has done any work with the blood sugar and sugar tolerance and gotten anywhere with it.

Dr. Pollock (in closing): Our results with glucose tolerance tests in adults have not yielded satisfactory results, so that we have not attempted to make use of it in this work as a part of our routine.

The observations reported here were carried out primarily on the assumption that without a significant alteration in basal rate we could consider that the thyroid was an unimportant factor in the disturbance.

As an aid in therapeutics I believe our series, although not large, is suggestive as a warning against the indiscriminate use of thyroid therapy in the constitutionally inferior child.