

Section of Therapeutics and Pharmacology.

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DISCUSSION ON THE VALUE OF ALCOHOL AS A THERAPEUTIC AGENT.¹

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THE aim of this discussion is to arrive at a clearer definition of the scope and value of alcohol as a therapeutic agent. It ought to be possible for any of us to hold a strong view, in either direction, as to the desirability of alcohol as an article of ordinary consumption by the healthy, without in any way prejudicing his opinion of its value in the treatment of the sick. It is the latter which we are asked to discuss to-day, as an independent and purely scientific question. We are asked to endeavour to put ourselves, by imagination, into the position of medical men practising in a country in which there is no "alcohol problem" of ordinary life—in a country, for example, which effectively prohibits the popular consumption of alcohol. The question before us is whether alcohol, under such conditions, would have a proper place in the Pharmacopœia, except as a solvent, and, if so, for what purpose it should be included. I venture to appeal to all who take part in the discussion to assist us in rigidly keeping it confined to the consideration of this scientific, therapeutic question, which is our only proper concern as a Section of Therapeutics and Pharmacology.

My own contribution to the discussion will be merely an attempt to review the physiological and pharmacological evidence as to the actions of alcohol which can be experimentally demonstrated. I shall leave it to those who follow to discuss the extent to which the action

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of alcohol in practical therapeutics fulfils, exceeds, or falls short of the expectations thus aroused.

In the first place, I think it must now be regarded as settled beyond dispute that alcohol can be used by the body as a source of energy, and that, in that limited sense, it can act as a food. The very careful experiments carried out especially by Atwater and Benedict indicate, indeed, that it is possible, for a limited period, to supply a surprisingly large fraction of the ordinary total energy-need of the body in the form of alcohol—as much as one-fifth. Dr. Mellanby, I believe, will have some new evidence to give us as to the limitation of the body's power to use alcohol. The question as to whether alcohol is a desirable substitute for part of the carbohydrate or fat in the diet of the healthy is not here involved. That is a question which each must determine by his view as to the significance of its other actions in normal life, and does not concern us to-day. Whatever our views on this question, we must recognize that a type of action, which may be deleterious to the normal activities of the healthy, may be harmless or advantageous to the sick. In the treatment of the sick, moreover, alcohol as a source of energy has certain points of positive advantage over the normal non-nitrogenous constituents of a diet. It requires no digestion, though in this respect it may be argued that it has no advantage over dextrose; it is not susceptible to such fermentation by yeasts or bacteria as to cause a deleterious production of gas in the alimentary canal; and it is absorbed with great rapidity. Reasoning purely from experimental knowledge of its properties, one would expect that there are conditions in which the digestive secretions are paralysed, as in acute fevers, in which absorption is imperfect, in which fermentation is liable to be excessive, and in which, therefore, the food value of alcohol should give it a place in therapeutics; its function being to supply to a system, unable to obtain it from the normal sources, the minimum of energy necessary to tide over a critical period. The discussion will doubtless enlighten us as to the extent to which alcohol can fulfil this rôle in practice. Concerning a very special case of its use for this purpose we shall hear, I believe, from Dr. Otto Leyton—namely, its use in the modern treatment of diabetes, during the period in which all other food is withheld, in order to render the urine free from sugar.

Entirely different from the question of this use of alcohol, as what I may call an emergency-source of energy, is its reputation with some practitioners in the diet of the convalescent. I do not think that any one will now contend that alcohol as such has a specific effect on

metabolism, a power of "building up the system," such as that with which an earlier and uncritical generation credited especially certain liquors containing it. Such views have probably as much scientific basis as that which credits red wine with a special power of forming red blood. So far as any rational basis can be found for the use of alcohol in convalescence, it seems to be this: that certain patients are made more comfortable and contented, worry less and take their food with keener enjoyment, if they are given alcohol. The treatment, therefore, would seem to involve the giving of the alcohol in a form in which the patient enjoys it. It would hardly be maintained that the same quantity of the drug, administered in a distasteful mixture, would have the same effect. So that the use of alcohol in convalescence will probably be decided by the relative importance attached by individual opinion to its appetizing qualities, on the one hand, and the danger of forming a habit on the other. No uniformity of opinion can be expected on such a subject from a meeting like this, and I hope that this point will not be the subject of lengthy discussion.

We are led, then, to consider the other actions of alcohol which may have therapeutic significance: its action as a drug, as distinguished from its action as a food. Here again, a prolonged controversy, which formerly divided the world of experimental pharmacology, seems to be practically settled. Most of you will be aware that there were two schools of opinion, one, of which the leading exponent was Binz, which maintained that alcohol was a stimulant, and the other, led by Schmiedeberg, which maintained that in all its actions, other than that of direct irritation to mucous membranes, alcohol was a depressant and narcotic. The question seemed to have some practical importance, since a large part of the therapeutic reputation of alcohol was based on the assumption that it was a respiratory and circulatory stimulant. I think anyone who studies the experimental evidence will reach the conclusion that the view of Schmiedeberg and his followers was the correct one, so far as the normal heart and respiratory centre are concerned. The most recent series of experiments in America, conducted on normal men, failed to show that alcohol had any stimulant effect on the action of the heart, or the activity of the respiratory centre, in doses up to those sufficient to produce a mild intoxication. I think it may be taken as the generally accepted pharmacological teaching that alcohol has no stimulant action on any of the vital functions of the normal animal or man. The slight acceleration of the heart which often follows its ingestion is attributable, as Professor Dixon, among others,

has shown, to the reflex effect of its direct action on mucous membranes. Its only other action on the normal circulation is the flushing of the general skin surface which it produces.

I think that it would be an important result of this discussion if those who will speak from wide clinical experience can do anything to clear up the discrepancy, between this lack of any sound experimental evidence, that alcohol is a stimulant and its still widely prevalent use in therapeutics as a stimulant of depressed or failing respiration and circulation. One must allow something, of course, for the greater hold of tradition on clinical practice than on experimental science; but I am not satisfied to regard this as the whole explanation of the anomaly. I think a good deal of weight may be allowed to the consideration that the experimental results have been obtained on normal subjects, while clinical experience is dealing with functions depressed, not merely by actual weakness, but by inhibitions due to reflex action or to influences from the higher centres. The weakening of such central inhibitions, which would be entirely compatible with the action of alcohol as demonstrated by experiment, would have the appearance of a stimulation; and from the strictly practical point of view it may seem a matter of minor importance whether the effect is really one of true stimulation or of mild narcotic action. If and when alcohol assists recovery from syncope due to fright or pain, I imagine that we have a condition in which the action of the heart and the vasomotor tone are subjected to severe central inhibition, and that alcohol helps to weaken and remove this inhibition. Dr. Haldane's recent work seems to show that excessive reflex stimulation, or excessive reflex excitability of the respiratory centre may, by causing respiration of the ineffective, rapid and shallow type, actually impair the oxygenation of the blood in the lungs. Administration of oxygen is the obvious remedy, but I do not think that the possibility can be excluded off-hand, that the mild sedative action of alcohol may have a valuable adjuvant effect in such a condition. Dr. Willcox is to put before us some results of practical experience on the combined use of alcohol and oxygen in pneumonia, and I hope he will be able to give us his views as to the mode of action of this treatment. Anything will have value which, in such a condition, can assist in restoring the quiet, deep rhythm of effective respiration, in thus securing for the blood the maximum oxygenation which the still functional lung tissue can give it, and in thereby sending well oxygenated blood to a heart threatened with overloading and dilatation. I hope our discussion will enable us

to form a clear opinion as to whether alcohol has any such action. If it has, it is a valuable drug. The issue has been too long obscured by the discussion as to whether it is a stimulant or a narcotic, as though a stimulant action were necessarily always beneficial and a narcotic action always to be avoided. Recognizing that alcohol is essentially and always a mild depressant and narcotic in its action, we should recognize also that such an action may have valuable therapeutic application in the weakening of excessive and deleterious inhibitions, and in controlling a morbid reflex excitability. It may be added that, assuming that such mild sedative action on the centres is what is required, the claim might be made for alcohol of a special position, in that it is the only narcotic drug at our disposal which at the same time materially contributes to the energy requirements of the body.

But while care may be necessary, lest we refuse to recognize what may be a beneficial action of alcohol, because of a prevalent misconception of its mechanism, I think it will be generally admitted that alcohol is still prescribed in a very indiscriminate and unscientific manner. A drug is of real value in therapeutics in proportion as we know clearly what it can and what it cannot do. I hope that this discussion may at least make an attempt towards a closer definition of the conditions in which alcohol is demonstrably valuable, and those in which it is useless or harmful. I suspect that a large proportion of the conditions in which it is professionally recommended, to say nothing of those in which it is used by the laity for self-medication, would fall into the latter category. Our business, I take it, is primarily to discover the condition in which it has value, and only incidentally to deal with those in which it has none. Perhaps some contributor will find time to deal with its reputation as a prophylactic against catarrhal infection, and, especially at the present time, against influenza. We shall agree, I imagine, that there is no evidence whatever to warrant the assumption that alcohol has a specific action against infection of any kind. As to its use against the lowering of resistance by chill, I suppose that the common-sense interpretation of its action is as follows: There is no doubt that it causes an acceleration of blood-flow through the skin, so that its use as a preliminary to, or during, exposure to cold would appear to be dangerous. After exposure, as an aid to the effect of external warmth, it may have value, by promoting superficial vaso-dilatation. Doubtless other particular examples of its action will appear in discussion. So far as they have any real basis, I believe that they will prove to be

capable of interpretation along the three known lines of action of this substance—as a limited source of quickly available energy, as a depressant of the nerve-centres, and as a weak superficial vasodilator.

Dr. E. MELLANBY.

In the short time at my disposal I propose to deal as briefly as possible with the question as to the amount of energy that can be supplied to the body by alcohol, and the relation which alcohol bears to the other energy-producing foodstuffs.

Atwater and Benedict's calorimetry work has placed on an experimental basis the fact that a considerable amount of energy can be obtained from the combustion of alcohol in the body—25 per cent. has been mentioned by Dr. Dale. There is good reason, I think, to believe that this is a low estimate. One gramme of alcohol on oxidation gives out 7 Calories of heat; this compares very favourably with proteins and carbohydrates, each of which yields 4.1 Calories of available energy. Practically all the alcohol taken is absorbed and oxidized, so that, disregarding the toxic action of alcohol for the time being, we see that alcohol can supply a considerable quantity of energy to the body.

Fig. 1 shows the rate of entrance into, and of disappearance from, the blood of alcohol in the case of a dog. The dog, weighing 13.5 kg., had 50 c.c. of diluted absolute alcohol put straight into the stomach. This was completely oxidized at the end of twenty hours, that is to say, 2½ c.c. of alcohol were oxidized per hour, showing that 1.04 Calories of heat per kilogram body weight per hour was supplied by the alcohol. This represents about 40 per cent. of the total heat lost during the period. By other methods Völtz and Dietrich calculated that in resting dogs 42 per cent. of the total energy was supplied by alcohol during a ten hours' experiment and 35 per cent. in a fifteen hours' experiment.

Fig. 2 (curve A) shows the result of an experiment performed on a man, whose weight was 70 kg. He took whisky containing 171 c.c. of absolute alcohol. It can be calculated from the curve that he oxidized 10 c.c. of alcohol per hour. That is to say alcohol furnished about 54 Calories per hour, or roughly 1,300 Calories *per diem*. This would represent about 40 per cent. of his total energy loss.

Having stated this fact let us see how alcohol, from the point of view of energy, resembles or differs from other foodstuffs.