PROCEEDINGS
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ALCOHOL AND ITS NUTRITIONAL SIGNIFICANCE

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Distribution of Alcohol Consumption and of Calories Derived from Alcohol in Various Selected Populations

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In a given country we usually know only the gross consumption per head for the main types of alcoholic beverages; we rarely hear how this consumption is distributed among the population. By gross consumption per head I mean the gross consumption divided by the total number of inhabitants irrespective of age. The 'potential' rate per head, at least in most countries, is arrived at by including only the population aged 15 years and over. We rarely know the percentage of the population that actually uses alcohol, so that we can seldom calculate the 'effective' or actual consumption rate per head.

I shall give here a few examples of distributions of alcohol consumption, or first approximations towards the question of distribution. The metabolic (Sinclair, 1955; Le Breton & Trémolières, 1955), nutritional (Platt, 1955; Wilkinson, 1955) and pharmacological (Weatherall, 1955) effects of alcohol consumption are presented by outstanding experts, so I shall deal only with the statistical aspects. I shall consider the distribution of alcohol consumption in the U.S.A., in Italy and, briefly, in Chile. I choose these countries because certain facts are known about them which enable us to go beyond the statement of simple consumption values per head. I may mention that for France a theoretical distribution was worked out separately for adult males and adult females by Ledermann (1953). I shall proceed from a few gross rates per head of apparently modest size to deviations of extraordinary extent, and first a few words may be necessary about the attitude in the literature towards reports of alleged extremely high individual consumption figures.

Individual consumption rates

From time to time we hear of some individuals or some ethnic or occupational group whose daily consumption of alcoholic beverages equals 400–450 g absolute alcohol. Such reports have always been refuted on the grounds that since such

amounts cannot be eliminated from the body in 24 h the drinker would double his weight within so many months, but of course long before that he would be dead. These arguments have always been based on the statement that the average elimination rate of alcohol is 100 mg/kg/h, which for the average body-weight of 70 kg would mean the elimination of not more than 168 g absolute alcohol in 24 h through oxidation and other means.

As other speakers touch upon recent advances in the knowledge of alcohol metabolism, I shall only criticize statistically the rigid acceptance of the elimination rate of 100 mg/kg/h. This rate is nothing more than an average, with a great dispersion around it. Furthermore, this dispersion is not of the nature familiar to us from the so-called normal distribution. For some time I have been collecting blood-alcohol concentration curves from the literature, and wherever the values were given, e.g. by Schmidt (1937) in Denmark, determining the various alcohol-elimination rates. This work is still going on, but it is becoming evident that this average of 100 mg is a pretty loose average. The data from the literature collected by me up to date indicate a symmetrical but flat-peaked (platicurtic) distribution curve. There is no great concentration of observations around the mean. But values below and above it occur in much higher proportions than in the normal curve.

Values of up to 150 mg are not exceptional; they are fairly common occurrences. On the other hand, values of 60–65 mg also occur fairly frequently. Thus we may find a high proportion of elimination rates 50–60% above the average, and when these are combined with body-weights well above the average it is evident that the result in the amount of alcohol metabolized is far above the accepted average. If one takes a group of 100 men and measures their alcohol-elimination rates, one will be able to predict the mean value fairly well, but this mean will be of such a nature that it cannot be applied as an approximation to individual occurrences. This statistical aspect explains only partly the high consumption figures; other explanations are given by Dr Trémolières and his associates (Le Breton & Trémolières, 1955).

Distribution of consumption in different countries

United States of America. For the United States we have reliable estimates of the number of total abstainers (determined by Gallup Poll and by three or four other independent surveys) and we have also good knowledge of the number of alcoholics and of the average daily consumption of alcohol by addicts.

When I mention calorie values in connexion with statistics on alcohol consumption I am not making any assumption about the utilization of those calories.

In 1950 in the United States of America the total consumption of absolute ethyl alcohol contained in beer, wine and distilled spirits—including a conservative estimate of 10% illegally produced alcoholic beverages—amounted to 226,562,000 U.S. gal. This corresponds to a rate per head of 1·498 or, let us say, 1·5 U.S. gal. for the year, or 0·53 oz./day. Thus the daily contribution of alcohol would have been 88·5 Cal./head.

This average is a rather fictitious value. The Gallup Polls and other highly reliable surveys, e.g. those of Riley & Marden (1947) and Maxwell (1952), show that in the U.S.A. 65% of the population of 18 years and over uses alcoholic beverages. Since, however, in the U.S.A. the population between the ages of 15 and 18 years must be considered too, the proportion of consumers in the population of 15 years and older must be adjusted to 63·5% (73% for males and 54·5% for females). Based on the above percentages, the number of actual consumers of alcoholic beverages for 1950 was 69,738,000, i.e. only 46·3% of the total population. The 'effective' rate per head (actual users only) was thus 3·25 U.S. gal. for the year, or 1·14 oz. absolute alcohol/day, with a daily equivalent of 190 Cal.

This latter value is still not particularly illuminating as the male consumers were not only more numerous than the female but, as I was able to estimate from the total evidence, drank individually three times as much alcohol. This sex ratio for individual alcohol consumption agrees with the ratio as computed for France by Ledermann (1953).

The 39,257,000 actual male users who represented roughly 26% of the total population consumed 181,000,000 U.S. gal., i.e. 80% of the total absolute alcohol consumed and the calories yielded by it. Their daily rate per head was 1·62 oz. (270 Cal.); that for actual female consumers was 0·52 oz. (87 Cal.).

We must take into consideration that for 1950 the number of male alcoholics in the U.S.A. was 3,276,000, as estimated by Jellinek (1952), and that their daily average consumption was 8 oz. absolute alcohol, i.e. 1336 Cal. Thus the male alcoholics, who represented 8·3% of all actual male consumers, drank 74,000,000 U.S. gal. absolute alcohol, i.e. nearly 41% of the total consumption by males, or 32·7% of the total U.S.A. consumption.

This leaves for the 35,981,000 non-alcoholic male consumers a total of 107,000,000 U.S. gal., or a daily rate per head of 1·06 oz. (177 Cal.). For 28,654,000 of these non-alcoholic male consumers the daily average consumption was not more than 0·5 oz. of absolute alcohol, or 83·5 Cal., and for approximately 19 million of these 28 million the average daily consumption was only 0·25 oz. or 41·75 Cal. On the other hand, there were around 7,300,000 non-alcoholic male consumers whose average daily intake was 3·15 oz. absolute alcohol, i.e. 526 Cal.

There are thus three drinking populations: the small users, whose daily average is 0·5 oz. or less, then a middle population with a daily average of 3·15 oz., and the alcoholics whose daily average is 8 oz. The lowest group of 28,000,000, drinking 0·5 oz. or less, are probably mostly beer drinkers. Of the middle population, some are heavy beer drinkers, some drink spirits, and some both. The alcoholics consume spirits, with sporadic consumption of beer.

Thus for the United States of America it may be said that for nearly 54% of the population ethyl alcohol is not a source of calories and for the great majority of actual consumers its contribution to total calories is negligible; in a fraction of the population the calories from alcohol are appreciable and in a smaller fraction the contribution made by alcohol is so high that it constitutes a dangerous interference with nutrition.

Italy. Before turning to Italy I should like to say a few words about the drinking pattern. American alcoholics drink in bouts, a very different pattern from that of the Italian and French alcoholics, who drink continuously. Drinking wine throughout the day is quite different from drinking 2 qt. of whisky, and 'spree' drinking has different effects from long-term wine drinking.

In Italy we have an exceptional drinking survey carried out by the Doxa Institute of Milan (Fegiz, 1952), the sampling covering geographical regions, occupations, economic conditions, and so on. In this investigation a table was also made of the number of meals per week with which Italians, male and female, take wine, and then a table showing the actual amount of wine taken with meals. Working from these tables I obtained the frequency distribution of the daily wine intake with meals by males shown in Fig. 1. This ranges from a low intake of 0–200 ml. through 200–400, 400–600, to 3 l. and above.
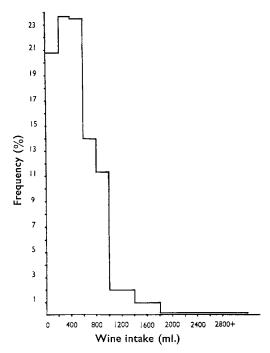

Fig. 1.   Frequency distribution of the daily wine intake with meals by adult Italian males.

In Italy 13,140,000 males, 28·4% of the total population, account for 75% of the total alcohol consumption, and 11,586,000 females, 25% of the total population, for 25% of it. Non-drinkers form 46·6% of the population. Within the male group, 10% account for 30% of the actual male consumption. The average intake for this 10% is 227 g/day, which provides 1612 Cal. There is thus a very uneven distribution of the calories derived from alcohol.

Chile. In Chile the average consumption rate is stated as 9·7 l. absolute alcohol/year, but in Chile the women do not drink. Thus this rate per head must be adjusted

to the adult male population and should be 27·7 l., which is about half what it is for males in France. Also, in Chile there is a consumption of distilled spirits which is insignificant in Italy, where also the beer consumption is almost negligible.

Conclusion

In conclusion, as far as the national calorie budget of most nations is concerned, with few exceptions, the contribution from alcohol is neither here nor there. But in nutritional surveys of ethnic or occupational groups, or social classes, it cannot be ignored. It may be contributing significantly towards the total calories and, more important, it may be the chief source of interference with nutritional functions. I warmly recommend that surveyors should not neglect the possible contributions and interference from alcohol.

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Part de l'Alcool dans la Dépense Calorique

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Ce problème, à la fois théorique et pratique, a donné lieu à de nombreuses discussions souvent obscurcies par des considérations morales et sociales. Notre attitude sera objective. Les arguments contre l'introduction de l'alcool dans le régime au-delà de certaines limites sont trop nombreux pour que nous soyons hésitants lorsqu'il faut reconnaître à ce métabolite certaines caractéristiques d'un aliment.

Caractères généraux de l'oxydation de l'alcool par les animaux supérieurs

L'alcool est oxydé et utilisé au niveau de la dépense basale. Administré de façon inaccoutumée, à une dose inférieure à 2 g/kg, l'alcool est oxydé. La vitesse d'oxydation est indépendante de la concentration (jusqu'à 0·25%) pour une série d'espèces, dont l'homme.

Dans la plupart des cas, cette oxydation ne s'accompagne pas d'une augmentation du métabolisme basal (M.B.); l'alcool n'a pas d'action dynamique spécifique (A.D.S.) et peut contribuer pour 50% aux dépenses basales. Ces faits ont été établis par diverses méthodes: