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SYMPOSIUM ON 'ALCOHOL IN NUTRITION'

Alcohol consumption in its different forms

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Much of our current scientific thinking on alcohol has its foundations in scientific advances in the last century. With the emergence of organic chemistry, ethyl alcohol was given its name (now ethanol) and formula and became a central point in the study of carbon compounds. Parallel investigations by Pasteur, on the nature of micro-organisms and their activities in wine-making and brewing, laid the basis of modern microbiology and, in providing explanations for age-old practices, prepared the way for the scientific control of fermentations. Simultaneous advances in human physiology led to investigations on the absorption and metabolism of alcohol, the first stages in the biochemical, pharmacological and nutritional experimentation to be considered in later parts of this symposium.

Long before these nineteenth century discoveries, there was a voluminous literature on the art and science of fermentation, for it has been the subject of research by the historians of the ancient civilizations of Iran and the Near East, of Egypt and North Africa, and of Greece and Rome. The production and use of alcohol goes back to prehistory; archaeological records reveal the widespread use of alcohol from different sources and in different forms. Greek writers distinguished between three sources of fermented beverages based respectively on honey (to give mead), cereals (to give beer) and the grape for wine. Later (about the fifth century A.D.), references began to appear to other sources, notably the apple (to give cider), the pear (for perry) and other fruits (Singer, Holmyard & Hall, 1954).

The products described in the classical literature or archaeological records of the Mediterranean world were derived direct from fermentation. Distillation awaited the rise of chemistry by way of the Arabian alchemists. Although crude stills were known in the first century A.D., it appears that improvements leading to the distillation of alcohol did not occur until about A.D. 1100 (Singer, Holmyard, Hall & Williams, 1956). This discovery led to the production of a wide variety of distilled spirits to supplement the older fermented beverages; it led also to the production of a third group of beverages, namely wines (or similar products) fortified by the addition of alcohol.

It may be noted that some foods, and especially yeast-fermented products, contain small quantities of alcohol (Kent-Jones & Amos, 1957).

Fermented beverages

The vine. The cultivation of the grape and the art of wine-making spread from Asia Minor westward with Greek civilization and colonization. Under the Romans, the legions spread the vine to Spain, France and England and to Germany, Austria and Hungary. The boundaries of viticulture were set in large measure by climatic – and in particular by temperature – conditions, for the vine will not flourish in regions which are too hot (such as parts of Egypt) or too cold (as in northern Europe). The vine, with the olive and the wheat grain, became symbolic of the Roman way of life and of the civilization and dietary pattern of western Europe (La Blache, 1946; Sorre, 1951).

Table 1. *Main wine-producing countries*

(Rounded figures for 1969)

Country	hl*/annum	Country	hl*/annum
Italy	71 000	Argentina	18 000
France	50 000	Algeria	8 700
Spain	25 000	USA	8 500
USSR	25 000	Portugal	8 300

*1 hl=100 l=22 imperial gallons=26.4 US gallons.

Table 1 lists some of the main wine-producing countries at the present time; Italy, France, and the Iberian Peninsula are the largest producers (Lichine, 1967; Johnson, 1971).

Other European countries not included in Table 1 have important wine industries, and outside Europe the vine has become well established in South America (notably in the Argentine, Uruguay and Chile), in the United States of America (especially in California) and in Canada, Australia and South Africa. In North Africa, Algeria ranks as sixth in world production.

Cereals. The traditional European beers are made from fermentation of malted (sprouted or germinated) barley and other cereals. Beer has become a national or regional beverage, and breweries play an important part in the national economy in many countries. Over the past two centuries breweries have spread to the USA and Canada, Australia and other countries in which people from northern and central Europe have settled. Beer production on the European model is well established also in many of the capitals and other cities of Africa and Asia.

There are many different types of beers depending on the grains used, the addition of materials such as hops, the sources of water and yeasts, and on local brewing practices. Up to comparatively recent times wine-making and brewing were carried out on a domestic or village basis as offshoots of agriculture. Although wine-making is still largely practised on a local basis, brewing in many countries over the last 100 years has become more centralized in its operations as well as in its finance. In parts of Africa and on other continents also, local beers made on a domestic scale from local cereals such as millet are a normal part of the dietary pattern (Platt & Webb, 1946).

Honey. Mead, one of the oldest drinks known to man, was produced in quantity in Russia and other countries around the Baltic and in England. Its use has declined, in part because of the availability of cereals as an alternative and cheaper raw material for alcohol production and in part because of preferences for distilled spirits.

Apples and pears. Some form of cider from apples (or perry from pears) is made in many countries; in Europe cider has been regarded up to recently as a beverage of particular regions, for example in the Basque area of France and Spain, in Normandy or in western England.

Other fruits. A wide variety of other fruits are used in different parts of Europe on a domestic, and sometimes on a commercial, scale to give fruit wines. In some districts local production is important as the basis for distilled products. In the Middle East, dates are used as a source of wine.

Other sources. There are very few regions of the world without some form of local fermented beverage obtained from an indigenous raw material ranging from milk in parts of the Caucasus, to palm wines in North Africa and the cactus plant in Mexico.

Distilled beverages

For some centuries after the discovery of distillation, the process was confined largely to the laboratories of the apothecaries and to the monasteries; from these two locations came several of the beverages well known today. Initially, spirits were made by the distillation of wine or in northern Europe from beer, but the distillery later was detached from the brewery (Singer *et al.* 1956). From the sixteenth century onwards knowledge of distillation spread rapidly throughout Europe and the world to become the basis of both illicit and public activities which have profoundly affected dietary and social habits and national economies (Lucia, 1963).

Table 2 lists some of the many types of spirits classified in terms of the carbohydrate sources. To this list may be added various fortified wines (e.g. port) which are important items of international commerce (Lichine, 1967).

Consumption patterns

Wine. Table 3 shows selected European countries in order of their annual wine consumption per head and gives also the comparative figures for beer and spirits. The first group of countries is headed by Portugal, Italy and France (with a consumption of over 100 l/head). The second group (consumption 10–50 l) includes countries to the east of France. The third group (with a consumption of less than 10 l) covers northern Europe, including Great Britain (2.9 l).

Outside Europe, three countries of South America, namely Argentina, Chile and Uruguay, have high annual wine consumptions (respectively 87, 49 and 25 l). The USA, Canada, Australia, New Zealand and South Africa give annual consumption figures between 3 and 10 l.

Beer. Beer production and consumption in Europe is highest in the region stretching from Germany, Belgium, Denmark to England (Table 3) and in Czechoslovakia (135 l per head).

Table 2. *Some sources of distilled alcoholic liquors*

Sources	Some products	Some producing areas
Cereals (such as barley, maize, rye) or potatoes	Whisky	Scotland, North America
	Whiskey	Ireland
	Vodka	USSR, Poland
	Gin	UK, North America
	Genever	Netherlands
	Schnapps	Germany
Sugar-cane or molasses	Rum	West Indies
	Cane-spirit	South Africa
Apples (or cider)*	Calvados	France (Calvados)
	Eau de vie de cidre	France (northern)
	Apple-jack	USA
Grape (or wine)	Cognac	France
	Brandy	Many countries
	Ouzo	Greece and Middle East
	Vinjan	Jugoslavia
(Grape skins)	Grappa	Italy
Other fruits*	Alcools blancs	France
	Wasser	Germany
	Kirsch (from cherries)	Austria
	Slivovitz (from plums)	Jugoslavia
Some other sources*		
Cactus	Tequila	Mexico
Rice	Arak	Asia
Coconut	Arak	Asia, Africa
Dates	Arak	Middle East
Water-melon	Kislav	USSR
Milk	Skhou	Caucasus

*These sources may be used in preparation of wines or the equivalent, as well as for production of distilled liquors.

Table 3. *Annual consumption of alcohol in some western and northern European countries (Anonymous, 1971c)*

(l/head of population)

Group	Wine as consumed	Beer as consumed	Spirits as 100% alcohol	Total as 100% alcohol
More than 50 l wine:				
Portugal	115	14	0.5	16
Italy	115	12	1.7	14
France	112	41	2.3	17
Spain	62	38	2.84	12
10-50 l wine:				
Switzerland	41	77	2.12	11
West Germany	17	139	2.97	12
Belgium	14	140	1.32	7.2
Less than 10 l wine:				
Sweden	6.4	58	2.65	5.9
Denmark	5.9	108	1.27	6.8
Netherlands	5.1	57	2.04	5.6
Great Britain	2.9	101	0.91	6.4
Norway	2.3	37	1.56	3.6

Spirits. High figures for consumption of spirits are found among both wine- and beer-drinking countries. In France and southern Europe, the figures refer primarily to some form of brandy; in Germany and northern Europe, whisky and vodka or some other grain distillate are more normal. European figures not listed in Table 3 include the USSR (7.4 l) Poland (3.2 l) and Yugoslavia (3.0 l). Corresponding figures for the USA and Canada are 2.87 and 2.41 l.

Local and regional variations. The national statistics quoted cover many different types of beverages which vary widely in their content of alcohol and other components. The figures for total alcohol consumption therefore involve the use of a variety of factors. As averages they disguise not only differences between individuals and families and between social classes, but also regional differences which within any one country may reflect climatic zones or older ethnic, religious or political boundaries. In examining the physiological effects of alcoholic beverages it is important to know whether or not the beverage is taken as part of a meal or divorced from food. There are wide variations in national patterns, for example in France or Italy wine is accepted as a normal part of a meal.

Variations in compositions. The non-alcoholic components of alcoholic beverages are important for many reasons. They may be grouped under four headings: (1) materials from the fruit, grain or other carbohydrate source; (2) materials derived from supplementary ingredients such as hops in beer, and additives in wine-making; (3) products of malting and fermentation including yeast components; (4) products of heat treatment, oxidation and storage including components derived from storage chambers or vessels.

The quantity and nature of these ingredients vary with the process used and according to changing practices over the years. All groups cover a vast range of chemical substances, often present in minute amounts, which contribute to the characteristics of the wine or beer and to personal reactions and preferences. Groups 1, 2 and 4 include colouring and flavouring materials such as tannins and essential oils. Group 3 may be a source of nutrients, such as members of the vitamin B complex, as in older English beers (Drummond & Wilbraham, 1958), African beers (Platt & Webb, 1946) and the Mexican pulque (Aylward, 1953).

Distilled liquors also contain non-alcoholic components, in particular, volatiles derived from the original ingredients or from additives such as the juniper (in gin production) and products formed during storage and ageing. The components will vary depending on whether the traditional pot still is used or the more modern continuous still. Accurate control of distillation is essential to reduce to the minimum the higher alcohols that are formed, along with ethanol, during fermentations, and which may occur in excessive quantities in crude distillates.

Changing patterns of consumption

Time does not permit any detailed consideration of many factors which have led to changing patterns of alcohol consumption in this and other countries. The initial discovery of distillation was, of course, crucial in producing change. The work of Pasteur leading to the control of fermentation and organized yeast production,

followed by other discoveries such as Coffey's continuous still, was a prelude to intensive scientific research and technical innovation in more recent years.

Changes in alcohol consumption in Britain have not risen from any single cause or followed any one route. Among the factors that can be identified over the ages are wars and political alliances responsible for the English interest in the wines of Spain and Portugal and later in the aqua-vitae of the Netherlands. Import duties have played a part because from the earliest times alcohol has attracted Chancellors of the Exchequer or their equivalents. Religious, temperance and other social movements have exercised an influence over the past two centuries. Taxation and regulations have also contributed to change together with improvements in general standards of living.

In the period 1950-70 there has been an increase in the annual consumption of alcohol per head in the UK: beer from 85 to 101 l, imported wines from 0.78 to 2.88 l, and spirits (in terms of pure alcohol) from 0.52 to 0.91 l. In addition there has been an increase of approximately 50% in the consumption of 'British wines' to a 1970 figure of 0.85 l (Anonymous, 1970*a,b*, 1971*a,b,c*). These increases arise from changing social structures and social standards accompanied by the growth of advertising, the restructuring of the home around the television set, and the expansion of tourism. The most striking change is in wine consumption and this has been paralleled by the re-establishment of vineyards and a remarkable development in home-wine production. The legions from the Mediterranean first introduced wine to Britain; the legions from Britain who in their millions have explored in recent years the islands and coasts of the Mediterranean have made some contribution to the return of the vine.

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