Public Perceptions of Beer in Relation to Health: New Opportunities and Challenges

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This paper addresses the perception of beer from early to contemporary times and how those perceptions have changed. Until the middle of the twentieth century, beer had retained its healthy image and it was only around the 1970s that concerns about potential adverse effects of alcohol on health, particularly chronic effects, began to surface. The drastic change in life expectancy brought about by scientific advances allowed people to live long enough for chronic diseases such as cancer and heart disease to become apparent. At the same time, analytical capabilities were developed which allow minute traces of residue chemicals to be detected in places and products previously thought to be residue-free. This has caused the all too familiar food scares that we have experienced. We now know that moderate consumption of alcohol may actually protect against heart disease. We also know that beer contains other beneficial nutrients and it is time that the brewing industry finds ways to promote the healthy benefits of moderate beer consumption.

Keywords: beer and health, alcohol and health, benefits of alcohol

ABSTRACT

This paper addresses the perception of beer by the general public, largely in relation to health, but also considers social attitudes where these are relevant. Before going on to consider future options, current perceptions will be set in the context attitudes to beer drinking in historical times.

INTRODUCTION

Beer drinking and brewing have been recorded in some of the earliest civilisations, including those of the Sumerians, 5000 years before present, and, later the Egyptians. In both of these periods we can identify two important factors; beer was closely associated with bread as a dietary staple, and beer drinking was widespread amongst the whole society, from the rulers down to the common people. In Sumer, for example, where beer was actually made from a type of bread, it was drunk through straws (the mash was not filtered and the straws helped to avoid swallowing the husk fragments). But some of those surviving straws are made of gold or precious lapis-lazuli, so at least some of the drinkers must have been quite rich. Likewise, in Egypt, beer was held in high enough regard to be sacrificed to the gods, whilst at the same time being an essential commodity used for paying labourers with. A thousand years later, in the Roman empire, the Roman soldier marched on beer, increasingly so as the empire reached out to northern and western Europe, where brewing was

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already well established. Julius Caesar praised beer, recognising its value for his fighting troops, and the historian Pliny noted that strong beers had the added advantage of keeping well.

At this time most of these beers were sweetened with honey or date juice and flavoured with a variety of herbs, so the flavour would have been very different from today. By the time we reach the ninth century, hops were being cultivated in France and Germany and the bitterness which we now regard as characteristic of beer began to gain in popularity. By the early medieval period beer was brewed by most families at home for domestic consumption — usually by the wife, who was both baker and brewer. Again we see the association with bread as the staple food, and beer as the staple drink. Beer was the essential beverage for the whole family, including the children, who drank the "small beer", which was lower in alcohol. It was the major, if not the only, fluid for most people, since water supplies, especially in cities, were often foul. Not only that, but already it was recognised that beer was nutritious, even although the existence of proteins and vitamins was not yet recognised.

In Europe there were no religious scruples concerning the consumption of alcohol. A very strong brewing tradition, which survives to this day, developed in the monasteries. There would be different grades of beer, strong, high quality brews for the abbot and his aristocratic visitors, and weaker ones for the local populace and travellers who sought shelter at the abbey for the night.

**POST-REFORMATION**

With the Reformation, the power of the church declined, and the hospitality formerly dispensed by the abbeys became the province of commercial inns, supplied by a new breed - commercial brewers. Many of these operated under royal patronage. In England, for example, Queen Elizabeth the first was renowned for her love of strong ale, and commissioned a special strong beer from her own brewmaster. At this time, the beer allowance for ladies-in waiting at court was 2 imperial gallons (that is 2.4 US gallons or 9 litres!) a day! It is evident that there was no association with drunkeness, since this would not have been tolerated by the Queen!

So we have a picture of beer as the commonest drink in many countries, consumed by young and old, by men and women, by rich and poor, and widely regarded as a staple food and a good source of nutrients, as well as a safe drink. It was equally accepted by Christian religion.

This situation changed in the eighteenth century as distilled spirits became widespread and very cheap. Drunkenness emerged as a common social problem. However, beer was still regarded as the drink of moderation, in contrast to spirits, a view that was immortalised in the series of prints by the artist and social critic William Hogarth. In "Gin Lane" Hogarth depicted spirit drinkers as feckless and disorderly, while "Beer Street" the citizens were sober and industrious, and the arts and crafts flourished.

In the nineteenth century, alcoholic drinks continue to be regarded as healthy, indeed, medicinal. Sir Richard Doll, the eminent physician who has published extensively on the clinical effects of moderate alcohol, quotes [8] from the memoirs of a certain Dr. Macalister, an English pediatrician, who recalls his childhood in the 1860s. Dr. Macalister notes that “at that time, alcohol was regarded as essential for health. Teetotallers were looked on as dietetic cranks and it is interesting that they were sometimes rejected by medical examiners on the grounds that they were taking risks in abstaining from what was considered to be an essential food”.

**THE TWENTIETH CENTURY**

In America, in the early years of the twentieth century, drinking — especially of spirits - was increasingly becoming associated with drunkeness, vice and social disorder. The result was of course prohibition, which lasted until the 1920s. In Europe, however, the long established perception from Hogarth’s day, of beer as the drink of moderation, was maintained. Beer continued to be regarded as a moderate drink suitable for polite society, and endorsed by celebrities. It also retained its healthy image during the first half of the twentieth century. Indeed, the slogan “Guinness is good for you” remained in use right up until the 1960s in Europe. In Africa, beer is still regarded as a significant source of dietary protein and other nutrients. Even in the UK a daily pint of stout was provided for nursing mothers in hospital by the British National Health Service, not generally known for its generosity or for its liberal attitudes, on the basis of its therapeutic role!

**CHRONIC DISEASE AND DIET**

It was around the 1970s that concerns about potential adverse effects of alcohol on health, particularly chronic effects, began to surface. This was part of a much wider awareness of chronic illnesses and of the possible interactions with diet and the environment. The introduction of antibiotics after the world wars had drastically reduced deaths from infectious diseases. By the middle of the century life expectancy in western societies had improved dramatically. (Figure 1).

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**FIGURE 1**

Changes in Life Expectancy in the USA in the Twentieth Century
Sufficient people were now living long enough for chronic diseases such as cancers and heart disease to become apparent. It was also a period in which public funds were being poured into scientific and medical research of all kinds. The World Health Organisation’s International Agency for Research into Cancer (IARC) began its highly respected series of monographs on cancer-causing agents in 1969, with the first volume, covering amongst other things, N-nitroso compounds, being published in 1972.

**ANALYTICAL DEVELOPMENTS**

During the same time, analytical capabilities were being extended and improved, with the first gas-liquid chromatographs going on commercial sale in 1955, followed by the development of liquid chromatography (HPLC) in the 1970s. These techniques allowed minor components in complex mixtures to be detected and quantified, and the limits of detection were progressively pushed down, allowing minute traces of chemicals to be detected in places where their presence had never previously even been suspected. It was the beginning of what can almost be described as a “witch-hunt” for chemicals with toxic properties – particularly carcinogenic properties.

At first it was considered that the ability for a chemical to deregulate cell division and cause cancer was rare, probably limited to man-made materials. The idea was that it would be possible to identify these chemicals and eliminate them from our environment. But as more natural materials and traditional foodstuffs - including alcohol itself - came under investigation, it became apparent that the ability to cause cancerous changes in cells is actually quite a common property even of naturally occurring materials.

For our own industry, the first indication of such problems came with the now familiar story of the discovery of volatile nitrosamines - NDMA - in beer and whisky. But other chemicals in other well established foods such as caffeine in coffee and pyrazines in barbecued foods also became suspect.

At the same time, analytical limits of detection were being driven forever downward. This phenomenon can be illustrated by the case of the fungal toxin, ochratoxin A (OA). This toxin is formed by a mould which can infect grain – and other crops, including grapes – during storage. Malting barley of course, must be stored in good dry conditions in order to safeguard its viability, so OA was not considered to be a problem for the brewing industry. But in the 1990s, antibody technology began to be exploited in order to increase the specificity and sensitivity of chemical analysis. The development of immuno-affinity columns for OA lowered the limit of detection by orders of magnitude, from 1 g/kg to 10 nanograms/kg! Now small traces – nanogram quantities – parts per trillion - could be detected in some beers, wines and other foods. Undoubtedly they had always been present, but a “new” problem in beer had been discovered.

It is worth considering just what limits like micrograms/kg and nanograms/kg actually mean. Milligrams/kg are roughly the same as 1 barley grain in 50 kgs – a sack, say. Micrograms/kg are more like 1 barley grain in a truck. When it comes to nanograms/kg, we are talking about one barley grain in several large silos. With the latest DNA technology we can measure femtograms/kg – this is equivalent to 1 barley grain in 50 million tonnes.

**THE ANALYTICAL PARADOX**

This gives rise to a paradox –

- consumers demand food which is totally risk free
- legislators react by citing the “precautionary principle” and imposing limits at the limit of detection
- as limits of detection fall further and further, substances which are potentially hazardous are detected in more and more foods.

Total elimination of such materials is no longer an option. This poses one of the big challenges to the perception of beer, or indeed of any food, as safe and wholesome. The old adage “the dose makes the poison” is completely ignored.

This realisation is one which legislators and public health guardians, indeed society in general, has still to come to terms with. The attitude in the EU, for example, very much governed by the “precautionary principle” is still one of total elimination. For example, there is a striking difference between the blanket limit of 0.1 g/litre for all pesticides in water set in the EU, compared with toxicity-based limits set by the WHO, or by the USA, for example.

<table>
<thead>
<tr>
<th></th>
<th>EU (µg/L)</th>
<th>USA (µg/L)</th>
<th>WHO (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldicarb</td>
<td>0.1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Atrazine</td>
<td>0.1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Dichlorprop</td>
<td>0.1</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>2,4-D</td>
<td>0.1</td>
<td>70</td>
<td>30</td>
</tr>
</tbody>
</table>

Consumer-led Based on risk to health

**FIGURE 2**
Limits for Pesticides in Water

If we are to retain a varied and tasty diet, I would suggest that legislators and public alike must be educated to understand and accept risk assessments.

**UNDERMINING OF PUBLIC CONFIDENCE BY SUCCESSIVE FOOD SCARES**

But how have the public reacted to these developments? Firstly they are continually bombarded with news of one food scare after another - examples being BSE in UK beef, E. coli 0157 in ground beef and hot dogs in the USA and other countries, *Listeria* in French soft cheeses. Then, first one traditional food then another (for example, butter, red meat or coffee) is
accused of causing disease. It is perhaps not surprising that, given this sort of background, the general public should develop both a suspicion of food and an even greater suspicion of food related advice—especially from official sources!

**FUNCTIONAL FOODS**

At the same time, food is credited with almost supernatural powers. Market surveys in the UK and Europe suggest that the general public considers that over 70% of disease is related to diet. This perception that “you are what you eat” has rapidly taken hold and has led to an increasing interest in functional foods, in which one or other of the natural attributes of a food is exploited to address some health need of the consumer. We may, however, see a change in these attitudes in the future, with the publication of the human genome and the accompanying media hype suggesting that all disease will now be curable by genetic means and we will all live to be 2000!

**BENEFICIAL EFFECTS OF ALCOHOL**

It is against this background that we must view the most recent developments—that is, the accumulating evidence that moderate consumption of alcohol may actually protect against heart disease—the biggest killer in Western society.

![Graph](image)

**FIGURE 3**

*Incidents of Heart Disease in Relation to Alcohol Consumption*

Figure 3, which represents only a few of the many studies published, demonstrates that people who consume moderate amounts of alcohol—about 1-2 drinks a day, suffer less heart disease than those who abstain from alcohol. These protective effects have now been demonstrated in peoples with quite different ethnic backgrounds, in men and in women and using quite different study designs. The supporting data is thus very robust, and is now generally accepted. The medical consensus from all the epidemiological studies is that it is the alcohol itself which is the main protective factor.

There are also feasible mechanisms by which alcohol can affect the cardiovascular system. Alcohol increases the proportion of high density lipoproteins (HDLPs), as opposed to the low density ones which are more likely to damage blood vessels. Alcohol also inhibits blood clotting. The effects are well summarised in a paper published at the end of last year by Rimml**[18]**, who reviewed about 42 clinical studies from the worldwide literature. He concluded that 30g a day of alcohol—in whatever form—was associated with an average, an 8% increase in HDLPs, a 6.5% increase in the protective apolipoprotein A1 and modest reductions in fibrinogen and other clotting factors. Overall, this equated to a 25% reduction in risk of heart disease.

This perception—of moderate consumption of alcohol being beneficial to health—has rapidly permeated popular consciousness. But it has been wine rather than the brewing industry that has benefited. Articles which address the potential health benefits of alcohol almost always refer to wine, and the public is only too ready to believe that a glass or two of wine a day is good for health.

Are there, in fact, other micronutrients in specific types of drinks that can give added benefits? The suggestion that wine could contain polyphenolic compounds which could confer added benefits is well known. The possibility certainly exists, but the evidence is as yet, far from certain. In that context, does beer contain such micronutrients, or have any extra advantages going for it?

**NUTRIENTS IN BEER**

In fact, beer is just as rich as wine in nutrients and micronutrients, if not more so (see Figure 4). Beer contains:-

- Carbohydrate, mainly in the form of complex dextrans rather than sugars, which is an advantage for maintaining even blood sugar levels
- Most B vitamins
- Useful amount of protein and fibre
- Antioxidant phenolics, in the same concentration range as are found in wine.

Of course it is no use having nutrients in the food if they cannot be absorbed by the body. It is therefore equally important to demonstrate the bioavailability of micronutrients. Many high molecular weight antioxidant polyphenols are not easily absorbed by the body. However, one of the main phenolics in beer is the low molecular weight ferulic acid, which is derived from barley cell walls. In the laboratory, it has been shown that ferulic acid can protect blood lipoproteins from oxidation. A recent clinical study[4] has demonstrated that it is also readily absorbed into the body from drinking beer.

Beer also contains useful amounts of many essential minerals. It is low in sodium and high in potassium, a ratio which is desir-
able from the point of view of controlling blood pressure. Another useful mineral in beer is silicon, which is important for healthy bones. There is a lot of silicon in cereals but it is not very easily absorbed by the body. The brewing process converts this silicon to a hydrated form which is much more bioavailable.[3]

Another important factor is that the traditional sprouting stage of malting increases the nutritional value of barley. Many of the B vitamins in barley increase during malting. Work currently in progress at the BRI suggests that this is particularly true for the antioxidant B vitamin, folate, which is now thought to play a protective role against heart disease and some cancers.

Beer is also unique in being made with hops. It is now known that hops contain a number of compounds such as prenyl flavanoids which have protective properties against a wide range of diseases[15]. Research here is at an early stage, and has so far been mainly confined to laboratory experiments. The bioavailability of such compounds, and whether or not they can exert their protective effects in the body as well as the test-tube, has yet to be determined.

Epidemiological evidence suggests that moderate drinking can help to protect against a number of diseases, including osteoporosis[17], Helicobacter infections[5], dementia[6] and kidney stones[111], as well as heart disease. Undoubtedly alcohol is the main active ingredient in many of these cases. However, for some of these conditions, such as kidney stones and Parkinson’s disease[10], beer appears to be particularly effective. The presence in beer of the trace compounds described above may provide some support for such claims.

**TABLE 4**

<table>
<thead>
<tr>
<th>INGREDIENTS</th>
<th>BEER (g/100mL)</th>
<th>WINE (g/100mL)</th>
<th>MILK (g/100mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Carbohydrates</td>
<td>1.5-3</td>
<td>0.1-6</td>
<td>5</td>
</tr>
<tr>
<td>(Of which, free sugars)</td>
<td>&lt;0.2</td>
<td>0.1-6</td>
<td>4.7</td>
</tr>
<tr>
<td>Total Protein</td>
<td>0.2-0.6</td>
<td>0.02</td>
<td>3</td>
</tr>
<tr>
<td>Lipids</td>
<td>negligible</td>
<td>negligible</td>
<td>3-4</td>
</tr>
<tr>
<td>Fibre</td>
<td>0.5-1</td>
<td>negligible</td>
<td>negligible</td>
</tr>
<tr>
<td>Vitamins (mg/100mL)</td>
<td>2-2.5</td>
<td>0.1-0.4</td>
<td>2</td>
</tr>
<tr>
<td>Antioxidant phenolics (mg/100mL)</td>
<td>20-60</td>
<td>30-74</td>
<td>0</td>
</tr>
</tbody>
</table>

**FIGURE 4**

Nutrients in Beer, Wine and Milk

Our forefathers’ perception that beer was safer to drink than the water available to them at that time has been supported by modern studies. Pathogenic micro-organisms, such as the bacteria Salmonella, Shigella sonnei and Escherichia coli[19] and the protozoa Cryptosporidium[20] and Giardia[14] are unable to survive in beer. The effective agents are probably a combination of the low pH, carbon dioxide, the hop acids and the low oxygen concentration, since alcohol alone is not thought to be sufficient to kill such organisms.

Thus it is evident that for 4950 years out of the 5000 during which man has been brewing beer, it has been regarded as highly beneficial or even essential to health. Even for the most recent 50 years, it has been recognised at least for the last 10 years that alcoholic beverages can offer significant protection against the biggest killers of our time, heart disease and some cancers.

**IS THE BREWING INDUSTRY MISSING AN OPPORTUNITY?**

So this is a time of great opportunity for the brewing industry. But it has, as yet, been difficult to realise that opportunity. Why is beer no longer seen as a healthy drink, when wine is? I believe that it comes back to the social image of beer. What was once the drink of kings is now distinctly downmarket. The more affluent section of society, which tends to regard itself as having a more discerning palate, tends to graduate to what is considered to be a more refined drink – wine. This is especially true of those countries that do not have an indigenous wine culture. Some market research suggests that some consumers do not even regard wine as alcohol!

This difference between the perception of beer and wine extends even to legislators and is nicely illustrated by the classifications of alcoholic beverages in the EU. According to the Treaty of Rome, beer (and spirits) are industrial products, while wine is an agricultural product! The challenge facing the brewing industry today, I believe, is to reclaim the public understanding of beer as a product of agriculture rather than of an offshoot of the chemical industry. This certainly does not mean turning our backs on technology. It is the connection with the raw materials which is important for consumers, not necessarily the manufacturing process.

Recently, we held a “brainstorming” workshop at BRI with technical and marketing personnel from UK and European brewing companies. The aim was to explore potential ideas for getting across the positive message of beer. It is interesting that one group came up with this admirable slogan:

**“WE DON’T MAKE BEER, WE GROW IT”**

Today beer is available in a whole range of styles and flavours, enough to cater for all situations and all tastes. We need to promote a product that is appreciated by the majority of the population, women as well as men, the more mature age groups as well as the young. It would be better for the perception of beer if it were drunk, perhaps only in moderate quantities, but by the majority of the population, rather than have an increasingly diminishing sector consuming excessively large volumes.
REFERENCES


