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REVIEW

Effects of moderate beer consumption on health and disease: A consensus document

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Abstract A large evidence-based review on the effects of a moderate consumption of beer on human health has been conducted by an international panel of experts who reached a full consensus on the present document.

Low-moderate (up to 1 drink per day in women, up to 2 in men), non-bingeing beer consumption, reduces the risk of cardiovascular disease. This effect is similar to that of wine, at comparable alcohol amounts. Epidemiological studies suggest that moderate consumption of either beer or wine may confer greater cardiovascular protection than spirits. Although specific data on beer are not conclusive, observational studies seem to indicate that low-moderate alcohol consumption is associated with a reduced risk of developing neurodegenerative disease. There is no evidence that beer drinking is different from other types of alcoholic beverages in respect to risk for some cancers. Evidence consistently suggests a J-shaped relationship between alcohol consumption (including beer) and all-cause mortality, with lower risk for moderate alcohol consumers than for abstainers or heavy drinkers.

Unless they are at high risk for alcohol-related cancers or alcohol dependency, there is no reason to discourage healthy adults who are already regular light-moderate beer consumers from continuing.

Consumption of beer, at any dosage, is not recommended for children, adolescents, pregnant women, individuals at risk to develop alcoholism, those with cardiomyopathy, cardiac arrhythmias, depression, liver and pancreatic diseases, or anyone engaged in actions that require concentration, skill or coordination.

In conclusion, although heavy and excessive beer consumption exerts deleterious effects on the human body, with increased disease risks on many organs and is associated to significant social problems such as addiction, accidents, violence and crime, data reported in this document show evidence for no harm of moderate beer consumption for major chronic conditions and some benefit against cardiovascular disease.

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Introduction

The multiple effects of alcohol consumption on human health have received increasing attention from the scientific community internationally [1]. However, while the harms associated with high intake of alcohol are well known, the effects of moderate doses (up to 1 drink -equivalent to 12 g of ethanol- per day in women, up to 2 in men of all types of alcoholic beverages combined) are more complex to deal with, and are the subject of a lively debate [1]. Of particular interest is the issue of the possible different effects of diverse alcoholic beverages (wine, beer, spirits), in relation to their heterogeneous content of non-alcoholic components. In particular, the question remains on the specific role of moderate consumption of beer, by far the most widely consumed alcoholic beverage throughout the world.

An international consensus document

It appeared thus appropriate to conduct an evidence-based review on the effects of the consumption of moderate amounts of beer on human health and disease.

A selected international Panel of independent scientific experts was gathered to develop a consensus document on beer consumption and health. Panelists contributed to this consensus on their own responsibility, not reflecting the opinion nor following the guidelines of any scientific society or association. To start, each panelist prepared a first draft manuscript on a specific aspect of the review's topic. Articles were individually retrieved by each panelist until November 2015, by search in PUBMED (MEDLINE), EMBASE and Cochrane Library using at least one of the following terms: beer, wine, liquor, spirits, alcohol in combination with health, morbidity, survival, death, cardiovascular or cancer or neurological or liver disease, hypertension, diabetes, supplemented by references included in the retrieved articles, meta-analyses and reviews. Studies were excluded if they were not in English. SC and ADC also carefully went through the volume "Beer in health and disease" edited by Victor R. Preedy, Elsevier, 2009. In several cases, the specific effects of beer consumption could not be separated from that of other alcoholic beverages: in that case the effects of alcohol itself were briefly reported.

All manuscripts were then exchanged and discussed among all panelists by mail/telephone and finally submitted to two external anonymous reviewers (one in Europe and the other one in USA). On the basis of the reviewers' comments, a pre-final text was prepared. A one-day meeting of the Panel was then held in Rome, during which the full text was read, commented and, when agreed upon by the Panel, modified. The consensus document was finalized few days later and submitted again to both external reviewers. The Panel unanimously approved the very final version and decided to submit it for publication to a peer reviewed journal specialized in nutrition and chronic diseases.

The preparation of the manuscript (in particular the organization and costs of the Panel meeting) was supported in part by *Assobirra*, the Italian Association of the Beer and Malt Industries. This funding source had no involvement in either study design, or selection of the Panel members, or collection and interpretation of data, or the writing of the report nor in Panel's decision to submit the manuscript for publication.

What is beer?

Beer has been included in the human diet since at least 5000 BC and as a product of the fermentation of cereals containing sugars and a variety of important nutrients (Table 1). Beer consists over 90% water; it contains carbohydrates and alcohol whose metabolism in the human body follows the release of an amount of energy. The alcoholic content of different kinds of beer varies and it is frequently estimated to range approximately from 3.5 to 10% w/v. Moderate intake of alcohol is considered up to 1 drink (typically a can of beer, 330 mL, containing about 4% w/v alcohol) per day in women and up to 2 in men. Using the food composition table (FCT) from the United States Department of Agriculture (USDA) [2] a can of 330 mL of an average beer contains approximately 140 Kcal. In a diet of 2000 Kcal in a general population, the almost "hidden liquid calories" of 1 drink of beer cover 7% of the daily energy requirements. Results from epidemiological and experimental studies provide inadequate scientific evidence to assess whether beer intake at moderate levels (i.e. $<$500 mL/day) is associated with general or abdominal obesity [3]. However, the extensive consumption of beer (i.e. $>$60 g/day of ethanol) may increase the risk for a positive energy balance that could lead to abdominal or general obesity [4,5]. Thus consumers should be informed on their daily energy requirements as well as on the caloric content of their preferred beer.

A small part of the caloric content of beer could be attributed to the metabolism of the carbohydrates it contains. According to the USDA FCT, a can of 330 mL of an average beer includes approximately 12 g of carbohydrates that may cover only 2.4% (i.e. 48 Kcal) of the daily energy requirements in a diet of 2000 Kcal. In addition, the mean content of simple sugars is zero [2].

Beer also contains trace amounts of minerals such as calcium, iron, magnesium, phosphorus, potassium,