

2-86 TS262 A35

ALCOHOLIC BEVERAGES

Edited by

G. G. BIRCH and M. G. LINDLEY



ELSEVIER APPLIED SCIENCE PUBLISHERS LONDON and NEW YORK

ELSEVIER APPLIED SCIENCE PUBLISHERS LTD Crown House, Linton Road, Barking, Essex IG11 8JU, England

Sole Distributor in the USA and Canada ELSEVIER SCIENCE PUBLISHING CO., INC. 52 Vanderbilt Avenue, New York, NY 10017, USA

British Library Cataloguing in Publication Data

Alcoholic beverages.

1. Alcoholic beverages

I. Birch, G. G. II. Lindley, M. G.

641.2'1 TP505

ISBN 0-85334-326-8

WITH 46 ILLUSTRATIONS AND 29 TABLES
© ELSEVIER APPLIED SCIENCE PUBLISHERS LTD 1985

The selection and presentation of material and the opinions expressed in this publication are the sole responsibility of the authors concerned;

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the copyright owner, Elsevier Applied Science Publishers Ltd, Crown House, Linton Road, Barking, Essex IG11 8JU, England

Printed in Great Britain by Galliard (Printers) Ltd, Great Yarmouth

ALCOHOLIC BEVERAGES

An industry-university co-operation Symposium organised under the auspices of the National College of Food Technology (Department of Food Technology), University of Reading, 27-29 March, 1984

THE SYMPOSIUM COMMITTEE

Mrs A. ALFORD

Tate and Lyle PLC, c/o Thames Refinery, Factory Road, Silvertown, London E16 2EW

GORDON G. BIRCH, B.Sc., Ph.D., D.Sc.(Lond.), F.R.S.C., C.Chem., M.R.S.H.

Reader, National College of Food Technology (Department of Food Technology), Food Studies Building, University of Reading, Whiteknights. Reading, Berks. RG6 2AP

J. A. FORD, B.A.(Oxon)

Assistant Bursar (London Road), University of Reading, Whiteknights House, Whiteknights, Reading, Berks. RG6 2AP

M. G. LINDLEY, Ph.D.

Tate and Lyle PLC, Group Research and Development, Philip Lyle Memorial Research Laboratory, PO Box 68, Reading, Berks. RG6 2BX

K. J. PARKER, M.A., D.Phil. (Oxon), F.R.S.C., C.Chem. 'Murrens', Reading Road, Crowmarsh Gifford, Wallingford, Oxon. OX10 8EN

E. J. ROLFE, B.Sc., M.Chem.A., F.R.S.C., C.Chem., F.I.F.S.T. Principal, National College of Food Technology (Department of Food Technology), Food Studies Building, University of Reading, Whiteknights, Reading, Berks. RG6 2AP

Mrs B. A. SHORE

c o National College of Food Technology (Department of Food Technology), Food Studies Building, University of Reading, Whiteknights, Reading, Berks. RG6 2AP

C. H. WALKER, Ph.D.

Department of Physiology and Biochemistry, University of Reading, Whiteknights, Reading, Berks. RG6 2AP

A. A. WILLIAMS, Ph.D.

Food & Beverages Division, University of Bristol, Long Ashton Research Station, Bristol BS18 9AF

List of Contributors

T. E. ACREE

Cornell University, Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, New York 14456, USA.

A. BOSSARD

Martini and Rossi, BP 50, 19 Avenue Michelet, 93401 Saint-Ouen Codex, France.

J. K. BURNETT

Croft & Ca Lda, 4401 Vila Nova de Gaia, Portugal.

P. R. CANAWAY

Department of Bioscience and Biotechnology, University of Strathclyde, 131 Albion Street, Glasgow G1 ISD, UK.

R. G. CAREY

Department of Bioscience and Biotechnology, University of Strathclyde, 131 Albion Street, Glasgow G1 ISD, UK.

T. H. E. COTTRELL

Cornell University, Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, New York 14456, USA.

K. ERIKSSON

Research Laboratories of the Finnish State Alcohol Company (Alko Ltd), POB 350, SF-00101 Helsinki 10, Finland.

A. I. M. GLEN

Highland Psychiatric Research Group, Craig Dunain Hospital, Inverness IV3 6JU, UK.

E. M. T. GLEN

Highland Psychiatric Research Group, Craig Dunain Hospital, Inverness IV3 6JU, UK.

D. F. HORROBIN

Efamol Research Institute, Kentville, Nova Scotia, Canada.

K. L. JONES

National College of Food Technology, Food Studies Building, University of Reading, Whiteknights, Reading RG6 2AP, UK. Present address: Tegfryn, Waunfawr, Caernarvon, Gwynedd, UK.

H. T. LAWLESS

Monell Chemical Senses Center, 3500 Market Street, Philadelphia, Pennsylvania 19104, USA. Present address: S. C. Johnson & Son, Inc., 1525 Howe Street, Racine, Wisconsin 53403, USA.

P. A. P. LIDDLE

Martini and Rossi, BP 50, 19 Avenue Michelet, 93401 Saint-Ouen Cedex, France.

F. K. MACDONALD

Highland Psychiatric Research Group, Craig Dunain Hospital, Inverness IV3 6JU, UK.

L. E. F. MACDONELL

Highland Psychiatric Research Group, Craig Dunain Hospital, Inverness IV3 6JU, UK.

J. R. MACKENZIE

Highland Psychiatric Research Group, Craig Dunain Hospital, Inverness IV3 6JU, UK.

M. S. MANKU

Efamol Research Institute, Kentville, Nova Scotia, Canada.

D. J. MONTGOMERY

Highland Psychiatric Research Group, Craig Dunain Hospital, Inverness IV3 6JU, UK.

N. Morse

Efamol Research Institute, Kentville, Nova Scotia, Canada.

C. M. PARSONS

W. H. Brakspear & Sons PLC, The Brewery, Henley-on-Thames, Oxon RG9 2BU, UK.

G. PASIN

Department of Food Engineering, Hacettepe University, Beytepe, Ankara, Turkey.

J. R. PIGGOTT

Department of Bioscience and Biotechnology, University of Strathclyde, 131 Albion Street, Glasgow G1 ISD, UK.

R. SHARPE

Whitbread and Company PLC, Research and Development Department, Oakley Road, Luton, Bedfordshire LU49QH, UK.

A. C. SIMPSON

International Distillers and Vintners Limited, Vintner House, River Way, Harlow, Essex CM20 2EA, UK.

J. C. SLAUGHTER

Department of Brewing and Biological Sciences, Heriot-Watt University, Chambers Street, Edinburgh EH1 1HX, UK.

A. D. THOMSON

The International Journal of the Medical Council on Alcoholism, 64 Lee Park, Blackheath, London SE3 9HZ, UK.

A. L. WHITEAR

Whitbread and Company PLC, Research and Development Department, Oakley Road, Luton, Bedfordshire LU49QH, UK.

A. A. WILLIAMS

Food and Beverages Division, Long Ashton Research Station, Long Ashton, Bristol BS18 9AF, UK.

R. H. YLIKAHRI

Research Laboratories of the Finnish State Alcohol Company (Alko Ltd), POB 350, SF-00101 Helsinki 10, Finland.

PROCEEDINGS OF PREVIOUS SYMPOSIA

Glucose Syrups and Related Carbohydrates, edited by G. G. Birch, L. F. Green and C. B. Coulson, 1970.

Sweetness and Sweeteners, edited by G. G. Birch, L. F. Green and C. B. Coulson, 1971.

Health and Food, edited by G. G. Birch, L. F. Green and L. G. Plaskett, 1972.

Molecular Structure and Function of Food Carbohydrate, edited by G. G. Birch and L. F. Green, 1973.

Vitamin C, edited by G. G. Birch and K. J. Parker, 1974.

Food from Waste, edited by G. G. Birch, J. T. Worgan and K. J. Parker, 1975.

Intermediate Moisture Foods, edited by R. Davies, G. G. Birch and K. J. Parker, 1976.

Sensory Properties of Foods, edited by G. G. Birch, J. G. Brennan and K. J. Parker, 1977.

Sugar, Science and Technology, edited by G. G. Birch and K. J. Parker, 1978.

Food and Health: Science and Technology, edited by G. G. Birch and K. J. Parker, 1979.

Enzymes and Food Processing, edited by G. G. Birch, N. Blakebrough and K. J. Parker, 1980.

Nutritive Sweeteners, edited by G. G. Birch and K. J. Parker, 1981.

Dietary Fibre, edited by G. G. Birch and K. J. Parker, 1982.

Control of Food Quality and Food Analysis, edited by G. G. Birch and K. J. Parker, 1983.

All published by Elsevier Applied Science Publishers.

Contents

	1	Page
List of Contributors	1	V
Paper 1. The Alcoholic in Wonderland		1
Paper 2. Enzymes in the Brewing Industry J. C. Slaughter		15
Paper 3. Hop Constituents and Beer Character . A. L. Whitear and R. Sharpe		29
Paper 4. Traditional Cask Ale	٠	43
Paper 5. Advances in the Spirits Industry	٠	51
Paper 6. Sensory Analysis and Evaluation of Whisky . J. R. Piggott, R. G. Carey and P. R. Canaway		69
Paper 7. The Analysis of Wines and Spirits by Capital Gas Chromatography. P. A. P. Liddle and A. Bossard	illary	85
Paper 8. Psychological Perspectives on Winetasting Recognition of Volatile Flavours H. T. Lawless	and .	97

Paper 9. Turkish Alcoholic Beverages	115
Paper 10. Methods Used in the Authentication of Wines A. A. Williams	129
Paper 11. Chemical Indices of Wine Quality T. E. Acree and T. H. E. Cottrell	145
Paper 12. Port	161
Paper 13. Adaptation of Fermentative Organisms to Alcoholic Environments	171
Paper 14. Physiological and Medical Problems Associated with Excessive Alcohol Intake	183
Paper 15. Essential Fagy Acids in the Treatment of the Alcohol Dependence Syndrome. A. I. M. Glen, E. M. T. Glen, F. K. Macdonald, L. E. F. Macdonell, J. R. Mackenzie, D. J. Montgomery, M. S. Manku, D. F. Horrobin and N. Morse	203
Index	223

The Alcoholic in Wonderland

A. D. THOMSON

The International Journal of the Medical Council on Alcoholism, London, UK

ABSTRACT

Man has enjoyed the mind-altering properties of alcohol for thousands of years and has also suffered the consequences of excessive intake. It would seem sensible to try to avoid the devastating physical and mental consequences of such damage which reaps such misery for the alcoholic, his family and even the unborn children of that family. Society's response is all too often one of denial which only reinforces the patient's own lack of insight and does nothing to interrupt the downward spiral of his behaviour. Such distortion of reality reminds us of Alice's journey into Wonderland which reflects the problems but offers no solutions.

INTRODUCTION

People drink alcohol because it is a mind-altering drug. It is only one of many substances which man uses to change his perception of a hostile environment and for a short time at least to blurr the edges of a too painful reality. The factors with which he is struggling to come to terms may be part of the external world or the product of his internal environment. Why else would one seek to alter the brain's function? The decision as to whether this is a wise thing to do must inevitably be influenced by the consequences of drinking and will ultimately be an individual decision, although not necessarily made in the full knowledge of where the road is leading.

There must be few people who have read about Alice's adventures

in Wonderland who have not had a secret desire to transform themselves as she did and follow her down the rabbit-hole into that strange world which required a drink to reach it.

It is all very well to say 'DRINK ME' but the wise little Alice was not going to do that in a hurry. "No, I will look first," she said, "and see whether it's marked 'poison'." However, this bottle was not marked 'poison' so Alice ventured to taste it and, finding it very nice... she very soon finished it off.

Alice's Adventures in Wonderland
LEWIS CARROLL

Societies have lived with alcohol for many thousands of years but as we come to examine more closely the role that it plays, like Alice's world, 'it grew stranger and stranger the more she looked at it'. The effects of excessive drinking have become too commonplace for us to take them seriously. Day after day we read in our popular newspapers the tragic stories associated with excessive drinking or the consequences of excessive drinking while the Government raises thousands of millions of pounds in revenue by taxing the sale of alcohol. It is unquestionably a major social problem facing the Western World today. There is growing recognition of brain damage and permanent injury to unborn children made more poignant by the increase in alcoholism among women and teenagers.

The problem in assessing the incidence of alcoholism is that there is no simple definition of the condition and nobody knows precisely how many alcoholics or problem drinkers there are in any country. In the United States 12% of the population are thought to be 'heavy drinkers' and the number of alcoholics is considered to exceed 10 000 000. At a conservative estimate, at least 500 000 people in this country are thought to have a drinking problem severe enough for them to be called alcoholics. Some believe that this is a gross underestimation. What is clear, however, is that alcoholism casts its net of misery wide and far and many other people may be affected by an alcoholic's drinking habits—the human misery associated with broken marriages, financial difficulties, child or spouse battering, road accidents and the large economic loss to society by reduced work output.

It has been estimated that alcoholism is the major contributing

factor to over a quarter of the illnesses leading to admission to acute medical units in Great Britain, although it frequently goes unrecognised by the medical staff. There are many roads to alcoholism and some people, through opportunity and the company they keep, will drift into it. There are many ways of drinking and many types of drink, but the disease is characterised by the repetitive and compulsive ingestion of alcohol to an extent that it interferes with the alcoholic's health, marital status, career or interpersonal relationships. The alcoholic prefers to go through life in a partially sedated state and, even at times of sobriety, has the continuous need to control his drinking. At the centre of the problem there is an isolated person. The alcoholic's chance of obtaining help is not made easier by the ambivalent attitude of the medical profession or by society which encourages drinking and often denies the obvious consequences of the excessive use of alcohol until it has extracted its price.

THE SHORT-TERM EFFECTS OF ALCOHOL

If you walk into a public house and ask for the conventional measure of almost any drink, you will be given 7-9 g of alcohol. This may be 24 ml of whisky, gin or vodka, 60 ml of sherry, 120 ml of wine or 280 ml of beer. If a man weighing 70 kg drinks a pint of beer (560 ml or 16 g of alcohol) this will be absorbed rapidly on an empty stomach. reaching a peak blood alcohol concentration of approximately 30 mg/100 ml in 1 h which gradually declines over the next 4-6 h as it is metabolised by the liver. Repeated drinking will therefore have an accumulative effect. The acute effects of drinking alcohol are well known and are illustrated in Fig. 1. Violence is often associated with bouts of drinking, causing injury due to fights, battering of the marital partner or child abuse. Patients will often present with severe burns of which they have no recollection (Fig. 2) and there is the nightly toll of road traffic accidents due to driving while under the influence of alcohol. Even below the legal limit of 80 mg/100 ml a driver has a 3-4 times greater risk of having a road traffic accident and, as the blood alcohol level rises, the probability increases dramatically. Figure 3 shows the period of time during which the blood alcohol will remain above the legal limit following different amounts of alcohol ingestion.



Fig. 1. Acute effects of alcohol intake. (Taken from *The Booze Book*, Hope Press Publications, London, 1979.)

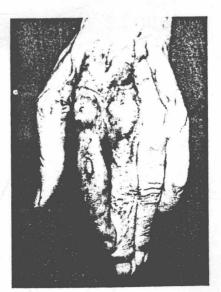


Fig. 2. Patient admitted to hospital with a severe burn of which he has no recollection.

Drink BEER		Period of time Blood Ethanol Concentration exceeds legal limit (80 mg / 100 ml).
3 PINTS		up to 1 HOUR
6 PINTS		up to 6 HOURS
6 DOUBLES		up to 6 HOURS
6 GLASSES SHERRY	IIIIII	up to 1½ MOURS
4 GLASSES	1111	up to 4 HOURS

LONG-TERM EFFECTS OF ALCOHOL ABUSE

Fig. 3. Effect of various drinks on ability to drive a car.

Attempts have been made to define safe levels of long-term drinking (Table 1). These are based largely on evidence of liver injury although it might be more appropriate to relate them to brain damage. It must also be borne in mind that there is no actual safe level of alcohol intake since certain predisposed individuals will develop irreversible damage at levels lower than the average daily intake recommended. Similarly, women appear to be more sensitive to the damaging effects of alcohol than men, both in their brain and their liver. This may be related to their smaller size as well as their biological make-up.

TABLE I SAFE LEVELS OF DAILY DRINKING

Upper fimits suggested by the Royal College of Psychiatrists:

Four pints of beer or Four doubles of spirits

Four doubles of spirits

or

One bottle of wine (standard size)

(From Clare, A. W. and King, M. (1983). Alcoholism: Quarterly Newsletter for General Practice, No. 1. By kind permission of Pergamon Press, Oxford.)