IARC Handbooks of Cancer Prevention

Volume 8

Fruit and Vegetables

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The International Agency for Research on Cancer (IARC) was established in 1965 by the World Health Assembly, as an independently financed organization within the framework of the World Health Organization. The headquarters of the Agency are in Lyon, France.

The Agency conducts a programme of research concentrating particularly on the epidemiology of cancer and the study of potential carcinogens in the human environment. Its field studies are supplemented by biological and chemical research carried out in the Agency’s laboratories in Lyon and, through collaborative research agreements, in national research institutions in many countries. The Agency also conducts a programme for the education and training of personnel for cancer research.

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This publication represents the views and opinions of an IARC Working Group on the Evaluation of Cancer-Preventive Strategies which met in Lyon, France, March 4–11, 2003

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Note to the Reader

Anyone who is aware of published data that may influence any consideration in these Handbooks is encouraged to make the information available to the Unit of Chemoprevention, International Agency for Research on Cancer, 150 Cours Albert Thomas, 69372 Lyon Cedex 08, France

Although all efforts are made to prepare the Handbooks as accurately as possible, mistakes may occur. Readers are requested to communicate any errors to the Unit of Chemoprevention, so that corrections can be reported in future volumes.

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Preface

Why a Handbook on fruit and vegetables?

Nutritional research and food policy have shifted focus during the last hundred years. In the early 1900s the focus was on identifying and preventing nutrient deficiency diseases; in the latter part of the last century the attention was on identifying nutrient requirements. More recently, investigations have turned to the role of diet in maintaining health and reducing the risk of non-communicable diseases, such as heart diseases and osteoporosis.

All types of diet have potential health risks as well as benefits associated with their consumption, both at the individual and collective level. During the past 30 years, while meat intake has been associated with increased risk for a variety of chronic diseases such as ischaemic heart disease and some cancers, abundant consumption of fruit and vegetables, legumes, unrefined cereals have been associated with a lower risk for many chronic degenerative diseases and total mortality (see WHO, 2003).

The low consumption of fruit and vegetables in many regions of the world, especially in the developing part, is a persistent phenomenon. Only a small or negligible minority of the world's population at present consumes the generally recommended high average intakes of fruit and vegetables. In 1998, only six of the 14 WHO regions had an availability of fruit and vegetables equal to or greater than the recommended intakes of 400 g/d (WHO, 2003).

Nutritional epidemiology provides the only direct approach to the assessment of health effects from diet in humans. There are special problems associated with the measurement of diet, including fruit and vegetable intake, particularly in case-control studies. However, in prospective studies within single populations, where there is little dietary variation between individuals, large measurement error can be associated with each assessment.

In 1997, scientists assembled by the World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR) concluded that diets rich in fruits and vegetables 'decreased the risk of many cancers', and perhaps cancer in general and they endorsed fruit and vegetables as parts of a diet that would reduce risk of various cancers (WCRF/AICR, 1997).

This evaluation originated mainly from the results of case-control studies. Since then, the messages have been clouded by more recent prospective cohort studies that found that such diets may not be protective against cancer. As these newer findings have introduced doubt about the role of fruit and vegetables in cancer prevention, the IARC has considered it important to make a new evidence-based evaluation of the current state of the evidence of a diet rich in fruit and vegetables.

The purpose of this IARC Handbook is to provide an up-to-date review of knowledge about fruit and vegetables collectively. Since various types of fruit and vegetables, such as cruciferous vegetables, allium vegetables and citrus fruits, have also been investigated separately, specialist panels will be convened later to look into the evidence concerning these specific categories separately, including the evidence on their main individual chemical components. The first such Handbook will consider cruciferous vegetables, isothiocyanates and indoles, and will be published in 2004.