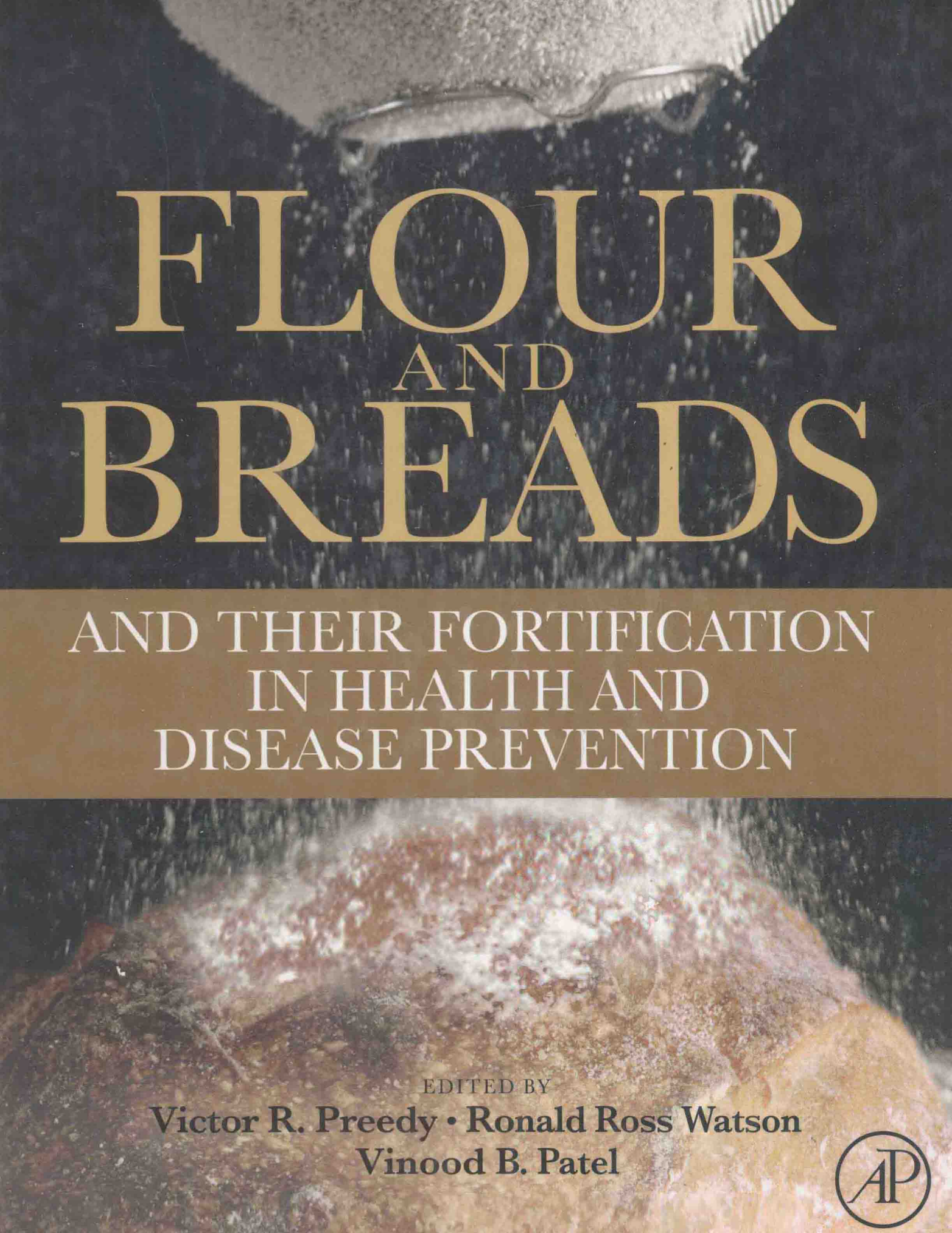

# FLOUR AND BREADS

## AND THEIR FORTIFICATION IN HEALTH AND DISEASE PREVENTION

EDITED BY
Victor R. Preedy • Ronald Ross Watson
Vinood B. Patel

# Flour and Breads and their Fortification in Health and Disease Prevention

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# PREFACE

The historical pictorial evidence for bread making dates back 8000 years, but it is probable that bread was consumed in the unleavened form (without yeast) earlier than this, going hand-in-hand with the cultivation of crops. In some cultures, bread is an integral part of sacred and religious ceremonies.

Currently, bread is an important part of the diet for millions of people worldwide. Its complex nature provides energy, protein, minerals, and many other macro- and micronutrients. However, consideration must be taken of four major aspects related to flour and bread. The first is that not all cultures consume bread made from wheat flour. There are literally dozens of flour types, each with its distinctive heritage, cultural roles, and nutritive contents. Second, not all flours are used to make leavened bread in the traditional (i.e., Western) loaf form. There are many different ways that flours are used in the production of staple foods. Third, flour and breads can be fortified either to add components that are removed in the milling process or to add components that will increase palatability or promote health and reduce disease per se. (In this book, the term "fortification" is used holistically to include statutory and nonstatutory additions.) Finally, there are significant groups of individuals who have intolerance to flours such as wheat, barley, or rye flours.

Finding all this knowledge in a single coherent volume is currently problematical, and *Flour and Breads and their Fortification in Health and Disease Prevention* addresses this.



This book is divided into two main sections:

1. Flour and Breads
2. Fortification of Flour and Breads and their Metabolic Effects

The editors are aware of the difficulties imposed by assigning chapters to different sections and their order, but the navigation of the book is enhanced by an excellent index. The book is also extremely well illustrated, with tables and figures in every chapter.

Where applicable, information on adverse effects or responses is provided. Emerging fields of science and important discoveries relating to flour and bread products are also incorporated in the book. Contributors are authors of international and national standing and leaders in the field.

This book represents a comprehensive coverage of material relating to flour and bread and their constituents. It is essential reading for policymakers, food technologists, marketing strategists, nutritionists, food chemists, health care professionals, research scientists, as well as those interested in flour and breads in general or working in the food industry.

**Victor R. Preedy, Ronald Ross Watson,**
**and Vinood B. Patel**

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SECTION 1

# Flour and Breads

CHAPTER 1

# The Science of Doughs and Bread Quality

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## INTRODUCTION

Cereals and cereal-based products have constituted the major component of the human diet throughout the world since the earliest times. Cereal crops are energy dense, providing approximately 10–20 times more energy than most juicy fruits and vegetables. Major cereal crops include wheat, rice, corn, and barley. The cereal crop most produced is corn (or maize) (31%), but it has relatively less importance than wheat and rice because it is not directly used for human consumption. Wheat and rice are the most important cereals with regard to human nutrition, and they account for 55% of the total cereal production. Nutritionally, they are important sources of dietary protein, carbohydrates, the B group vitamins, vitamin E, iron, trace minerals, and fibers. It has been estimated that global cereal consumption directly provides approximately 45% of protein and energy necessary for the human diet and only approximately 7% of the total fat (Table 1.1). The specific contribution of wheat to daily food intake corresponds to approximately 20% of the required energy and protein for the human diet (see Table 1.1).

Cereals have a variety of uses as food, although only two cereals, wheat and rye, are suited for the preparation of leavened bread. Nevertheless, wheat is a unique cereal that is suitable for the preparation of a wide diversity of leavened breads that meet consumer demands and requirements worldwide (Figure 1.1) (Rosell, 2007a). Among baked goods, bread has been a staple food for many civilizations. Even today, bread and cereal-based products constitute the base of the food pyramid, and its consumption is recommended in all dietary guidelines. Bread has a fundamental role in nutrition due to the adequate balance of

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