



Cracking the secret of eggs

A comprehensive reference that covers all egg components and their known bioactive compounds

In the last decade, numerous studies have characterized the diverse biophysiological functions of egg components and their biologically active substances. Hen eggs are now understood to contain substances with applications that can improve human and animal health. With contributions from leading scientists from Canada, Japan, France, and the United States, *Egg Bioscience and Biotechnology* compiles the most recent advances in the study and use of the bioactive egg components into one definitive reference that:

- Organizes information according to the parts of the egg: egg shell and membranes; albumen; and yolk
- Includes chapters on egg structure and chemical composition; recent proteomic and genomic analyses of the eggshell; utilization of refined eggshell as a source of dietary calcium and eggshell membrane as a biological dressing for skin injuries; the biochemical and molecular characteristics of egg allergens; the production of novel proteins in eggs; and more
- Features a detailed discussion of the biological activities of egg white and egg yolk components, covering: novel antimicrobial activities; antiadhesive properties; hypercholesterolemic activity; immunomodulatory, anticancer, and antihypertensive activities; and antioxidant properties
- Covers protease inhibitors, nutrient bioavailability, and antibody and functional lipids
- Provides a perspective on the future of egg science and technology and the potential to increase the value of eggs and their specific benefits for human and animal health

Assimilating the latest advances and findings in one comprehensive reference, this is a core resource for scientists in the food, nutrition, pharmaceutical, nutraceutical, cosmetic, poultry, and biotechnology industries, as well as an excellent textbook for senior undergraduate and graduate students in related fields or in poultry science programs.

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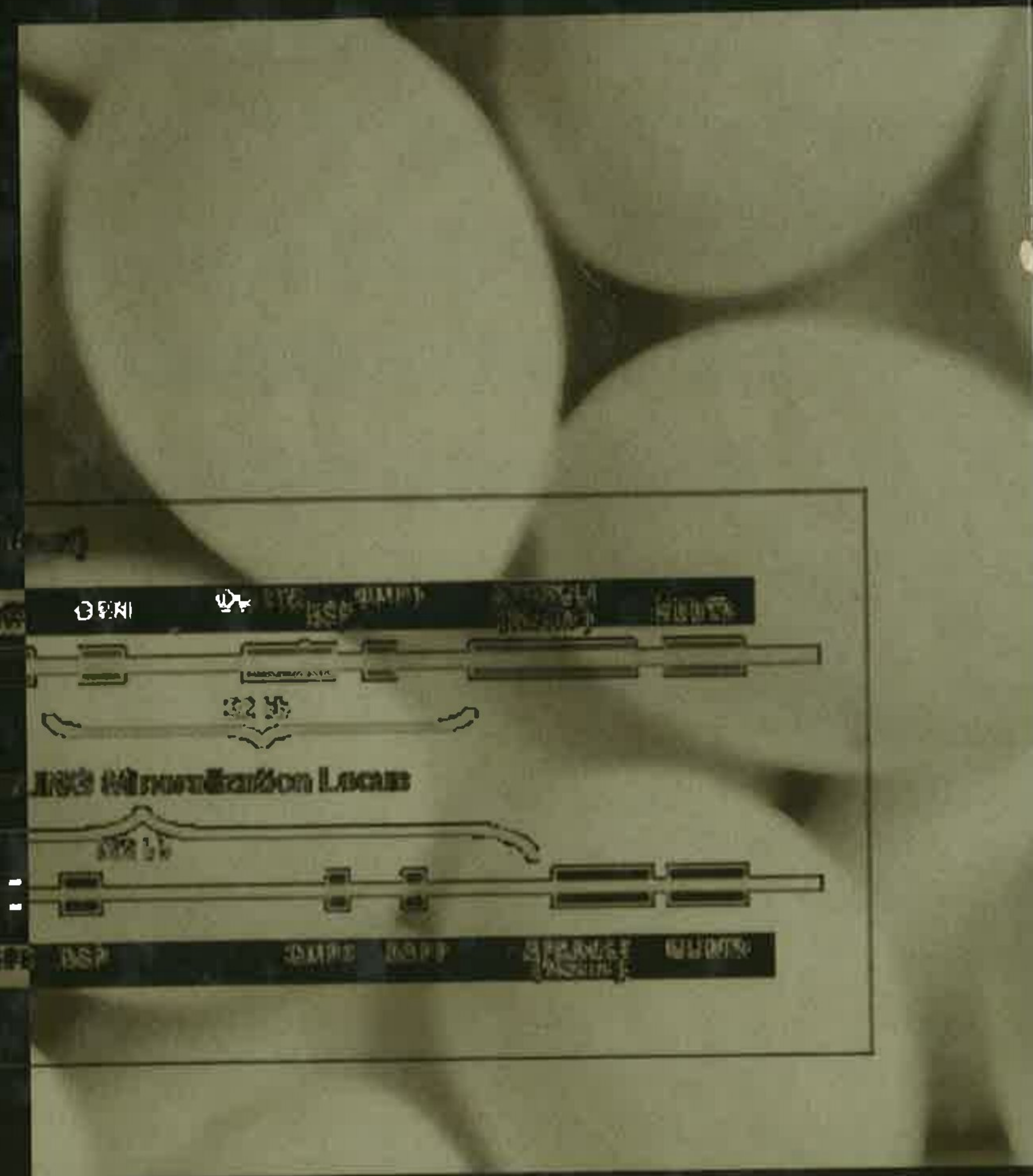
EGG BIOSCIENCE



TECHNOLOGY



EGG BIOSCIENCE and BIOTECHNOLOGY



Edited by Yoshinori Mine



EGG BIOSCIENCE AND BIOTECHNOLOGY

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PREFACE

Avian eggs have long been recognized as an excellent source of nutrients and foods. The egg is the largest biological cell known to originate from one cell division and is composed of various important chemical substances that form the basis of life. The egg is a complete set of biological substances containing nutrients such as proteins, lipids, inhibitors, enzymes, and various biologically active substances, including growth promoting factors as well as defense factors against bacterial and viral invasion. Since the mid-1990s, numerous extensive studies characterizing biophysiological functions of egg components and seeking novel biologically active substances in hen eggs have been conducted. These applications are being developed to utilize the nutritional and functional contributions of eggs not only in food products but also as biologically active components that may be used as nutraceutical and functional food ingredients with the potential to reduce the risk of disease and enhance human health and also as materials for drug and cosmetic applications. This book focuses mainly on the most recent advances in biologically active (bioactive) components such as nutraceuticals, pharmaceuticals, and cosmetics derived from egg components.

Chapter 1 defines the basic fundamental structural and chemical characteristics of eggs. Key elements of the physical structure, chemical composition, and properties of the eggshell, albumen, and yolk are described, including highlights of the most recent literature on factors that may affect structure and chemical composition, as well as novel functional or bioactive properties that are attributed to specific chemical components of eggs. The avian egg is a reproductive structure that has been shaped through evolution to resist physical, microbial, and thermal attack from an external and possibly aggressive environment, while satisfying the needs of the developing embryo. Chapter 2

focuses on recent proteomic and genomic analyses of the eggshell and draws attention to the impact of this information on the current understanding of eggshell function. Chapter 3 deals with utilization of the refined eggshell as a source of dietary calcium and the eggshell membrane as a biological dressing for the treatment of skin injuries. Chapters 4 and 5 describe the recent scientific body of literature on the numerous biological activities of egg white and egg yolk components. These include novel antimicrobial activities; antiadhesive and antioxidant properties; hypercholesterolemic, immunomodulatory, anti-cancer, and antihypertensive activities; protease inhibitory function; nutrient bioavailability; and antibody and functional lipids activities, highlighting the importance of egg and egg components in human health and disease prevention and treatment. The hen's egg is one of the most common sources of food allergens, especially in children. Chapter 6 focuses on providing the reader with up-to-date knowledge about the biochemical and molecular characteristics of egg allergens, as well as prospects for novel immunotherapeutic and preventive strategies against egg allergy. The potential to produce novel proteins in chicken eggs was identified in 1990, when the introduction of genetic modifications into the chicken genome was first suggested. Chapter 7 presents the background and most recent developments in the production of novel proteins in eggs. Along with changes in egg-processing technology, there has been a continuing growth of further processed egg products. Today, approximately 30% of the total consumption of eggs is in the form of further processed egg products. Chapter 8 discusses future perspectives of egg science and technology to increase the value of eggs. Continued research to identify new and existing biological functions of hen egg components will help define new methods to further improve the value of eggs, as a source of numerous biologically active compounds with specific benefits for human and animal health.

The editor has succeeded in bringing together many renowned international egg experts to review current egg bioscience and biotechnology and is grateful to all the authors for their state-of-the-art compilation of the most recent developments in this field. The editor believes that this book will be the first to unlock the secrets of eggs as an excellent source of biologically active substances for various applications. It certainly warrants a broad readership in the disciplines of nutrition, pharmacology, nutraceutical/functional foods, poultry science, food science, biology, biochemistry, biotechnology, and life science. This book could also be used as a reference by senior undergraduate and graduate students.

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