



Review

The Role of Human Milk Lipids and Lipid Metabolites in Protecting the Infant against Non-Communicable Disease

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Abstract: Non-communicable diseases continue to increase globally and have their origins early in life. Early life obesity tracks from childhood to adulthood, is associated with obesity, inflammation, and metabolic dysfunction, and predicts non-communicable disease risk in later life. There is mounting evidence that these factors are more prevalent in infants who are formula-fed compared to those who are breastfed. Human milk provides the infant with a complex formulation of lipids, many of which are not present in infant formula, or are present in markedly different concentrations, and the plasma lipidome of breastfed infants differs significantly from that of formula-fed infants. With this knowledge, and the knowledge that lipids have critical implications in human health, the lipid composition of human milk is a promising approach to understanding how breastfeeding protects against obesity, inflammation, and subsequent cardiovascular disease risk. Here we review bioactive human milk lipids and lipid metabolites that may play a protective role against obesity and inflammation in later life. We identify key knowledge gaps and highlight priorities for future research.

Keywords: lipidomics; human milk; developmental origins of health and disease; infant programming



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1. Introduction

The incidence of non-communicable diseases (NCD), including type 2 diabetes, cardiovascular disease and chronic obstructive pulmonary disease, is rapidly increasing and NCD are predicted to contribute to over 75% of deaths worldwide by 2030 [1]. The pathogenesis of most NCD begins in childhood, as early as the first 1000 days of life, and during this period of developmental and physiological plasticity, nutrition is a key determinant of long-term health outcomes [2]. Both primordial and primary prevention are essential to reduce the global burden of obesity and downstream NCD.

Key risk factors for NCD in adulthood are obesity and metabolic dysfunction, and adverse childhood adiposity is a risk factor for both obesity and metabolic dysfunction in adulthood [3]. There is considerable evidence that breastfeeding is protective against excess adiposity, with breastfed infants having lower adiposity and a 13–26% reduction in overweight and obesity compared to those who are not breastfed [4,5]. Breastfeeding occurrence and duration are inversely associated with both the extent and velocity of infant weight gain, and infants who are formula-fed have different growth trajectories and higher rates of obesity and diabetes later in life compared to their human milk-fed counterparts [6]. In addition, inflammation is increased in obesity and is a shared pathogenic mechanism

The Lipids Of Human Milk

Robert Gordon Jensen



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Human Milk Feeding as a Complex System Daniel W. Sellen, Sonia Hernández-Cordero, 2024-07-04 The exploding science of human milk lactation breastfeeding and human milk feeding has brought us to our current understanding that we are studying a complex system operating at multiple levels molecular cellular physiological immunological nutritional ontological and socio behavioral and techno political Modern research in this field is responding to new scientific questions and emerging policy needs that can leverage technological innovations and sophisticated multidisciplinary approaches The International Society for the Study of Human Milk and Lactation 2022 international conference brings together professionals from research disciplines such as anthropology biochemistry immunology molecular biology maternal and child health and nutrition physiology toxicology health care professionals such as medical doctors nurses midwives dietitians breastfeeding consultants policy makers and commercial entities that promote protect and support breastfeeding

The Lipid Handbook with CD-ROM Frank D. Gunstone, John L. Harwood, 2007-03-13 Extensively revised reorganized and expanded the third edition of the industry standard The Lipid Handbook reflects many of the changes in lipid science and technology that have occurred in the last decade It places a stronger emphasis on the nutritional medical and agricultural aspects of lipids to reflect the increased interest and research in these areas in the past 10 years and beyond This edition features updated chapters and expanded coverage including additional compounds to its dictionary Written by experts from a diverse range of fields many of whom have contributed new research in the areas under review this handbook remains an essential reference

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disciplinary nature Advances in Dietary Lipids and Human Health Duo Li, 2022-05-06 *Advances in Dietary Lipids and Human Health* systematically summarizes recent research advances in dietary lipids and human health. The book proposes a strategy for the prevention of NCDs and the management of population and personal health through the rational use of dietary fat. It covers the relationship between total lipids, saturated and unsaturated fatty acids, and NCDs, and other uncommon fatty acids such as conjugated fatty acids, middle and short chain fatty acids, furan fatty acids, n-3 docosapentaenoic acid (DPA), and structured fat. Intended for nutrition researchers, dietitians, clinicians, and others in academia who are focused on medicine, preventive medicine, public health, and food science, this valuable reference provides information that will assist readers in the prevention and treatment of cardiovascular disease, hypertension, metabolic disorders, diabetes, neuropsychiatric diseases, and cancer by specifically managing dietary lipids. Offers an evidence-based systematic review of dietary fat and fatty acids and health. Provides extensive knowledge on the relationship between type and quantity of lipid, fatty acids, and NCDs. Proposes a strategy for the prevention of NCDs and the management of population and personal health through the rational use of dietary fat. *Healthful Lipids* Casimir C. Akoh, 2019-05-08 *Healthful Lipids* addresses critical and current regulatory issues and emerging technologies as well as the efforts made toward the production of healthier lipids. This book examines the latest technological advancements and the emerging technologies in processing and analysis, health-related concerns, and strategies used in the production and application. Advanced Dairy Chemistry Volume 2: Lipids Patrick F. Fox, Paul L. H. McSweeney, 2007-04-25 The *Advanced Dairy Chemistry* series was first published in four volumes in the 1980s under the title *Developments in Dairy Chemistry* and revised in three volumes in the 1990s. The series is the leading reference on dairy chemistry, providing in-depth coverage of milk proteins, lipids, lactose, water, and minor constituents. *Advanced Dairy Chemistry Volume 2: Lipids*, Third Edition, is unique in the literature on milk lipids, a broad field that encompasses a diverse range of topics including synthesis of fatty acids and acylglycerols, compounds associated with the milk fat fraction, analytical aspects, behavior of lipids during processing, and their effect on product characteristics, product defects arising from lipolysis and oxidation of lipids, as well as nutritional significance of milk lipids. Most topics included in the second edition are retained in the current edition, which has been updated and considerably expanded. New chapters cover the following subjects: Biosynthesis and nutritional significance of conjugated linoleic acid, which has assumed major significance during the past decade; Formation and biological significance of oxysterols; The milk fat globule membrane as a source of nutritionally and technologically significant products; Physical, chemical, and enzymatic modification of milk fat; Significance of fat in dairy products: creams, cheese, ice cream, milk powders, and infant formulae; Analytical methods: chromatographic, spectroscopic, ultrasound, and physical methods. This authoritative work summarizes current knowledge on milk lipids and suggests areas for further work. It will be very valuable to dairy scientists, chemists, and others working in dairy research or in the dairy industry. Core Curriculum for Interdisciplinary Lactation Care Lactation Education

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