

Extension of AOAC Official Method 999.14 (Choline in Infant Formula and Milk) to the Determination of Choline in Dietary Supplements

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AOAC Official Method 999.14 is applicable for the determination of choline in milk and infant formulas. To date, its use has not been extended beyond these matrices. We modified Official Method 999.14 and applied it to the determination of choline in a range of choline-containing dietary supplements. Dietary supplement tablets, capsules, wafers, softgels, liquid products, and drink powders were included. We found that the standard curve could be extended to cover a wider range of choline concentrations and defined a procedure for the use of Norit for samples in which the vitamin C content was high enough to interfere with the analysis. Recoveries of choline added to infant formula powders and to representative dietary supplement tablets, capsules, powdered drink mix, and wafer products were 85–114%. The use of Norit during the procedure did not affect the recovery of choline added to infant formula powders or to dietary supplements. An alkaline digestion was included for use with a product containing lecithin as the sole source of choline. Ten of 11 dietary supplement products analyzed by the modified method contained amounts of choline at or above declarations found on the product labels. The remaining product contained about 40% of the label-declared amount of choline.

Choline, a dietary constituent, is an important component of membrane phospholipids. It provides a source of labile methyl groups, participates in transmembrane signaling, exerts a lipotropic action on the liver, is important for lipid and cholesterol transport and metabolism, and serves as a precursor for the neurotransmitter acetylcholine (1, 2). Choline is widely distributed in foods, with most of it in the form of phosphatidylcholine in membranes. Milk, liver, eggs, and peanuts are rich in choline.

Choline is also available as a dietary supplement of choline chloride or choline bitartrate and as lecithin, which usually contains about 25% phosphatidylcholine or 3–4% choline by weight. Foods and dietary supplements may now carry nutrient content claims, including claims about choline content, as authorized under the U.S. Food and Drug Administration Modernization Act (3).

Relatively few methods for the analysis of choline appear in the literature. Recently published methods report the use of proton nuclear magnetic resonance spectroscopy (4), liquid chromatography/electrospray ionization-isotope dilution mass spectrometry (5), and choline biosensors (6) for the quantitation of choline and its metabolites in several matrices. Instrumentation requirements of some of these methods may put them out of the reach of laboratories needing rapid and routine analyses for choline in foods and dietary supplements.

We studied the recently adopted AOAC Official Method 999.14 (Choline in Infant Formula and Milk—Enzymatic Colorimetric Method; 7, 8) to determine its applicability to the analysis of choline in matrices such as dietary supplements that may bear choline content claims. We used standard reference material (SRM) 1846 (Infant Formula), which has a noncertified reference value for choline, as an in-house quality assurance/quality control (QA/QC) material. We analyzed 5 infant formula powders and 11 dietary supplements of different types.

Experimental

Principle

The test sample is digested in acid (or, if needed, alkali) at 70°C, thereby releasing most of the choline. Following pH adjustment, treatment of hydrolysates with Norit (Fisher Scientific Co., Fairland, NJ) is included if needed to reduce interference from vitamin C. Residual choline phospholipids are then cleaved with phospholipase D, and the free choline moiety is subjected to choline oxidase with subsequent liberation of hydrogen peroxide. In the presence of peroxidase, phenol is oxidized and a quinoneimine chromophore is formed with 4-aminoantipyrine. Both enzymatic and color-forming reactions are formatted to occur concurrently. Absorbance is measured at 505 nm and choline

Aoac Methods For Dairy Products

Ralph Early



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Handbook of Dairy Foods Analysis Leo M.L. Nollet, Fidel Toldra, 2009-11-04 Dairy foods account for a large portion of the Western diet but due to the potential diversity of their sources this food group often poses a challenge for food scientists and their research efforts Bringing together the foremost minds in dairy research Handbook of Dairy Foods Analysis compiles the top dairy analysis techniques and methodologies from around the world into one well organized volume Co Edited by Fidel Toldra Recipient of the 2010 Distinguished Research Award from the American Meat Science Association Exceptionally comprehensive both in its detailing of methods and the range of products covered this handbook includes tools for analyzing chemical and biochemical compounds and also bioactive peptides prebiotics and probiotics It describes noninvasive chemical and physical sensors and starter cultures used in quality control Covers the Gamut of Dairy Analysis Techniques The book discusses current methods for the detection of microorganisms allergens and other adulterations including those of environmental origin or introduced during processing Other methodologies used to evaluate color texture and flavor are also discussed Written by an International Panel of Distinguished Contributors Under the editorial guidance of renowned authorities Leo M L Nollet and Fidel Toldr this handbook is one of the few references that is completely devoted to dairy food analysis a extremely valuable reference for those in the dairy research processing and manufacturing industries

Analytical Methods for Milk and Milk Products Megh R. Goyal, N. Veena, Santosh Kumar Mishra, 2024-02-22 This valuable resource on the microbiological analysis of milk and milk products delves into various aspects of bacterial enumeration pathogen detection mastitis milk identification quality testing for starter cultures isolation and characterization of lactic acid bacteria LAB safety assessment protocols for probiotics DNA isolation methods molecular characterization techniques and statistical tools for laboratory data analysis It presents an in depth description of the methodologies for isolation identification and confirmatory tests for various hygiene and safety indicator organisms Together with Volume 1 Sampling Methods and Chemical and Compositional Analysis and Volume 2 Physicochemical Analysis of Concentrated Coagulated and Fermented Products this 3 volume work is a valuable resource on the scientific analysis of milk and milk products

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Selected Technical Publications, 1967 Selected Technical Publications United States. Food and Drug Administration, 1977 **Food Analysis** S. Suzanne Nielsen, 2010-06-25 This book provides information on the techniques needed to analyze foods in laboratory experiments All topics covered include information on the basic principles procedures advantages limitations and applications This book is ideal for undergraduate courses in food analysis and is also an invaluable reference to professionals in the food industry General information is provided on regulations standards labeling sampling and data handling as background for chapters on specific methods to determine the chemical composition and characteristics of foods Large expanded sections on spectroscopy and chromatography also are included Other methods and instrumentation such as thermal analysis ion selective electrodes enzymes and immunoassays are covered from the perspective of their use in the analysis of foods A website with related teaching materials is accessible to instructors who

adopt the textbook **Enzymes Beyond Traditional Applications in Dairy Science and Technology** Y.S. Rajput, Rajan Sharma, 2023-01-26 A volume in the series on Foundations and Frontiers of Enzymology Enzymes Beyond Traditional Applications in Dairy Science and Technology presents the applications of enzymes in dairy science and technology Broken into four sections this book provides a brief account of traditional applications of indigenous milk enzymes the actions of exogenous enzymes on milk proteins for generating bioactive peptides and lactose for value addition and methods and approaches for ensuring milk quality or cleaning milk plants This book is an excellent resource for postgraduate students academics food scientists and dairy professionals engaged in milk processing Provides coverage on in vitro generation and in silico prediction of bioactive peptides by action of proteolytic enzymes on major milk proteins and peptides generated during fermentation and cheese manufacturing and their downstream processing Presents the enzymatic conversion of lactose into galactooligosaccharides or tagatose or producing low lactose milk Discusses indigenous enzymes in normal and mastitis milk Covers regulatory policies on enzyme use in food science Analytical Chemistry of PCBs Mitchell D. Erickson, 2018-05-11 This updated and expanded Second Edition of Dr Erickson s Analytical Chemistry of PCBs appears a decade after the first and is completely revised and updated The changes from the First Edition reflect the significant growth in the area and a growing appreciation of the importance of PCB analysis to our culture This book is a comprehensive review of the analytical chemistry of PCBs It is part history part annotated bibliography part comparison and part guidance Featuring a new chapter on analyst customer interactions and several new appendices the Second Edition is an invaluable resource for both chemists with no experience in PCB analysis and seasoned PCB researchers All topics have been more thoroughly treated and updated in this new edition to reflect advances made in the last decade especially

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