Med Clin (Barc). 2015;145(2):55–61

MEDICINA CLINICA

www.elsevier.es/medicinaclinica

Original article

Iodine concentration in ultra-high temperature pasteurized cow's milk. Applications in clinical practice and in community nutrition☆

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ARTICLE INFO

Article history:
Received 14 October 2013
Accepted 3 April 2014
Available online 29 January 2016

Keywords:
Cow's milk
Ultra-high temperature pasteurisation milk
Iodide concentration
Iodine content

ABSTRACT

Background and objective: Changes to dairy cow feeding have made milk a very important food source of iodine in several European countries and in USA. We aimed to measure the iodine content in ultra-high temperature (UHT) milk, the most widely consumed milk in Spain and in the south-west of Europe.
Material and methods: Every month, throughout 2008, UHT milk samples of commercial brands available in Vitoria-Gasteiz (Basque Country, Spain) were collected and their iodine content was determined using high-performance liquid chromatography, according to official method 992.22 of the Association of Official Analytical Chemists International.
Results: The average (SD) iodide content and median (P25–P75) of standard UHT milk samples (n = 489) were 197.6 (58.1) and 190 (159–235) μg/l, respectively. There were no significant differences between the iodide content in whole, semi-skimmed and skimmed milk (*P*=.219). The average iodide concentration and median in organic UHT milk (n = 12) were 56.4 (8.6) and 55 (50.5–61.5) μg/l, figures that are much lower than those found in standard milk (*P*<.0001).
Conclusions: Standard UHT milk available in our food-retailing outlets constitutes a very important source of iodine. One glass of standard UHT milk (200–250 mL) provides an average amount of 50 μg of iodine. This amount represents around 50% of the iodine intake recommended during childhood or 20% of the iodine intake recommended for pregnant and lactating women.

Concentración de yodo en la leche ultrapasteurizada de vaca. Aplicaciones en la práctica clínica y en la nutrición comunitaria

Palabras clave:
Leche de vaca
Leche ultrapasteurizada
Concentración de yoduro
Contenido de yodo

RESUMEN

Fundamento y objetivo: Los cambios producidos en la alimentación de las vacas lecheras han convertido a la leche en una fuente alimentaria muy importante de yodo en varios países europeos y en EE. UU. El objetivo del trabajo es conocer el contenido de yodo de la leche de mayor consumo en España, la leche procesada mediante tratamiento térmico muy intenso (*ultra-high temperature*, [UHT, «ultrapasteurizada»]).
Material y métodos: Se recogieron todos los meses durante el año 2008 muestras de leche UHT de marcas comerciales disponibles en Vitoria-Gasteiz, y se determinó su contenido de yodo mediante cromatografía líquida de alta resolución según el método oficial 992.22 de la *Association of Official Analytical Chemists International*.

☆ Please cite this article as: Arrizabalaga JJ, Jalón M, Espada M, Cañas M, Latorre PM. Concentración de yodo en la leche ultrapasteurizada de vaca. Aplicaciones en la práctica clínica y en la nutrición comunitaria. Med Clin (Barc). 2015;145:55–61.
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2387-0206/

Resultados: El contenido medio (DE) de yoduro y la mediana (P25-P75) en las muestras de leche corriente UHT (n = 489) fueron de 1976 (58,1) y 190 (159-235) μg/l, respectivamente. No hubo diferencias significativas entre el contenido de yoduro de la leche entera, la semidesnatada y la desnatada (p = 0,219). La concentración media de yoduro y la mediana en la leche ecológica UHT (n = 12) fueron 56,4 (8,6) y 55 (50,5-61,5) μg/l, cifras muy inferiores a las halladas en la leche corriente (p < 0,0001).
Conclusiones: La leche corriente UHT disponible en nuestros comercios de alimentación constituye una fuente alimentaria muy importante de yodo. Un vaso de leche corriente UHT (200-250 ml) proporciona una cantidad media de 50 μg de yodo. Esta cantidad supone alrededor del 50% de la ingesta recomendada de yodo durante la infancia o el 20% de la recomendada para las mujeres gestantes y para las que amamantan a sus hijos.

Introduction

Iodine, an essential nutrient for all animal species, is not evenly distributed throughout the planet. The main reserves of this element are to be found in oceans and seas, where large quantities of soluble telluric iodine were deposited throughout the earth's geological evolution from ice melting, snow and rain.[1] Those territories with the most intense glaciations are the poorest in iodine deposits. Lands with intense rains and floods are also poor in iodine.

Due to the geochemical characteristics of the earth's crust, both human beings and animals in many parts of the planet have perennially been consuming insufficient amounts of iodine. In human beings iodine deficiency (ID) leads to a broad spectrum of adverse effects on growth and development and on health, which are generally called iodine deficiency disorders (IDD).[2] The most frequent disorder resulting from ID is goitre, but the most dramatic consequences of the lack of this nut irate are those relating to the central nervous system (CNS). During periods of CNS development ID may lead to irreversible brain damage and result in psychomotor disorders of varying severity, from subtle neurological and cognitive deficiencies to the most extreme case of cretinism, and between the two, different levels of deficiency in the coordination capacities and learning, and in hearing. Furthermore, ID has adverse effects on reproductive functions and increases the frequency of abortions and congenital anomalies, as well as still-births and perinatal mortality. Due to their magnitude and the enormous impact on both health care and society, IDD are a serious public health problem worldwide and an international challenge in the field of nutrition. The WHO recommends the fortification of salt with iodine for the prevention and control of IDD. Thanks to international consciousness raising by WHO activities and those of other international bodies since 1990 iodised salt (IS) prophylaxis has been introduced into most countries in the world and at present 70% of families on the planet have access to IS. This is huge progress if we take into account that only 10% of families used IS at the beginning of the 1990s.[3] Nutritional status with respect to iodine is currently appropriate in 111 states worldwide; in 30 mild or moderate ID persists or has reappeared (including several Europe states such as Albania, Finland, Hungry, Italy, Ireland and United Kingdom) but there is no longer any country affected by serious deficiency of iodine. On the contrary, in 10 countries there is excessive consumption of this micro nutrient, mainly due to excessive concentrations of iodine in IS.[3]

ID can also lead to a wide range of adverse effects on animals' health, and reduce livestock productivity. ID produces endemic goitre in cows, sheep, pigs, horses, mules, dogs and cats,[4] and reduces the reproductive capacity of birds, horses, sheep, pigs and cows. It reduces offspring survival and leads to a lower production of eggs, milk, meat and wool.[5,6]

Supplementing animal feed with iodine is necessary in preventing ID and IDD in birds and livestock.[6] Iodine prophylaxis measures used to protect health, improve reproductive function, increase the production of meat, milk and eggs, and prevent financial losses caused by IDD in animals from the geographical areas where land and surface waters are poor in iodine basically consists of iodinating feed, adding vitamins and minerals which contain iodine and using salt blocks for licking during grazing periods. Iodine prophylaxis in egg-producing hens, milk cows and cattle, pigs, etc., produces an increase in the iodine content of the food from the animals. This is much higher in eggs and milk than in fowl or stock tissues, because the iodine concentrates during active transport of eggs and in mammary glands during lactation.[6] Due to the frequency and volume of their consumption by human beings, milk and milk products have therefore become the means of providing a very important part of iodine from food in peoples' diet in U.S.A.[7] and in several European countries, including Finland, Sweden, Norway, United Kingdom, Denmark, Germany, France, Switzerland, Italy and the Czech Republic.[8–17]

Information relating to the iodine content in cow's milk is a basic aspect within the sectors of Nutrition and Public Health. Owing to the lack of studies published in this respect in Spain, we decided to conduct some research to find out the iodine concentration in cow's milk. Milk which has been treated to ultra-high temperatures (UHT milk) for 1–2 s destroys the microorganisms and can be stored for long periods of time whilst the recipient is kept closed. It is the most highly sold form of milk in several European counties, including Belgium, Spain, France, Portugal and Sweden, where it constitutes 90% of all milk consumed. The general aim of our research was to discover what iodine content UHT cow milk has had.

Material and Methods

A descriptive, longitudinal study on iodine concentration in UHT cow's milk samples was collected monthly between January and December 2008 in large food distribution channels in Vitoria-Gasteiz, Álava.

Material

In order to discover that the mean concentration of iodine in cow's milk was, we needed to analyse milk samples throughout the year, as the content of the micronutrient in the milk is liable to broad seasonal variations when the cows are given iodised feed.[11,15,18,19]

Due to operational reasons, and so as not to open up the research study to samples from all commercial brands, we limited the samples exclusively to UHT milk, as it is the most highly consumed and of these, we only considered the basic, standard milk from each company, in accordance with the following inclusion and exclusion criteria.

Inclusion criteria: (1) exclusively UHT milks packaged in cartons; (2) only the standard milks of each commercial company; (3) store brand milks from the major food distribution chains;