



Nutrition Factsheet

September 2019

connect to the world of dairy

The role of dairy in helping to prevent lifestyle diseases



Naturally nutrient-rich

Dairy products are **naturally nutrient-rich foods** and are recognised as an important part of healthy and balanced diets.



Dairy matrix effect

The **unique combination of constituents** of milk and other dairy products probably contributes to the health effect known as “dairy matrix” and to the prevention of many diet-related diseases



Prevention of lifestyle diseases

Thanks to the **natural nutrient richness** combined with the unique matrix effect, dairy foods contribute to good health.

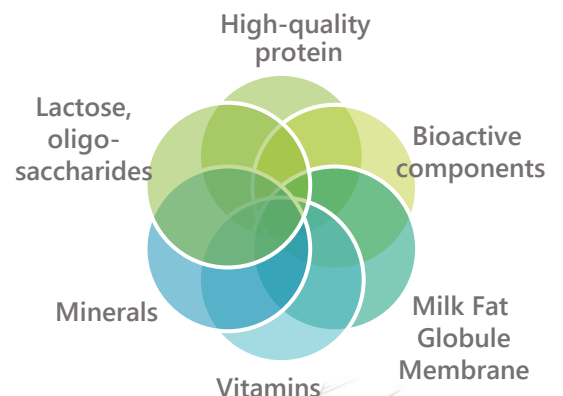
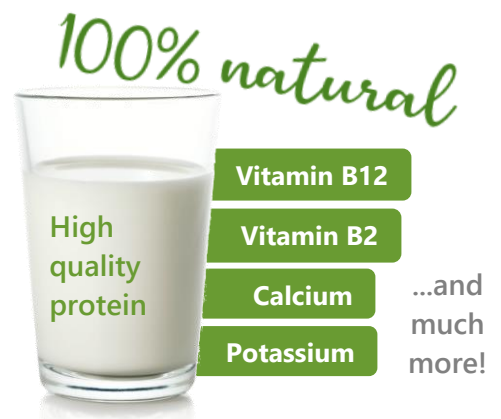
Dairy is naturally nutrient-rich

Dairy products are **nutrient-rich** and are excellent sources of **high-quality protein**, as well as **calcium, phosphorous, potassium, iodine, vitamin B2 and B12**. They also contain small amounts of other nutrients such as **zinc, selenium and magnesium**; and other **B vitamins (B3, B6, B9)**, and **vitamin A**.^(1,2) Therefore, they can play an important role as part of a **healthy and balanced diet**.^(1,3,4)

Dairy matrix^(1,5,6)

The beneficial effects of milk and dairy products on health are becoming increasingly recognised. The combination of nutrients, bioactive components and how they interact with each other is known as the “dairy matrix”. **Future dietary guidelines should consider the latest evidence of the effects of whole foods alongside that of individual nutrients**. Further research should be encouraged to investigate the mechanisms behind the food matrix and its health effects.

^a EDA Nutrition [Factsheet](#); Nutrient-rich dairy, an affordable source of nutrition.





Nutrition Factsheet

connect to the world of dairy

Dairy contributes to numerous health benefits

Reduced risk of overweight and obesity ⁽⁶³⁾

Overweight and obesity are dramatically on the rise. They are defined as abnormal or excessive fat accumulation that presents a risk to health. Both are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer.



Studies show that the inclusion of dairy in our daily diet can help to reduce the risk of overweight and obesity.

Dairy products content of **high-quality protein** may help prevent over-consumption due to its satiating effect and can play an important role in **weight loss** as it contributes to **muscle protein synthesis** and **maintenance of lean body mass** during energy restriction. ^(7,8)

It has been suggested that **calcium**, which is naturally present in high quantities in dairy products, may help binding fat in the intestine and thereby increase fat excretion from the body which leads to a **decrease in fat absorption**. ^(9,10)

Calcium in the dairy food matrix may be more effective in this respect than other forms of calcium. ⁽¹¹⁾

Other components of the **dairy matrix** are also likely to be involved in dairy's beneficial health effects in relation to obesity. It has been suggested that some fatty acids, in particular medium-chain fatty acids, may have preventive effects. Moreover, preliminary evidence suggests that fermented dairy foods such as cheese, favour production of short-chain fatty acids in the gut, which may have positive effects on appetite regulation. ⁽¹²⁻¹⁴⁾

Lower risk of metabolic syndrome

Metabolic syndrome is a combination of risk factors for CVD and is therefore the major contributor to not only CVD but also type 2 diabetes. ⁽²⁵⁾

A systematic review has recently indicated that dairy consumption is inversely associated with the incidence and prevalence of metabolic syndrome. However, additional studies are needed to provide further evidence. ⁽⁶⁴⁾

Reduced risk of cardiovascular disease (CVD)

A recent meta-analysis of the relationship of total dairy intake with CVD showed an inverse relationship between total dairy intake and CVD. Considering the limited number of studies in this regard, more studies are required to investigate the effect of different factors. ⁽⁶⁸⁾ Moreover, an overview of systematic reviews and meta-analyses provided a high level of evidence that **dairy products are significantly associated with reduced risk of stroke**. ⁽⁶⁹⁾





Nutrition Factsheet

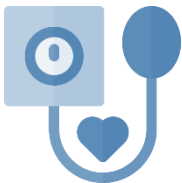
connect to the world of dairy

Dairy includes **natural trans fatty acids**, such as **conjugated linoleic acid** (cis-9, trans-11 CLA) and trans palmitoleic acid (trans-C16:1) ^(16,17); that in a context of dairy matrix, may have **beneficial effects on CVD risk factors such as blood lipids and markers of inflammation.** ^(75,76)

The focus on dairy foods and CVD is often in relation to saturated fat. However, the research shows that dairy foods, including **cheese, despite its content of fat and saturated fat, actually have a neutral or even a beneficial effect on CVD.** This can be explained by a complex composition of the **dairy matrix.** ⁽¹⁵⁾ Therefore, when testing a food's health effect, it is important to investigate the total profile and composition of a food, and not just its single individual nutrients.



Prevention of hypertension ⁽⁶⁶⁾



Dairy consumption has a beneficial effect on blood pressure and contributes to the prevention of hypertension. The Dietary Approaches to Stop Hypertension (DASH) diet is recommended for the management of high blood pressure and consists of fruit, vegetables, whole grains and **low-fat dairy products.** ^(18,21) Studies show that **substituting low-fat dairy with full-fat dairy in the DASH diet may have the same favourable effect on blood pressure.** ⁽⁶⁵⁾

Recent research has focused on the importance of **bioactive peptides** in regulation of blood pressure. A group of peptides released during digestion of casein proteins in the gut or by fermentation, have been shown to have **anti-hypertensive properties** and to regulate blood pressure. ⁽²²⁻²⁴⁾ Dairy is also a source of **potassium** which contributes to the maintenance of **normal blood pressure.**

Reduced risk of type 2 diabetes ⁽⁶⁷⁾

Type 2 diabetes occurs when the body becomes resistant to insulin and/or does not produce enough insulin to reduce blood sugar levels properly.

A recent meta-analysis on dairy intake and diabetes incidence show an **inverse association between yoghurt intake and risk of type 2 diabetes.** ⁽⁷¹⁾

The benefits of **fermented dairy products (cheese and yoghurt)** in relation to type 2 diabetes may be due to their effect on the gut microbiota. ^(72,73) Other studies have identified that **wey protein** (primarily in **milk and yoghurt**) can reduce postprandial (occurring after a meal) plasma glucose concentration in type 2 diabetic subjects. ⁽⁷⁴⁾



Different components of the **dairy matrix** could be potentially involved in the protective relationship between dairy and type 2 diabetes. The **beneficial effects on glycaemic control** can be explained by the interaction of different nutrients in the dairy matrix, including e.g. calcium and magnesium ⁽²⁷⁻²⁹⁾, high-quality protein ⁽³⁰⁻³³⁾, bioactive peptides, a form of



Nutrition Factsheet

connect to the world of dairy

vitamin K ⁽³⁴⁾ and dairy fatty acids. ⁽³⁵⁻⁴¹⁾ Similarly, dairy products may indirectly modify diabetes risk through beneficial effects on body weight, body fat and on muscle mass and function.

Prevention of osteoporosis



Osteoporosis is a skeletal disease characterised by a decrease of bone mass and changes in bone structure which leads to increase risk of fractures. Osteoporosis has **three main factors**: advanced bone loss in women after menopause or in aged men and women; deficient bone growth during childhood or adolescence; and bone loss due to a disease, eating disorder or medication. ⁽⁴⁶⁾

Dairy consumption contributes to achieving peak bone mass in early adulthood, which helps to prevent fractures later in life. Several studies showed that dairy food lead to an increase in bone mineral density, have a beneficial impact on bone metabolism and attenuate bone loss. ^(46,47-49) The role of dairy products for bone mineral content or bone mineral density has been sufficiently established in **girls and women**. ⁽⁷⁰⁾



The importance of calcium in bone development and maintenance is well established. ^(42,43) Milk and dairy products make the largest contribution to calcium intake in the European diet. Only few other foods naturally contain as much calcium as dairy. Nevertheless, **calcium from dairy is known to be one of the most bioavailable to the human body**. ⁽⁴⁴⁾ While it is sometimes assumed that supplementation with the same amount of calcium from different sources have comparable effects on bone health, dairy products may have greater benefits ⁽⁵⁰⁻⁵²⁾ and the skeletal benefits may persist longer than the equivalent calcium in the form of supplements. ⁽⁴⁵⁾ Similarly, the science increasingly indicates that the greater benefits of dairy may be due to the nutrients in the **dairy matrix** which work together to help maintaining healthy bones. ⁽⁵³⁻⁶¹⁾

Cancer ⁽⁶²⁾

Colorectal cancer is the second most commonly occurring cancer in women and the third most commonly occurring cancer in men. In line with the latest **WCRF/AICR Report (2017)**, **there is strong evidence that consumption of dairy products decreases the risk of colorectal cancer**.



Moreover, milk and dairy products may also be associated with a reduced risk of **bladder cancer** and **premenopausal breast cancer**; within dairy subgroups particularly yoghurt and low-fat dairy were found to be inversely associated with the risk of developing breast cancer. ⁽⁷⁷⁾ As calcium and vitamin D supplementation was previously shown to reduce risk of breast cancer in the Women's Health Initiative ⁽⁷⁸⁾, these nutrients could be involved in the underlying mechanisms.





Nutrition Factsheet

connect to the world of dairy

References

1. EMF. MILK, nutritious by nature. Available from: www.milknutritiousbynature.eu
2. Drewnowski A., Fulgoni V. Nutrient profiling of foods: creating a nutrient-rich food index. *Nutr Rev.* 2008 Jan 1;66(1):23–39.
3. Streppel M, de Groot L, Feskens. Nutrient-rich foods in relation to various measures of anthropometry. *Fam Pract.* 2012;29: i36–43.
4. Drewnowski A. Concept of a nutritious food: toward a nutrient density score. *Am J Clin Nutr.* 2005; 82:721–3.
5. Peters S. (Dutch Dairy Association, NZO). The food matrix: food is more than the sum of its nutrients. *Voeding Magazine* 2 – 2017
6. T. Kongerslev Thorning et al. Whole dairy matrix or single nutrients in assessment of health effects: current evidence and knowledge gaps. *Am J Clin Nutr* 2017, doi:10.3945/ajcn.116.151548
7. World Health Organization. Obesity and overweight [Internet]. Available from: <https://www.who.int/news-room/factsheets/detail/obesity-and-overweight>
8. Astrup A. et al. The role of higher protein diets in weight control and obesity-related comorbidities. *Int J Obes (Lond).* 2015 May;39(5):721-6.
9. Soares M.J. et al. Mechanistic roles for calcium and vitamin D in the regulation of body weight. *Obes Rev.* 2012 Jul;13(7):592-605.
10. Gonzalez J.T. et al. Effect of calcium intake on fat oxidation in adults: a meta-analysis of randomized, controlled trials. *Obes Rev.* 2012 Oct;13(10):848-57.
11. Lorenzen J.K. et al. Effect of dairy calcium or supplementary calcium intake on postprandial fat metabolism, appetite, and subsequent energy intake. *Am J Clin Nutr.* 2007; 85: 678–687.
12. Tsuji H. et al. Dietary medium chain triacylglycerols suppress accumulation of body fat in a double-blind, controlled trial in healthy men and women. *J Nutr.* 2001; 131: 2853–2859.
13. St-Onge M.P. & Jones P.J. Physiological effects of medium-chain triglycerides: potential agents in the prevention of obesity. *J Nutr.* 2002; 132: 329–332.
14. Byrne C.S. et al. The role of short chain fatty acids in appetite regulation and energy homeostasis. *Int J Obes.* 2015; 39: 1331-1338.
15. Thorning T.K. et al. Whole dairy matrix or single nutrients in assessment of health effects: current evidence and knowledge gaps. *Am J Clin Nutr* 2017: 105:1–13.
16. Tricon S. et al. Opposing effects of cis-9, trans-11 and trans-10, cis-12 conjugated linoleic acid on blood lipids in healthy humans. *Am J Clin Nutr.* 2004; 80: 614-620.
17. Kratz et al. The relationship between high-fat dairy consumption and obesity, cardiovascular, and metabolic disease. *Eur J Nutr.* 2013; 52: 1-24.
18. WebMD. DASH diet and High Blood Pressure [Internet]. Available from: <https://www.webmd.com/hypertension-high-blood-pressure/guide/dash-diet#>
19. McGrane M.M. et al. Dairy Consumption, Blood Pressure, and Risk of Hypertension: An Evidence-Based Review of Recent Literature. *Curr Cardiovasc Risk Rep.* 2011 Aug 1;5(4):287-298.
20. Soedamah-Muthu S.S. et al. Dairy consumption and incidence of hypertension: a dose-response meta-analysis of prospective cohort studies. *Hypertension.* 2012 Nov;60(5):1131-7.
21. Ralston R.A. et al. A systematic review and meta-analysis of elevated blood pressure and consumption of dairy foods. *J Hum Hypertens.* 2012 Jan;26(1):3-13.
22. Ricci I. et al. Milk protein peptides with angiotensin I-converting enzyme inhibitory (ACEI) activity. *Crit Rev Food Sci Nutr.* 2010; 50: 390-402.
23. Fekete A.A. et al. Casein-derived lactotripeptides reduce systolic and diastolic blood pressure in a meta-analysis of randomised clinical trials. *Nutrients.* 2015; 7: 659-681.



Nutrition Factsheet

connect to the world of dairy

24. Neilsen R. et al. Short communication: Is consumption of a cheese rich in angiotensin-converting enzyme-inhibiting peptides, such as the Norwegian cheese Gamalost, associated with reduced blood pressure? *J Dairy Sci.* 2014; 97: 2662–2668.
25. International Diabetes Federation. The IDF consensus worldwide definition of the METABOLIC SYNDROME. 2006.
26. Rice B. Dairy Components and Risk Factors for Cardiometabolic Syndrome: Recent Evidence and Opportunities for Future Research. *Advances in Nutrition*, Volume 2, Issue 5, 1 September 2011, Pages 396–407.
27. Pittas A.G. et al. Review: the role of vitamin D and calcium in type 2 diabetes. A systematic review and meta-analysis. *J Clin Endocrinol Metab.* 2007; 92: 2017-2029.
28. Belin R.J. & He. K. Magnesium physiology and pathogenic mechanisms that contribute to the development of the metabolic syndrome. *Magnes Res.* 2007; 20:107-129. 20. Dong JY et al. Magnesium intake and risk of type 2 diabetes: meta-analysis of prospective cohort studies. *Diabetes Care.* 2011; 34(9): 2116-2122.
29. Dong J.Y. et al. Magnesium intake and risk of type 2 diabetes: meta-analysis of prospective cohort studies. *Diabetes Care.* 2011; 34(9): 2116-2122.
30. McGregor R.A. & Poppitt S.D. Milk protein for improved metabolic health: a review of the evidence. *Nutr Metab.* 2013; 10: 46.
31. Jakubowicz D. & Froy O. Biochemical and metabolic mechanisms by which dietary whey protein may combat obesity and Type 2 diabetes. *J Nutr Biochem.* 2013; 24: 1-5.
32. Ricci-Cabello et al. Possible role of milk-derived bioactive peptides in the treatment and prevention of metabolic syndrome. *Nutr Rev.* 2012; 70: 241-255.
33. Comerford K.B. et al. Emerging Evidence for the Importance of Dietary Protein Source on Glucoregulatory Markers and Type 2 Diabetes: Different Effects of Dairy, Meat, Fish, Egg, and Plant Protein Foods. *Nutrients.* 2016; 8: 446.
34. Beulens J.W. et al. Dietary phylloquinone and menaquinones intakes and risk of type 2 diabetes. *Diabetes Care.* 2010; 33: 1699–1705.
35. Ericson U. et al. Food sources of fat may clarify the inconsistent role of dietary fat intake for incidence of type 2 diabetes. *Am J Clin Nutr.* 2015; 101: 1065-1080.
36. Mozaffarian D. et al. Trans-palmitoleic acid, metabolic risk factors, and new-onset diabetes in US adults: a cohort study. *Ann Intern Med.* 2010; 153: 790-799.
37. Mozaffarian D. et al. trans-Palmitoleic acid, other dairy fat biomarkers, and incident diabetes: the Multi-Ethnic Study of Atherosclerosis (MESA). *Am J Clin Nutr.* 2013; 97: 854–861.
38. de Souza R.J. et al. Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. *BMJ.* 2015; 11; 351:h3978.
39. Forouhi N.G. et al. Differences in the prospective association between individual plasma phospholipid saturated fatty acids and incident type 2 diabetes: the EPIC-InterAct case-cohort study. *Lancet. Diabetes Endocrinol.* 2014;2: 810–818.
40. Hellgren L.I. Phytanic acid - an overlooked bioactive fatty acid in dairy fat? *Ann N Y Acad Sci.* 2010; 1190: 42-49.
41. Nestel P.J. et al. Specific plasma lipid classes and phospholipid fatty acids indicative of dairy food consumption associate with insulin sensitivity. *Am J Clin Nutr.* Epub ahead of print 23 October 2013. DOI: 10.3945/ajcn.113.071712.
42. Heaney R.P. Dairy and bone health. *J Am Coll Nutr.* 2009; 28: 82S-90S.
43. Heaney R.P. Calcium, dairy products and osteoporosis. *J Am Coll Nutr.* 2000; 19: 83S-99S.
44. Guéguen L. & Pointillart A. The bioavailability of dietary calcium. *J Am Coll Nutr.* 2000; 19: 119-136.
45. Bonjour J.P. et al. Dairy in adulthood: from foods to nutrient interactions on bone and skeletal muscle health. *J Am Coll Nutr.* 2013; 32: 251-263.
46. Kathleen Mahan L., Escott-Stumps S. *Krause's Food and Nutrition Therapy.* 12th edition. 2012.
47. Vicky Tai, William Leung, Andrew Grey, Ian R Reid, Mark J Bolland. Calcium intake and bone mineral density: systematic review and meta-analysis. *BMJ* 2015;351:h4183



Nutrition Factsheet

connect to the world of dairy

48. De Fu Ma et al. Milk intake increases bone mineral content through inhibiting bone resorption: Meta-analysis of randomized controlled trials. February 2013 Volume 8, Issue 1, Pages e1–e7.
49. Sahni S. et al. Milk and yogurt consumption are linked with higher bone mineral density but not with hip fracture: the Framingham Offspring Study. *Arch Osteoporos.* 2013;8:119.
50. Cheng S. et al. Effects of calcium, dairy product, and vitamin D supplementation on bone mass accrual and body composition in 10–12-year-old girls: a 2-y randomized trial. *Am J Clin Nutr.* 2005; 82: 1115–1126.
51. Manios Y. et al. Changes in biochemical indexes of bone metabolism and bone mineral density after a 12-mo dietary intervention program: the Postmenopausal Health Study. *Am J Clin Nutr.* 2007; 86: 781-789.
52. Kerstetter J.E. Do dairy products improve bone density in adolescent girls? *Nutr Rev.* 1995; 53: 328-332.
53. Surdykowski A.K. et al. Optimizing bone health in older adults: the importance of dietary protein. *Aging Health.* 2010; 6: 345-357.
54. Bonjour J.P. Protein intake and bone health. *Int J Vitam Nutr Res.* 2011; 81: 134-142.
55. Bonjour J.P. et al. Dairy in adulthood: from foods to nutrient interactions on bone and skeletal muscle health. *J Am Coll Nutr.* 2013; 32: 251-263.
56. Rizzoli R. et al. The role of dietary protein and vitamin D in maintaining musculoskeletal health in postmenopausal women: A consensus statement from the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO). 2014; *Maturitas* 17 July 2014; doi: 10.1016/j.maturitas.2014.1007.1005. doi:10.1016/j.maturitas.2014.07.005.
57. Kerstetter, J.E. et al. Dietary protein and skeletal health: a review of recent human research. *Curr Opin Lipidol.* 2011; 22:16-20.
58. Fenton T.R. et al. Causal assessment of dietary acid load and bone disease: a systematic review & meta-analysis applying Hill's epidemiologic criteria for causality. *Nutr J.* 2011; 10: 41-64.
59. Mangano K.M. et al. Dietary protein is beneficial to bone health under conditions of adequate calcium intake: an update on clinical research. *Curr Opin Clin Nutr Metab Care.* 2014; 17: 69-74.
60. Durosier-Izart C. et al. Peripheral skeleton bone strength is positively correlated with total and dairy protein intakes in healthy postmenopausal women. *Am J Clin Nutr.* 2017; doi: 10.3945/ajcn.116.134676
61. McCabe L. et al. Prebiotic and probiotic regulation of bone health: role of the intestine and its microbiome. *Curr Osteoporos Rep.* 2015; 13: 363–371.
62. World Cancer Research Fund International/American Institute for Cancer Research. Continuous Update Project Report. Cancer trends. Data on specific cancers. Colorectum [Internet]. Available from: <https://www.wcrf.org/dietandcancer/cancer-trends/colorectal-cancer-statistics>
63. Carmen Sayon-Orea et al. Associations between Yogurt Consumption and Weight Gain and Risk of Obesity and Metabolic Syndrome: A Systematic Review. *Adv Nutr* 2017;8(Suppl):146S–54S;
64. Y. Kim and Y. Je. Systematic Review or Meta-analysis Dairy consumption and risk of metabolic syndrome: a meta-analysis. *Diabet. Med.* 33, 428–440 (2016)
65. Chiu et al. Comparison of the DASH (Dietary Approaches to Stop Hypertension) diet and a higher-fat DASH diet on blood pressure and lipids and lipoproteins: a randomized controlled trial. *Am J Clin Nutr* 2016;103:341–7.
66. Schwingshackl et al. Food Groups and Risk of Hypertension: A Systematic Review and Dose-Response Meta-Analysis of Prospective Studies. *Adv Nutr* 2017;8:793–803.
67. Lieke Gijsbers et al. Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies. *Am J Clin Nutr* 2016;103:1111–24
68. Gholami et al. The effect of dairy consumption on the prevention of cardiovascular diseases: A meta-analysis of prospective studies. *J Cardiovasc Thorac Res* 2017;9(1):1-11.
69. Deng et al. Stroke and food groups: an overview of systematic reviews and meta-analyses. *Public Health Nutrition:* 21(4), 766–776



Nutrition Factsheet

connect to the world of dairy

70. Ellen G. H. M. van den Heuvel* and Jan M. J. M. Steijns. Dairy products and bone health: how strong is the scientific evidence?. *Nutrition Research Reviews* (2018), 31, 164–178
71. Gijsbers L. et al. Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies. *Am J Clin Nutr* 2016; 103(4): 1111-24.
72. Astrup A. A changing view on saturated fatty acids and dairy: from enemy to friend. *Am J Clin Nutr* 2014; 100(6): 1407-8.
73. Zheng H. et al. Metabolomics investigation to shed light on cheese as a possible piece in the French paradox puzzle. *J Agr Food Chem* 2015; 63(10): 2830-9.
74. Frid AH, Nilsson M, Holst JJ, Bjorck IM. Effect of whey on blood glucose and insulin responses to composite breakfast and lunch meals in type 2 diabetic subjects. *Am J Clin Nutr* 2005; 82(1): 69-75.
75. M.V. Calvo et al. Grasa láctea: una fuente natural de compuestos bioactivos. *Alim. Nutri. Salud.* 2014 Instituto Danone Vol. 21, N.º 3, pp. 57-63, 2014
76. Manuela Juarez Iglesias et al. Los nutrientes de la leche en la salud cardiovascular. *Nutr Hosp.* 2015;31(Supl. 2):26-32
77. Zang J, Shen M, Du S, Chen T, Zou S. The association between dairy intake and breast cancer in western and Asian populations: a systematic review and meta-analysis. *J Breast Cancer* 2015; 18(4): 313-22.
78. Cauley JA, Chlebowski RT, Wactawski-Wende J, Robbins JA, Rodabough RJ, Chen Z, et al. Calcium plus vitamin D supplementation and health outcomes five years after active intervention ended: the women's health initiative. *J Womens Health (Larchmt)* 2013; 22(11): 915-29.