

ORGANIC VS. CONVENTIONAL DAIRY: A COMPARISON

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This report examines existing research to compare the health benefits of organic versus conventional dairy products. Findings point towards 3 key trends associated with organic dairy intake: a reduced risk of eczema in infants under two years, an increased level of essential fatty acids, and a potential for higher vitamin concentration.

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TABLE OF CONTENTS

Introduction	4
Research Goals.....	4
Background	4
Methods	Error! Bookmark not defined.
Literature Review	Error! Bookmark not defined.
Databases Searched	5
Selection of Articles	5
Limitations of the Methods.....	5
Findings	6
1. Summary of Findings.....	Error! Bookmark not defined.
Conclusions.....	10
General Conclusions	10
Future Considerations	10
References.....	11

INTRODUCTION

RESEARCH GOALS

The aim of this research project was to examine and synthesize findings from scientific studies and current literature regarding the health benefits of organic versus conventional dairy products.

BACKGROUND

This research project was conducted on behalf of The Research Shop at the University of Guelph for the Organic Council of Ontario. From October 2012 to April 2013, a literature review was conducted, which involved scanning multiple databases for articles on this topic. Eight papers were selected to act as sources for identifying key trends in health benefits related to organic dairy consumption.

METHODS

LITERATURE REVIEW

A computerized literature search was conducted by scanning various scientific databases for relevant, unbiased, and valid studies on this topic.

DATABASES SEARCHED

The primary databases used in the literature review were Google Scholar and Web of Science. These databases were accessed through the University of Guelph Electronic Reference Library.

SELECTION OF ARTICLES

While no formal inclusion criteria were used throughout the literature search, articles were critically analyzed and selected based on their relevancy. No restrictions to the study design were applied, however, basic components of each study design were reviewed for accuracy and validity. This included articles that directly compared organic and conventional milk products, as well as those that contained a measurable health benefit (i.e. CLA fatty acids, specific vitamins, or an increase/decrease in certain ailments/diseases). Studies that only compared organic “diets”, but not specifically dairy products, were omitted from article selection. Note that food or agricultural production certified as ‘organic’ excludes the use of any synthetic inputs (such as fertilizers and pesticides), as well as genetically modified seeds and breeds. Food items classified only as “natural”, “antibiotic-free”, “hormone-free”, or “free-range” were excluded. Articles were limited to those using a human study design, and written in the English language.

LIMITATIONS OF THE METHODS

Although the search was wide enough to ensure that the most relevant material was included, time constraints did limit the scope of the literature review. Additionally, there

were no specific inclusion/exclusion criteria for the articles selected, or a formal abstract screening process. Thus, bias towards age, ethnicity, geography, gender, and/or the presence or absence of any other health conditions may exist in the subjects of these studies. Using a screening process increases the likelihood of producing more reliable results and extrapolating appropriate conclusions from the different articles. However, the presence of several related studies demonstrating similar findings makes it highly unlikely that these limitations significantly impact the merit of our research.

FINDINGS

SUMMARY OF FINDINGS

Based on the research, three main trends have been identified that associate health benefits with organic dairy consumption. Firstly, consumption of organic dairy products has been associated with a lower risk of eczema in children up to two years. Secondly, an increase in essential polyunsaturated fatty acids has been observed in organic milk compared to conventional milk. Third, there is evidence of higher vitamin concentration in organic milk, including alpha-tocopherol and beta-carotene, which act as antioxidants in biological reactions.

MAIN TRENDS

1) Reduced Risk of Eczema in Infants under 2 years

Previous work has indicated that one potential benefit of consuming organically produced food is the protection against atopic diseases in young children. Atopic

diseases, including eczema, asthma, and allergic rhinoconjunctivitis, has increased worldwide over the past 30 years and affects approximately one third of all children in “Western” societies (in this case this includes the United Kingdom, Australia, Germany, Ireland, Canada and the United States) (Maziak et. al, 2003). The KOALA Birth Cohort Study measured the effects of organic food consumption on atopic manifestations in infants from birth until two years of age, and found that children were associated with a lower risk of eczema when their mothers fed them strictly organic dairy products. The precise mechanism by which organic dairy consumption protects against eczema is currently unknown, however, there is reason to believe it is related to the content and quantity of fatty acids and bacteria found in organic dairy products.

We speculate that a high intake of n-3 fatty acids and/or conjugated linoleic acid from organic dairy products by the child is protective against eczema (independent of atopy), and that also the mother’s intake of these fatty acids during pregnancy and lactation contributes to this protection. (Kummeling *et. al*, 2008, p. 603)

In addition,

Organic dairy products can also contain more gram-negative bacteria and higher levels of the corresponding lipo-polysaccharide than conventional, pasteurized dairy products... the protective factor associated with the consumption of organic dairy products could be the ingestion of non-infectious microbial components with a possible effect on gut immunity development. (Kummeling *et. al*, 2008, p. 603)

In this study, no associations were found between the consumption of meat, fruits, vegetables and eggs with the development of eczema, wheeze, or other atopic ailments.

2) Increased level of essential fatty acids found in organic milk

Many studies have focused on the increase in omega-3 and omega-6 group of PUFA (polyunsaturated fatty acids), specifically CLA (conjugated linoleic acid), found in organic dairy products. There has been accumulating evidence indicating the various positive effects of CLA on human health, such as improved immune function and cancer prevention.

Some of the fatty acids in milk, including conjugated linoleic fatty acids (CLA) and the omega-3 group of the polyunsaturated fatty acids, are considered to have positive effects on human health, including anticarcinogenic and antidiabetogenic effects of CLA and improvement of the plasma cholesterol status. (Fall and Emanuelson, 2011, p.287)

Studies by Rist *et. al* (2007) demonstrated increased levels of CLA in breast milk in mothers who included organic dairy in their diets; this directly corresponded to the amount of organic dairy products consumed. Ellis *et. al* (2006) reported that organic milk collected at the bulk tank had a higher proportion of PUFA's to monounsaturated fatty acids, and of omega-3 fatty acids, than conventional milk. Additionally, Fall and Emanuelson (2011) confirmed that the concentration of CLA was higher in total omega-3 fatty acids, as well as total content of n-6 fatty acids, in organic milk bulk tanks.

The dietary content of CLA has attracted much interest as it is considered to have a positive effect on consumer health. In our study, organic milk had a higher CLA content than the conventional milk. The main source of CLA for the human consumer is of dairy origin. (Fall and Emanuelson, 2011, p.290)

3) Potential for Higher Vitamin Concentration in Organic Milk

There has also been supporting information in the Bergamo *et. al* (2002) studies demonstrating that potential fat soluble vitamin concentrations such as alpha-tocopheral (a-tocopherol), and beta-carotene (b-carotene) are higher in organic milk. Conventional and organic milk fat contains a high concentration of both these vitamins, which act as antioxidants in biological tissues and food products. A comparison between organic and conventional cows' milk found significantly higher levels of a-tocopheral and b-carotene in the organic milk.

The finding of higher levels of TH [a-tocopheral] and b-carotene in organic milk fat might have positive implications in human nutrition as these substances, besides specifically protecting polyunsaturated fatty acids, reduce cholesterol oxidation and, therefore, its cytotoxicity and atherogenicity. (Bergamo *et. al*, 2002, p.630 taken from Kumar & Singhal, 1991)

In other words, these nutrients helps to prevent the formation of fatty or lipid masses in arterial walls, reducing the risk of developing serious heart conditions such as atherosclerosis.

It is hypothesized that these differences may be attributed to the feeding strategy of both the conventional and organic farms. "The most important reason for the observed differences is presumably the large amounts of maize silage used in the conventional production, whereas a considerable amount of grass and leguminous plants are used in the organic production" (Nielson *et. al*, 2004).

CONCLUSIONS

GENERAL CONCLUSIONS

Overall, these three trends identify a few of the valuable health benefits associated with organic dairy consumption. Higher concentrations of essential fatty acids, vitamins, and antioxidants, as well as a lower risk of cancer, heart disease, and eczema are among these benefits. The mechanism behind the improved quality of organic dairy products is currently unknown, but there is strong reason to suggest that allowing cows to graze on fresh silage (the feeding strategy associated with organic farming) enhances the nutritional capacity of their milk.

FUTURE CONSIDERATIONS

While this document compiles some of the existing research on the benefits of organic dairy foods, further studies focusing on specific health benefits with measurable outcomes (such as vitamins or nutrient concentrations) are needed to fully investigate the nutritional potential of organic dairy products.

REFERENCES

- Bergamo P., Fedele E., Iannibelli L., Marzillo G. (2003). Fat-soluble vitamin contents and fatty acid composition in organic and conventional Italian dairy products. *Food Chemistry*, 82, 625-631.
- Butler G., Nielsen J., Slots T., Seal C., Eyre M., Sanderson R., Leifert C. (2008). Fatty acid and fat-soluble antioxidant concentrations in milk from high- and low-input conventional and organic systems: seasonal variation. *Journal of the Science of Food and Agriculture*, 88, 1431-1441.
- Ellis KA, Innocent G, Grove-White D, Cripps P, McLean WG, Howard CV & Mihm M. (2006). Comparing the fatty acid composition of organic and conventional milk. *Journal of Dairy Science*, 89, 1938–1950.
- Fall N and Emanuelson U. (2011). Fatty acid content, vitamins and selenium in bulk tank milk from organic and conventional Swedish dairy herds during the indoor season. *Journal of Dairy Research*, 78, 287-292.
- Kummeling I., Thijs C., Huber M., van de Vijver L., Snijders B., Penders J., Stelma F., van Ree R., van den Brandt P., Dagnelie P. (2008). Consumption of organic foods and risk of atopic disease during the first 2 years of life in the Netherlands. *British Journal of Nutrition*, 99, 598-605.
- Maziak W., Behrens T., Brasky TM., Duhme H., Rzehak P., Weiland SK & Keil U. (2003). Are asthma and allergies in children and adolescents increasing? Results from ISAAC phase I and phase III surveys in Munster. Germany. *Allergy*, 58, 572–579.
- Nielsen JH, Lund-Nielsen T & Skibsted L. (2004) Date accessed: 2010-06-09. Higher antioxidant content in organic milk than in conventional milk due to feeding strategy. Available from: <http://www.darcof.dk/enews/sep04/milk.html>
- Rist L, Mueller A, Barthel C, Snijders B, Jansen M, Simões-Wüst AP, Huber M, Kummeling I, Von Mandach U, Steinhart H., & Thijs C. 2007. Influence of organic diet on the amount of conjugated linoleic acids in breast milk of lactating women in the Netherlands. *British Journal of Nutrition*, 97, 735–743.