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Review Article

Conventional and Organic Animal Foods: Eggs, Milk, and Meat- Review Analysis

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ABSTRACT

The term "organic" denotes a product of a food production system that is socially, ecologically and economically sustainable. It is known there are many environmental benefits when food is grown in the organic system. The organic food market is growing in response to an ever increasing demand for organic products. They are often considered more nutritious, healthier, and free from pesticides than conventional foods. However, the results of scientific studies do not show that organic products are more nutritious and safer than conventional foods. In this paper a comparison between conventional and organic foods have been made with the emphasizing the focus is on animal products.

Keywords: *Eggs, Milk, Meat, Organic food*

INTRODUCTION

Organic food production primarily involved small farms and local distribution of fresh produce, today's organic food system is a complex combination of small and large food producers, local and global distribution networks, and a wide variety of products, including fruits, vegetables, meats, dairy, and processed foods. The data available in the existing literature is often conflicting, even if the differences are often associated with breeds suited to organic vs. conventional production systems. In order to have a clear understanding of the role that "organic effect" plays on animal foods, further research is necessary.

The "organic", "biological", "biodynamic" and "agro-ecological" food has been related to the food production system, which forbids the use of chemical fertilizers, pesticides and intensive animal husbandry.

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In organic products, the use of external inputs and the use of synthetic fertilizers and growers are avoided; the organic livestock seeks to prevent diseases, to progressively eliminate the use of veterinary chemical allopathic drugs, to reduce feeding with animal source products, and to maintain the health and the welfare of the animals (FOA, 1999). According to scientific evidence, the soil conservation and biodiversity are improved in organic farming, that proves the benefits to environmental and sustainability of organic foods (Bengtsson, 2005). The motivation for the consumption of products so-called organic is originated from the concern with the environment and conservation of natural resources (Lee & Hwang, 2016; Toassa, Machado, Szarfarc, 2009). An additional motivation is the perception that organics are healthier and safe products since they are free of pesticide residues (Kesse-Guyot et al., 2013; Lee et al., 2016; Bourn & Prescott, 2002).

The nutritional value, however, should be better investigated to be included or not or even partially as motivation and benefit of organic foods. In general, there are few differences in nutrient concentration between the organic and conventional, whether macro or micronutrients are evaluated. According to data from the French Food Safety Agency Lairon (2010) and extensive studies from European Parliament Mie et al. (2016), organic foods may have higher levels of minerals, polyunsaturated fatty acids (PUFA) and phytochemical compounds. Other authors also suggested a trend of higher content of functional compounds in plant foodstuffs (Young et al., 2005; Borguini and Torres 2006; Lima and Vianelo, 2010; Bernacchia et al., 2016)

Protein: Researchers that assessed protein concentration also found no differences between the two types of poultry raising and egg collection Mizumoto et al.,2008; Hidalgo et al.2008). The amount of protein in the milk from conventional and organic production ranges between 2.66 to 3.35% and 2.9 to 3.87% respectively. It is possible to observe a small increase Toledo et al.,(2002) or decrease Kourimska et al.,(2014) in protein levels. Beside this conflicting data, some researchers reported no differences for proteins in organic or conventional milk. Butler et al., 2011; Toledo et al., 2002)

Lipids, fatty acid and cholesterol: The comparison between the total lipid amount in the organic eggs and conventional eggs are inconclusive. While the results found by Mizumoto et al.(2008) indicated that there are reduced levels (8.3 × 9.16 g% egg), results from Hidalgo et al. (10.1 × 9.5% egg) and Samman et al.(2009) (4.45 × 4.43% yolk) found no relevant difference in the total lipids in organic eggs. Besides the little difference, the proportions of lipids in eggs are compatible with the food composition table, which indicates that conventional eggs have 10.7% (USDA). It is not evident that there is less or more lipid in organic eggs. The results of the concentration of Saturated Fatty Acids (SFA) are also inconclusive. Chemical analysis of organic eggs from the metropolitan area of Sydney, Australia Samman et al.(2009) or the Italian market showed higher SFA. In an experimental study, Mugnai et al.(2014) Showed the more significant difference in SFA levels during the four seasons in the year, such as 60 to 68 g and 82.1 to 85.7 g/kg yolk in organic eggs and in conventional husbandry system, respectively. The higher concentration of w-3 fatty acid in organic eggs (6.2-7.7 g/kg yolk) compared to conventional ones was observed only in one study Mugnai et al. (2014). Regarding evaluation of the cholesterol content, it was found that organic eggs have the same amount as no organic eggs (Mugnai et al., 2014; Mizumoto et al. 2008).

Minerals: Although the comparison of the presence of minerals indicates possible modifications for Fe, Zn, and Se, the data should be evaluated with caution due to the inconsistency of results. Higher iron content in organic eggs (about 2 mg% fresh matter) was found compared to that of non-organic production (about 1.6 mg% fresh matter), but without statistical differences; the amount of calcium and magnesium were similar in the evaluated eggs Mizumoto et al. (2008) Finally, few studies compare the chemical nutritional characteristics of organic or non-organic eggs, even though these foods are frequent in the organic consumer's diet Wier et al. (2008). The potential health benefits could be the lower SFA and the higher w-3 fatty acids and lower atherogenic index.

Milk and dairy products are an important group of organic foods, being the most purchased items among consumers in Denmark and the United Kingdom Wier et al. (2008), and the third more significant commodity within the global organic food market, after fruits and vegetables Organic Monitor (2011). For milk obtained from organic and conventional production, the most evident changes occur for lipids profile, and yet there is no agreement among researchers regarding the amount of total lipids or protein.

Vitamins: Vitamins in organic milk have been poorly evaluated. The amount of α-tocopherol is higher in organic than compared to conventional systems according to experimental studies and meta-analysis. No conclusive data has been obtained from the other lipid soluble vitamins. Cholecalciferol (Vitamin D3) and mono-hydroxycholecalciferol were quantified using a highlysensitive method; no statistical difference was observed Jakobsen and Saxholt (2009). Results in Italian dairy showed by Bergamo et al. indicated a greater content of Vitamin E and β-carotene in organic milk. The recent meta-analyses confirm a higher level of α-tocopherol Srednicka et al. (2016) but not of β-carotene level Palupi et al., (2012). Several studies investigated the concentration of water and fat soluble vitamins in milk in order to verify whether the concentration of these nutrients differs between organic and conventionally produced milk. The *α*-tocopherol (a form of vitamin E) and *β*-carotene (a vitamin A precursor) content in milk are of interest for milk industries because they may prevent spontaneous milk oxidation. In general, milk fat is a good dietary source of retinol, *α*-tocopherol, and *β*-carotene, which exert their antioxidant activity in biological tissues, as well as in foods. Moreover, *β*-carotene and retinal can act as a potent free radical scavenger, thus preventing or limiting the oxidation of fatty acid (Bergamo et al., 2003). Their concentration in milk depends on their content in the diet of the animal (Mogensen, Kristensen, Søegaard, Jensen, & Sehested, 2012). Higher concentrations of vitamins can be found in fresh forage than in stored or dried forages and cereals (Kay, Roche, Kolver, Thomson, & Baumgard, 2005). Indeed, Butler et al. (2008) reported higher amounts of *α*-tocopherol and *β*-carotene in organic milk than conventional milk ($p < 0.001$) and the same results were also reported by other researchers (Schwendel, Wester, et al., 2015; Slots, Sorensen, & Nielsen, 2008; Stergiadis et al., 2014). It can also be assumed that the lower concentration of antioxidant in conventional milk is the consequence of dilution, resulting from the higher milk yields in conventional farming compared with organic farming (Ellis et al., 2007). No significant differences in *α*-tocopherol and *β*-carotene concentrations between organic and conventional milk were observed by Ellis et al. (2007) and by Fall and Emanuelson (2011). Nevertheless, it should be noted that different results may occur depending on the different methods of quantification used. In particular, Slots, Sorensen and Nielsen (Slots et al., 2008) showed that contents of the natural stereoisomer RRR-*α* -tocopherol are higher for organic than for conventional milk, whereas the synthetic 2R stereoisomer of *α*-tocopherol is significantly higher in conventional than in organic milk, due to fortification of concentrates. With regard to water soluble vitamins, Zagorska and Ciprovica (2008) reported that thiamine and riboflavin (vitamin B_1 and B_2) concentrations in organic milk are lower than in conventional milk ($p < 0.05$). The same was reported by Poulsen et al. (2015) regarding the content of riboflavin. This can be explained by the fact that both vitamins are found in cereals and the diet of conventional dairy cows contains a higher intake of grains than the diet of cows in organic farming (Gołda, Szyniarowski, Ostrowska, Kozik, & Rąpała-Kozik, 2004).

Some studies compared the mineral content of organic and conventional milk. Their concentrations in animal products are generally related to feed (Windisch & Ettle, 2008) Especially in conventional farming the main source of trace elements are the mineral supplements routinely added to the concentrate. On the contrary, in organic farming mineral supplements are not routinely used (Blanco-Penedo, Lundh, Holtenius, Fall, & Emanuelson, 2014; Rey-Crespo, Miranda, & López-Alonso, 2013). Due to restrictions on the type of feeding imposed by EU regulations, in organic dairy farms, a clear deficiency in zinc, molybdenum, selenium, copper, and iodine can occur (Rosati & Aumaitre, 2004). This has been demonstrated also by Rey-Crespo et al. (2013), who evaluated the main essential different trace elements in milk (Co, Cr, Cu, Fe, I, Mn, Mo, Ni, Se, and Zn) and highlighted a significantly lower concentration of these minerals in organic compared to conventional milk. In the same way, Rey-Crespo, Miranda, and López-Alonso (2013) and Hanuš, Brychtova, et al. (2008), observed higher concentrations of Cu in conventional than in organic milk ($p \leq 0.01$). This fact suggested that organic dairy cows could be exposed at a greater risk of deficiency of essential elements compared to animals kept in conventional herds. However, in a recent study, Ghidini et al. (2005) found comparable levels of Cd, Cu, Fe, and Zn in organic and conventional milk. These contrasting results could be attributed to the different experimental methods and to the physiological state of the cows. For example, a higher Cu serum level and a lower Mo in serum concentrations may depend on the stage of lactation. Iodine concentrations in organic and conventional milk have been extensively researched and were found to depend largely on dietary intake. In fact, as has been reported by several authors (Bath, Button, & Rayman, 2012; Johner, von Nida, Jahreis, & Remer, 2011; Payling, Juniper, Drake, Rymer, & Givens, 2015) conventional milk has a significantly higher iodine concentration than organic milk, regardless of the season in which it is produced. The content of toxic elements in milk is generally low and within the admissible level (Gabryszuk, Sloniewski, Metera, & Sakowski, 2010; Gabryszuk, Słoniewski, & Sakowski, 2008), the content of heavy metals in milk depends on feed, on their presence in the soil, environmental contamination, as well as on the antagonistic interaction between bioelements and heavy metals, which influences their absorption and metabolism. For these reasons, the content of toxic elements in milk from organic farms is not lower than in milk from conventional herds (Gabryszuk et al., 2010).

In conclusion, although the composition of organic milk has become an important issue for debate, mainly due to higher consumer expectations, the results in the literature do not point in a clear direction, but are often contradictory. Certainly the effect of animal nutrition on the composition of milk, especially fat composition, is well documented. However, one must consider that there are numerous other factors that affect milk composition, such as breed, genetics, and stage of lactation, management, and season. Consequently, any differences in milk composition cannot be attributed to the farming system alone.

Meat: Currently meat consumption habits are changing and it has been found that consumers not only demand products with better physicochemical and sensory characteristics, but that are also safe, healthier, and environmentally friendly. In recent years, organic animal products have received significant attention in most developed countries, as environmentally friendly products are considered to be healthier and safer than those produced by intensive production systems (Hansen, Claudi-Magnussen, Jensen, & Andersen, 2006; (Sundrum, 2001). Major differences between organic and conventional animal nutrition are the ban on synthetic amino acid and products of genetically modified organisms. Moreover, antibiotics and growth promoters are prohibited (International Federation of Organic

Agricultural Movements, 1996; Kim et al., 2009).

Several studies have investigated the difference between organic vs conventional breeding for different animals by examining and evaluating chemical, physical, and sensory parameters of the meat. Revilla et al. (2009) compared the meat from suckling lamb bred by dt systems—organic and conventional. The sensory properties of the meat were investigated by a trained panel and the overall customer satisfaction of those consuming the product was also evaluated. In terms of homogeneous aspect, sinew content and juiciness in raw or grilled meat no significant differences were found. The grilled meat sample was also assessed for various chemical parameters, such as texture. Fibrous texture ($p \leq 0.05$) and fatness sensation ($p \leq 0.01$) were found to be significantly lower in the organic samples than in the conventional samples. The less fibrous texture found in organic meat may be related to the fact that the meat from organic suckling lamb was considered to be less tough; while the lower fatness sensation could be attributable to the higher proportion of unsaturated fatty acids in organic meat, due to its lower melting point (Revilla, Vivar-Quintana, Luruena-Martinez, Palacios, & Severiano-Perez, 2008).

Overall satisfaction expressed by habitual consumers was high for both samples, but the highest scores given to the organically produced samples ($p \leq 0.05$). Husak, Sebranek, and Bregendahl (2008), did not detect any differences in the aroma, tenderness, chewiness, moistness, or flavor of chicken breast from organic, free-range, and conventionally farmed chickens. However, the sensory analysis indicated that conventional chicken thighs are more tender and less chewy than the legs from organic and free-range chickens, confirming the instrumental tenderness values observed. Castellini, Mugnai, and Boso (2002) found that panelists gave significantly higher scores for juiciness and overall acceptability to organic breast muscles than to conventional meat. Kishowar, Paterson, and Piggott (2005) concluded that for breast meat from organic, free-range, and corn-fed chickens, it was the appearance and texture of the meat that distinguished organic groups from conventional groups. Furthermore, the different farming systems have an effect on color: in the suckling lamb meat, a brown color ($p \leq 0.01$), was more common in the organic samples, and a pink color in raw meat. The sensory results for pink and brown colored meat were coherent with the higher values obtained by instrumental analysis of a^* (CIELab parameters) in raw meat from organic suckling lamb (Palacios, Revilla, Vivar-Quintana, Luruena-Martinez, & Severiano-Perez, 2008). A study on pork meat showed that the meat of organically reared pigs has significantly ($p < 0.05$) higher CIE a*(red) and b*(yellow) values than the meat of conventionally reared pigs of equivalent weight. The myglobin content (Kim et al., 2009) in these samples was also significantly ($p < 0.05$) higher. This could be attributed to the higher amount of exercise that is part of the organic farming management system (Kim et al., 2009; Revilla et al., 2009). The breast, thigh, and skin parts of conventionally raised chickens usually have a more yellow appearance than carcass components of organically raised chickens (Husak et al., 2008).

The superficial fat and intramuscular fat were lower in organic suckling lamb meat samples, although the results for raw meat revealed the opposite (Revilla et al., 2009). Odor intensity ($p \leq 0.01$) was lower in organic samples, also in raw meat (Revilla et al., 2009) because of the lower amount of n-3 PUFAs (Revilla et al., 2008), associated with a more intense lamb flavor (Angood et al., 2007) and this is due to a lower suckling lamb smell intensity found in raw meat. However, organically produced samples had higher country odor values. This result is attributable to the higher amounts of heptanal found in organic samples (Revilla et al., 2009). The anomalous smell was significantly lower ($p < 0.1$) in organic meat samples than conventional meat. Kim et al. (2009) studied the carcass characteristics of Korean-native black pigs, showing no noticeable differences in live and carcass weight. The organically reared pigs had lower shear force values than the conventionally reared ones. This contrasting result may be due to the differing diets and rearing conditions of the two farming systems. Heyer, Kristina Andersson, and Lundström (2006) observed that shear force tended to be lower for pigs in the outdoor systems than for pigs in the indoor systems. The meat quality characteristics of conventional and organic pigs were the same with regard to pH and cooking loss. The breeding system did not affect off-odor, acidulous taste, off-taste, or tenderness; moreover, the consumer preference tests showed no significant differences between organically and conventionally produced meats.

Courtney, Kirsty, and Given (2015) have shown that the meat from organic production has less fat than conventional meat; a finding confirmed by Castellini et al. (2002) and by Husak et al. (2008) observed that the most significant differences between broilers provided to consumers as organic and conventional chickens included: color, fatty acid composition, and tenderness. Kamihiro, Stergiadis, Leifert, Eyre, and Butler (2015) reported how organic and conventional production systems and the end-of-season production can affect the meat and fat quality of sirloin steaks. They observed little difference in meat quality (pH, shear force, and color), but found that the fat profiles varied considerably between production systems and seasons. Organic, summer- finished beef provides nutritionally more favorable FA profiles with higher n-3 (ALA, EPA, DPA, and DHA), CLA, and VA compared to non-organic, winter finished samples.

The different diets used in organic and conventional production systems may influence the nutrient and fatty acid composition in pork (Bosi, 1999). Differences in space allowance, stocking density, and climatic conditions might also influence the composition and quality of pigs reared out-of-doors. A number of studies reported that organic pork contained a higher content of unsaturated fatty acid (Danielsen, Hansen, Møller, Bejrholm, & Nielsen, 2000; Hansen et al., 2006; Nilzén et al., 2001). In the Korean native black pigs, Kim et al. (2009), found higher levels of C18:2n6, C20:3n6, and C22:4n6 in pigs produced organically ($p < 0.05$) and lower levels of C14:0, C16:0, C16:1n7, C18:1n9, C20:1n9, and C20:4n6 than in conventionally produced pigs ($p < 0.05$). This was supported by the findings of Hansen et al. (2006). In organically produced pork meat, the proportion of SFA and MUFA was significantly lower than in conventional pork meat, while unsaturated fatty acid (USFA) and PUFA were significantly higher. The higher content of PUFA in organically produced pigs may be not only the result of the different feed, but may also be a consequence of a higher percentage of lean meat (Hansen et al., 2006). Högberg, Pickova, Andersson, and Lundström (2003), observed that the fatty acid composition varies substantially between the organic and conventional feed. The conventional feed had a higher SFA, MUFA, and PUFA. These differences consisted in higher levels of n-6 and n-3 PUFA in the neutral fraction of intramuscular fat and higher levels of n-3 PUFA in the polar lipids of the conventional pigs compared with organic pigs.

In rabbit meat, the main fatty acids are palmitic, linoleic, and oleic acid (Cambero, de la Hoz, Sanz, & Ordóñez, 1991; Högberg et al., 2003; Ramírez et al., 2005). Pla, Hernández, Ariño, Ramírez, and Díaz (2007) observed that the meat of organic rabbits is significantly poorer in MUFA and richer in PUFA than that of conventional rabbits. However, a real comparison between organic and conventionally produced meat is difficult, because different breeds are used (Kouba, 2003) therefore, the detected differences can be explained by the production system, mainly due to the diet and age at slaughter. Cambero et al. (1991) comparing rabbits fed different diets and slaughtered at different ages, reported that it is difficult to establish a clear relationship between the fatty acid content in rabbit meat and age, sex, diet, or breed.

Organic chicken breasts and thighs had significantly greater percentages of PUFA, including n-3 and n-6 FA, compared with conventional chickens (Revilla et al., 2008). The same results were reported by Courtney et al. (2015) except that they found a lower n-3 FA content in organic chicken meat than in conventional meat. Chicken meat is a rich source of cis-MUFA; however, organic meat contained less than conventional meat. The lower total n-3 PUFA concentration in organic meat is due to lower 18:3 n-3; whereas organic meat contains more EPA and DHA than conventional meat (Courtney et al., 2015). Bianchi et al. (2007), Fanatico, Pillai, Emmert, and Owens (2007) and Ponte et al. (2008) showed that genetics, production methods, and season influence the meat quality of broilers. Finally, it is clear that the farming method affects both nutritional and sensory characteristics of livestock products. However, also factors such as the age, the breed of the animal, and the season can affect the overall meat quality. Moreover, the storage, transportation, and preparation of the foodstuffs may have an effect on the quality of meat products (Dangour et al., 2009).

Fish: In organic aquaculture the research primarily regards organic feed and fish nutrition; differences in feed and nutrition compared to conventional systems lead to differences in the quality of the fish (Mente, Karalazos, Karapanagiotidis, & Pita, 2011). Moreover, the nutrition of fish accounts for over 50% of the variable operating costs (Rana, Siriwardena, & Hasan, 2009). In conventional aquaculture diet formulations include vitamins and minerals, carotenoids (naturals and/or synthetics), and other pigments (astaxanthin and canthaxantin) responsible for the skin and flesh color of the fish; moreover, the use of antibiotics and immunostimulants is permitted. Also in an organic system, either the use of synthetic vitamins identical to natural vitamins, or the use of pigments from organic or natural sources, is allowed. However, with regard to antibiotics, the European Union allows a maximum of two annual treatments. However, the use of alternative treatments to antibiotics is recommended, such us natural substances in homeopathic dilutions, plant extracts, minerals, natural immunostimulants, and probiotics (EU, 2009).

Several studies showed that the rearing system and feeding regimes affect the flesh quality, the fatty acid profile, and the appearance of fish (Grigorakis, 2007; Poli et al., 2001; Xiccato, Trocino, Tulli, & Tibaldi, 2004). Also Trocino et al. (2012) investigated the influence of different rearing systems (organic or conventional) on the quality of sea bass (*Dicentrarchus labrax*). The authors reported that the rearing system does not affect the texture of the fish; however, they found a correlation between the size of the fish and its characteristics; firmness of the sea bass increased with size. Also the color was affected by the size of the fish; in fact, the skin and the fillets were darker, the red index of the skin had higher values and the yellow index of fillet increased in medium-sized sea bass. The differences in color may be due to differences in moisture content between small and medium-sized sea bass. The most significant difference between organic and conventional bred fish was observed in their fatty acid composition. The fish from organic farms had a higher content of n-3 PUFAs compared to the fish from conventional farms. The high content of PUFAs was due to the composition and fatty acid profile of their diet. The concentration of n-3 PUFAs was higher in the organic diet than that conventional diet. The organic diet was supplemented with herring oil characterized by a high level of ecosanoic acid, cetoleic acid, and a high content of n-3 PUFAs. Costa, Menesatti, Rambaldi, Argenti, and Bianchini (2013), investigated color differences in European sea bass reared under organic protocols. The authors found a color difference between conventional and organic fish; however, further investigations are required on several fish species to demonstrate that there is a real difference in the color between conventional and organic animals. In such cases, the colorimetric analyses can be used to discriminate the fish produced under different farming protocols (conventional or organic). From the different data analyzed it emerged that the fatty acid composition of the fish is affected by the feeding. Specifically, the fish from organic farms have a higher content of PUFAs than fish from conventional farms. However, other aspects such as color and texture of the fish flesh seem to be more influenced by the physiology of the animal rather than the farming system.

Eggs: In poultry production organic farmers adhere to strict rules regarding stock density, access to outdoor pens, animal feed which must be formulated using only organic raw materials. These rules may lead to some differences between eggs obtained from organic or conventional farmers, as showed in Minelli, Sirri, Folegatti, Meluzzi, and Franchini (2007) examined the characteristics of organic eggs compared to conventional eggs. From this study, it emerged that organic eggs are significantly lighter ($p < 0.01$) than conventional eggs with a weight of 64.4 and 66.2 g, respectively. Also the yolk/albumen ratio is significantly lower ($p < 0.01$) in the organic product compared to conventional eggs. Moreover, it was found that the resistance of the eggshell to breakage is higher in conventional than organic eggs ($p < 0.01$), confirming the findings reported by Brand, Parmentier, and Kemp (2004). On the contrary, Hughes, Dun, and McCorquodale (1985) observed a higher thickness and better breaking strength in eggshell of laying hens kept in outside pens but fed with conventional diets. Furthermore, in conventional eggs Minelli et al. (2007) observed that the Haugh index is lower in conventional than organic eggs ($p < 0.01$), probably due to the higher concentration of ammonia in conventional systems which influences albumen pH and its consistency. The yolk of organic eggs showed a lower pigmentation than conventional products, due to the exclusion in organic diets of synthetic pigments ($p < 0.01$). With regard to the chemical composition of organic yolk, a significantly higher content of cholesterol and proteins was found ($p < 0.01$) van Ruth, Alewijn, Rogers, Newton-Smith, and Tena (2011) suggested that the carotenoid content can be used to discriminate organic and conventional eggs. In fact, carotenoids are common colorants of egg yolk and their presence is influenced by the hens' feeding. In the study the yolks of the organic eggs were subjected to carotenoid fingerprint analysis. It was found that organic eggs contained a greater quantity of lutein and zeaxanthin compared to free range and barn eggs. Lutein and zeaxanthin are important antioxidant compounds, representing about 85% of all carotenoids. These results confirm the findings of Breithaupt, Weller and Grashorn (Breithaupt, Weller, & Grashorn, 2003) which revealed a higher lutein concentration in organic eggs compared to conventional eggs. In conclusion, as a result of different diets, organic eggs are lighter, less pigmented, with a lower yolk/albumen ratio but also more fragile than conventional eggs. However, the number of studies concerning eggs is limited, so it is necessary to conduct further studies.

CONCLUSIONS

In all animal foods, some differences between organic and conventional were observed. Existing data is conflicting, even though differences can often be associated with breeds favored for use in organic vs. conventional production systems. Sometimes these differences affected the appearance of foods (the color, the texture, etc.); other times the nutritional value of the product, particularly the fatty acid content, was affected. The different composition of fatty acids found repeatedly in organic products is certainly an advantage for the consumer's health. In fact, the polyunsaturated fatty acids found in greater concentrations in organic foods are associated with the prevention of various diseases. Therefore, the consumer would also benefit from the fatty acid composition of organic food. However, as reported by almost all the researchers, other aspects must be considered, such as race, age, the season, before starting with absolute certainty that these differences are the consequence of the farming system alone. Further investigations are necessary to understand more clearly the role of "organic effect" on animal foods. Regardless of the scientific evidence, consumers perceive organic foods as more nutritious and safer than conventional food, so the consumer preference is for organic foods.

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