

Centre for **Food Innovation**

a **fresh** perspective on food



The benefits of consuming goat's milk

Executive summary

In recent years, cow's milk and its derived products have suffered poor public perception. People believe it to be high in fat and energy, with consequent negative health effects. In addition, heightened awareness of intolerant and allergic symptoms arising from cow's milk consumption has led those affected to look for alternatives.

Milk has been part of our staple diet since the agricultural revolution, so eliminating its consumption has nutritional consequences. Milk supplies an economical source of nutrients and confers numerous health benefits: it plays a critical role in nutrition and health. Avoidance of cow's milk may not be the only option for those who experience side effects to it. Goat's milk, with its unique composition, could be a valuable alternative.

A number of recent scientific studies have examined differences between cow's and goat's milk. Disparities in their fat, protein and sugar composition may explain why an increasing number of goat's milk consumers report significant health benefits including improved digestion and asthma and reduced catarrh and eczema.

Contemporary issues related to cow's milk consumption

Despite the numerous health benefits that cow's milk and cow's milk products can offer, an increasing number of people are seeking alternatives¹. Some do not consume cow's milk because they believe it can have negative health effects. Public health messages highlight the issues associated with consuming too much fat and saturated fat. Whole milk contains 3.9g fat and 2.5g saturated fat per 100g serving, but a wide variety of lower fat milk and milk products are available². There are also many people who completely avoid cow's milk due to the negative side effects they experience³. These undesirable side effects fall under the category of food hypersensitivity. Food hypersensitivity includes food allergy and food intolerance.

A food allergy is an exaggerated immune response triggered by a specific food. In normal circumstances, the immune system defends the body against harmful substances, such as bacteria and viruses⁴. In some people, an immune response can be triggered by a substance that is harmless, such as a specific food. In the case of a food allergy, the body mistakenly recognises part of a food (the allergen) as a harmful substance and responds by making allergy-producing immunoglobulin E antibodies and histamine⁴. A reaction can occur when just a small amount of the allergen is consumed and the response can range from minor to very severe. Although treatments to overcome allergic reactions are being developed, food allergy is generally managed by avoiding the problem food.

Cow's milk is the most commonly offending food in gastrointestinal and cutaneous manifestations; around 2.5% of infants experience cow's milk allergy (CMA) in the first years of life⁵. The major risk factors for CMA are a positive family history of allergy and early exposure to cow's milk proteins⁵. CMA is a complex disorder because numerous cow's milk proteins are potent allergens and most contain multiple allergenic epitopes (the part of the allergen that is recognized by the immune system). There is considerable heterogeneity amongst allergic individuals

for the particular proteins and epitopes to which they react, and to further complicate matters, allergic reactions to cow's milk are driven by more than one immunological mechanism⁶. The complexity of CMA has led to misconceptions about this disorder, including confusion with lactose intolerance and frequent self-misdiagnosis: the prevalence of self-diagnosed CMA is 10-fold higher than the clinically proven incidence, suggesting a sizable population may be unnecessarily avoiding milk products⁵.

Food intolerance itself can be classified in two ways; the type which arises from a deficiency in certain digestive enzymes (for example, those with lactose intolerance lack the enzyme lactase) and the type where symptoms occur in response to food but there is no clear medically diagnosable cause. Typical reactions in this category include eczema, catarrh, indigestion, abdominal pains, headaches and sinus or nasal problems⁷. In the UK, 20% of people believe themselves to have specific food intolerance⁷. In particular, an increasing number of children are reporting digestive difficulties or eczema linked to cow's milk consumption¹.

Intolerance to cow's milk can be difficult to manage and the sufferer may choose to completely eliminate it from their diet. This often occurs without the support of a medical practitioner; complete avoidance of cow's milk can mean a nutritionally balanced diet is not achieved and the many health benefits provided by this food become unavailable². Those who completely avoid cow's milk however, may benefit from consumption of alternatives, such as goat's milk.

The health benefits of consuming milk

Milk is a naturally valuable source of vitamins and minerals such as vitamin A, vitamin B6, vitamin B12, thiamin, riboflavin, niacin, calcium, phosphorus, magnesium, zinc and potassium⁸. Some milk, like goat's milk, naturally contains these nutrients. Other milks such as soya, rice and oat milks do not and so are often fortified with vitamins and minerals. There is continued debate as to whether purified nutrients that are added to food confer the same health benefits as whole foods. There is increasing evidence to suggest that consuming whole foods has additive and synergistic health benefits⁹. In addition to the essential nutrients it contains, other health benefits of consuming milk are widely recognised (Table 1). As such, the Food Standards Agency recommends that milk and other dairy products should be consumed daily as part of a healthy balanced diet².

Table 1:

The purported health benefits of milk consumption
A rich supply of nutrients, vitamins and minerals
Optimal bone health
Improved blood cholesterol
Protection against cardiovascular disease
Reduced colon cancer risk
Reduced blood pressure
Body weight regulation
Protection of tooth enamel
Reduced risk of type 2 diabetes

The association between milk consumption and bone health has long been established¹⁰. Milk consumption promotes bone health due to the calcium it contains; one 200ml glass of goat's milk provides 29% of the UK dietary reference value of calcium for an adult¹⁰. Optimal calcium intake is critical in achieving optimal bone mass. Not achieving optimal bone mass is a risk factor for osteoporosis¹¹. The association between milk consumption and bone health was demonstrated in a study in New Zealand¹². The fracture risk in children was 34.8% in those that avoided

milk compared to 13% who consumed it. A recent UK National Health and Examination survey suggested it was not possible for adolescents to achieve calcium requirements whilst meeting other nutrient demands when consuming a dairy free diet¹³.

The fats or fatty acids within milk are often a cause for concern. However, not all fats are the same, so whilst some have negative health implications, consumption of others can have positive health benefits. One fatty acid present within milk is conjugated linoleic acid (CLA). CLA has been shown to have beneficial health effects; it may protect against cancer, improve blood cholesterol and protect against coronary heart disease¹⁴.

Dairy consumption itself has been associated with reduced colon cancer risk and a reduction in inflammatory markers that are important risk factors for cardiovascular disease^{15, 16}. Research has shown that low fat dairy products reduce high blood pressure^{17, 18}. Studies examining the DASH (Dietary Approach to Stop Hypertension) diet, which is rich in fruit and vegetables and low fat dairy products, showed it could reduce blood pressure. 50% of the reduction in blood pressure was attributed to the consumption of dairy foods^{17, 18}. The calcium within milk, as well as the bioactive peptides formed from the milk proteins, help to modulate blood pressure¹⁷.

Despite public opinion that consumption of dairy products contributes to weight gain, research has shown that dairy products, and in particular calcium, play a role in body weight regulation. In the CARDIA (Coronary Artery Risk Development In young Adults) study, low dairy consumption was associated with increased obesity¹⁹. In a study comparing weight loss following different diets, greater weight loss was observed in those following a high dairy diet compared to a low dairy diet; in particular abdominal fat was lost²⁰.

Goat's milk

Whilst goat's milk consumption currently accounts for a small but growing percentage of the UK dairy market, it is the milk of choice in most of the world²¹. Nutritionally, it is comparable to cow's milk as it contains similar levels of calcium, potassium, phosphorus and many other nutrients which confer health benefits⁸. Compared to soya milk and other dairy alternatives, goat's milk contains much more naturally occurring calcium, potassium, phosphorus and vitamin A⁸. It also, compared to cow's milk, contains higher levels of six out of the ten essential amino acids²¹. Goat's milk contains less riboflavin, vitamin B12, folate and pantothenate than cow's milk but those consuming a nutritionally balanced diet would not be expected to be deficient in these nutrients⁸. Goat's milk exceeds cow's milk in its content of monounsaturated and polyunsaturated fatty acids and medium chain triglycerides, all of which are known to be beneficial for human health, in particular, prevention of cardiovascular conditions²².

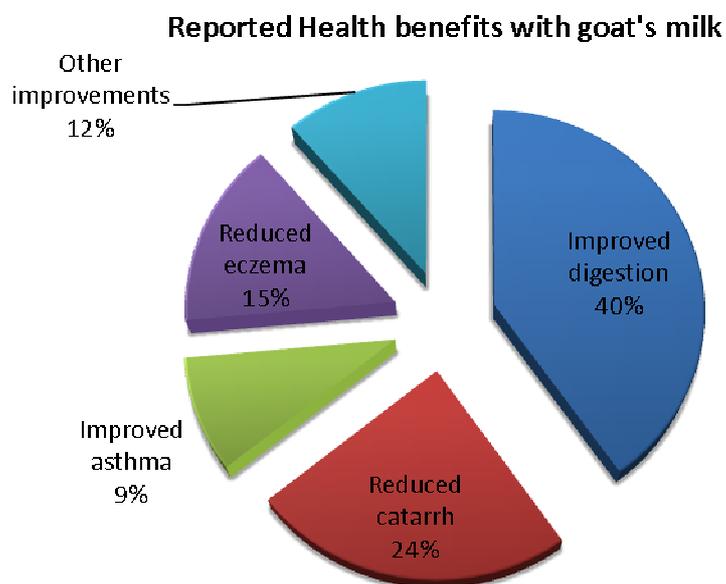
Due the significant nutritional advantages of goat's milk, it is widely used to feed more starving and malnourished people in the developing world than cow's milk²². In a study conducted in Madagascar, researchers fed thirty hospitalized and undernourished children either goat's or cow's milk in addition to their recovery diet. Children randomised to receive the goat's milk demonstrated significantly increased body weight gain and improved fat absorption compared to those fed cow's milk²³. Animal studies have provided significant evidence to suggest that, in comparison to cow's milk, goat's milk improves calcium and phosphorous metabolism, zinc status and bioavailability of iron in those with anaemia^{24,25,26}.

There is mounting evidence from consumer observations that suggests those who cannot tolerate cow's milk can tolerate goat's milk. An important four year survey of milk drinkers revealed that 66.8% of those consuming goat's milk did so for medical reasons; in particular to overcome intolerance to cow's milk²⁷. 71.3% of those who consumed goat's milk stated that they received significant health benefits from the

product. These benefits included; improved digestion (in particular irritable bowel type symptoms), reduced catarrh, improved asthma and reduced eczema (Figure 1).

The suitability of goat's milk as a replacement for cow's milk for those who experience intolerant type symptoms has not yet been tested in a comprehensive scientific study. Further studies to examine the hypoallergenic and therapeutic significance of goat's milk are clearly warranted.

Figure 1:



How is goat's milk different to cow's milk?

A number of recent scientific studies have examined differences between cow's and goat's milk^{28, 29, 30, 31, 32}. Differences in their fat, protein and sugar compositions have been observed and these differences may explain why people report goat's milk is easier to digest and less likely to cause intolerant type symptoms.

The fats within goat's milk are smaller in size than in cow's milk and this can make goat's milk easier to digest²⁸. In addition, goat's milk consumption by animals has been shown to result in lower cholesterol²⁹. The unique composition of the type of fats found in goat's milk have been studied, and certain trans fats, the consumption of which are known to be a risk factor for heart disease, were found in significantly lower proportions in goat compared to cow's milk³⁰.

Cow's milk is one of the most common causes of food allergic reactions in children. The majority of children out-grow their allergy by the time they reach four years of age but some retain the allergy for life²¹. Cow's milk allergy can occur in adults, presenting as immediate allergic reactions or eczema. Cow's milk contains more than 20 proteins that can cause allergic reactions. The major proteins that people are allergic to are called lactoglobulins and caesins. Goat's milk contains a similar amount of lactoglobulins as cow's milk but less of a particular casein known as α_{s1} -casein²⁸. Goat's milk, like human milk, has a lower ratio of casein because the amounts of soluble proteins are higher than those found in cow and sheep milk³¹. This unique property allows the milk to form a soft, as oppose to hard, curd during digestion. Those who are experiencing intolerance to casein may therefore find they have reduced symptoms when consuming goat's milk.

Finally, the non-digestible sugars or oligosaccharides within milk can act as a prebiotic. Prebiotics help maintain the health of the gastrointestinal tract by encouraging the growth of beneficial gut bacteria and preventing the growth of

detrimental bacteria. The oligosaccharides found in goat's milk have been shown to reduce intestinal inflammation and aid recovery from colitis in animals³².

Lactose intolerance is a particular barrier to the consumption of dairy and can lead to avoidance. Evidence now suggests however, that complete dairy avoidance may not be necessary; lactose intolerant people can tolerate one to two servings of milk when served in divided doses with meals^{33, 34}. By consuming this level of goat's milk, the recommended daily intake of calcium could be achieved.

Conclusion

This report highlights a number of notable areas surrounding goat's milk and its role in nutrition, although further research is clearly warranted to provide more solid conclusions.

Despite negative public perception of milk and milk products, its consumption has significant health benefits. Goat's milk and its products play significant roles in human nutrition. Due to its highly nutritious composition, goat's milk and dairy products such as yoghurts, cheeses and powders are chosen to feed more starving and malnourished people in the developing world than respective cow products²¹. Many milk alternatives such as soya, oat and rice-based milks are fortified with essential vitamins and minerals. The ongoing debate about whether these additives offer the same health benefits highlights the need for additional research in this area.

Goats differ from cows in terms of their anatomy, physiology and product biochemistry. These differences support the contention that goat's milk offers many unique qualities for human nutrition. However the authors recommend a comprehensive scientific study to fully examine the hypoallergenic and therapeutic significance of goat's milk.

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Appendix A: About the research team

Charlotte Harden, lead researcher

Charlotte Harden works as part of the Centre for Food Innovation academic group at Sheffield Hallam University and the Molecular Gastroenterology Research Group at the University of Sheffield.

She is a registered nutritionist and has written a number of high profile reports for leading food suppliers and trade associations on the nutritional, sensory and functional attributes of food and has disseminated her findings worldwide. Her research has appeared in respected journals such as Nutrition Research and the Journal of Functional Foods as well as being covered by mainstream media such as the Daily Mail.

Sheffield Hallam University's Centre for Food Innovation

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