

Nutritional qualities of meat are affected by production methods



My Farm Shop Research Program

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"You are what you eat eats." Quotation from Michael Pollan

Abstract

Meat is a natural and important component of the Australian diet, for both cultural and nutritional reasons. But it is increasingly associated with poor health, both of people and the environment. Why does the conflict and confusion exist? Is meat good or bad for you? Studies of meat nutritive characteristics find that differences in livestock production practices affect the nutritive qualities of meat as well as the health and sustainability of the farming landscape. This article outlines the emerging scientific understanding of these relationships and describes the livestock management models that produce the healthiest meat. It finds that the healthiest meats are produced from animals that are locally adapted to their landscape, have a healthy social system, and access to a diverse, natural diet. Farmers applying these animal management principles are also improving the health of their landscapes. Certification for such holistic production methods are under development to guide consumers towards meat that is not only healthy to eat, but that sustains healthy landscapes as well.

Meat is a natural part of the human diet

Humans evolved as meat eaters, hunting wild animals and game to supplement the plant and insect forages they gathered. In contemporary society, meat (red meat plus poultry and fish) is a major source (almost half of dietary requirements) of long-chain Omega 3 Polyunsaturated Fatty Acids (n-3 PUFA) for Australians (Howe et al., 2006) as well as many other important nutrients. As a consequence of this and the Australian cultural preference for meat-eating, meat has a significant effect on the health of our population. Meat, particularly from ruminants (for example cattle, sheep and goats) can be a particularly important source of important nutritive elements including critical fatty acids: docosahexaenoic acid (DHA), a particular isomer of Conjugated Linoleic Acid (CLA) and n-3 PUFA (Mulvihill, 2001, Howe et al., 2007, Moloney et al., 2008, Fraser et al., 2009). Beef produced from healthy grasslands is as high in n-3 PUFA as white fleshed fish (Ponnampalam et al., 2006). In addition to being associated with lower risk of cancer and cardio vascular disease, the presence of these nutrients are thought to aid the

effectiveness of cancer treatment (see for example Belury, 2002, Bartsch, 1999, Eduard Escrich, 2001, Evans, 2009, Roynette, 2004, Yaqoob, 2006). Unbalanced ratios or high proportions of the less-healthy form of these nutrients are increasingly associated with non-communicable disease and ill health including cancer and cardiovascular disease.

Meat that contains these vital nutrients in the right forms and ratios should be an important part of a naturally healthy diet. But some studies have found that a diet high in red meat is a significant contributor to ill health including cancer (AICR, 2007, Zhang, 2010, Council, 2003). So why the conflicting, confusing findings? Is meat good or bad for you?

How the animal lives affects the nutritive characteristics of the meat

The wild meats or meats produced from natural grassland environments are typically very low in total fat (particularly intramuscular fat) and have a low (almost 1:1) ratio of Omega 6 (n-6) to n-3 PUFA (Simopoulos, 2006, Mann, 2000). They were

a key part of the diet throughout human history until recently. By the 21st century, all pork and poultry, the dominant portion of beef and a small but increasing portion of lamb available from Australian supermarkets and restaurants is produced from Confined Animal Feeding Operations (CAFO or Feedlots) (ALFA, 2013). With the introduction of CAFO agriculture and the development of higher yielding, more profitable and efficient livestock genetics and production methods, there have been significant changes to the characteristics of meat, particularly to the fatty acids now known to be important to human health.

Livestock production methods significantly affect the nutritive characteristics of meat. Animals grazed on natural grasslands that are rich with diverse species of perennial grasses have meat that is much closer to the nutritive characteristics associated with good health than the modern high yielding breeds produced in intensive confinement operations (see for example Pickett, 2012). The characteristics of meat produced from natural, free-range environments with high dietary quality and diversity have significantly lower total intramuscular fat, higher Vitamin E, and lower Omega 6 to Omega 3 ratios (Ponnampalam et al., 2012, Ådnøy et al., 2005, Fraser et al., 2009, Panea, 2011, Ponnampalam, 2006, Wood et al., 2004, Decker, 2010). Animals selectively bred for high yielding, fast-growth characteristics and their suitability for CAFO produce meat with nutritive characteristics associated with poor health (Pickett, 2012). In particular, the feeding of grain to ruminants causes meat to quickly change within weeks to less healthy nutritive characteristics including high total fat, high Omega 6 to Omega 3 ratios, low amounts of the beneficial isomer of CLA and low Vitamin E. (Ponnampalam et al., 2012, Ponnampalam et al., 2006, Pickett, 2012, Mir et al., 2004).

The changes in the nutritive characteristics of the meat directly derive from the diet and lifestyle of the animals. Grain is not a natural part of the diet for ruminants and if fed in large quantities it significantly alters the composition and

biochemistry of their gut flora and fauna which in turn affects their metabolism.

The evidence is strengthening that the risk factors for cancer and cardiovascular disease in humans are changed by the nutritive characteristics of meat and milk (Coates et al., 2009, Tsiplakou et al., 2008, McGuire and McGuire, 2000). The evidence that production methods affect the nutritive characteristics of meat may explain the apparent conflict between perceptions of meat as a healthy food and meat as a contributor to disease. In developing the conclusions that red meat and cancer are strongly associated, reports such as Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective. Washington DC: World Cancer Research Fund/American Institute for Cancer Research (AICR, 2007) would have had difficulty or been unable to separate out meat by production methods (and may not have perceived the need to). To our knowledge, no studies have yet attempted to examine the relationship between production method of livestock and population health of humans.

Supplementation may not substitute for healthy food

In an effort to correct the nutritional deficiencies perceived to be contributing to ill health, the health industry is increasingly making recommendations to patients and clients for artificial supplementation. Livestock producers are also responding. CAFO livestock producers are developing methods to 'fortify' the balanced rations given to livestock in CAFOs (Coates et al., 2009, Moloney, 2008, Zhang, 2010, Decker, 2010, Mir et al., 2004). There is evidence to suggest that artificial supplementation of animal feeds change the fatty acid characteristics of the meat (Moloney et al., 2008) and this appears to be effective in changing the impacts on the currently known human health risk factors (Coates et al., 2009, Mann, 2000).

But artificial supplementation as a safe and effective way for replacing natural functions of metabolism needs to be treated with caution until

more knowledge is gained about the potential for negative side-effects. Studies of direct supplementation of human diets with particular nutrients suggest supplements can sometimes be beneficial to health (Biondo, 2008, Chapkin, 2008) but sometimes be detrimental or have no effect (Brouwer, 2008, Mann, 1999, Martí-Carvajal AJ, 2013, Wahle et al., 2004). The conflict in findings suggests that there is more to be learned about the interactions of nutrients, genes and lifestyle. Expectations of a single element fix to correct problems within a complex and dynamic system are usually deemed to be unrealistic.

We know from animal studies that prescriptions of diets or supply of rations balanced to meet the 'average requirement' may not meet the requirement of the individual (Villalba et al., 2008). These studies indicate that lack of ability for individual food choices to match the dietary requirements of an individual reduce animal health and increase stress (Manteca, 2008). Although the mechanism for this is yet unknown, better health outcomes seem to be associated with a 'teamwork effect' of nutrient combinations found in natural foods rather than a particular key nutrient isolated for supplementation (Temple and Kaiser Gladwin, 2003, Williamson, 2001).

The combination of these mechanisms suggests that the health of animals in CAFO may be compromised by the 'average' diet not meeting their individual nutritional needs. It also suggests that artificial supplementation of a nutrient thought to be significant may have unintended negative effects. Functions performed by the combinations of the nutrients found in foods that may not be able to be substituted by isolated compounds and health effects may not be able to be isolated from lifestyle.

We know how healthy meat is produced

Animal health can be significantly improved by management via key mechanisms; local adaptation to the landscape they live in; the development of foraging expertise and access to a wide diversity (species and age structure) of foods. Herbivores

such as cattle and sheep require mainly grasses and forbs, but will naturally include small amounts of trees and shrubs in their diets. Omnivores such as pigs and chickens can utilise grubs, insects and soil organisms such as worms in addition to grains and plants. As our understanding of epigenetics¹ increases, we are learning that the physiology of livestock changes in response to the landscape (food and climate) it is born and raised in; animals become locally adapted to their environments (Chadwick et al., 2009, Simitzis et al., 2008) and moving them to another landscape or into CAFO can negatively affect their health (Manteca, 2008).

It is now known that animals (domestic and wild) learn from their mothers and herd mates (Provenza, 2006) and via post-ingestive feedback (Villalba and Provenza, 1999, Villalba, 1997) to forage expertly to eat a range of foods in the combinations and sequences that supply required nutrients or self-medicate for toxicities (see for example Lyman et al., 2011, Owens et al., 2012, Villalba and Landau, 2012) or disease (including parasites) (Provenza et al., 2003, Villalba et al., 2006, Metcalfe and Alonso-Alvarez, 2010, Simone-Finstrom and Spivak, 2012, Provenza, 2010). Consequently, producers with grazing practices that create agricultural landscapes with high biodiversity and species richness and use techniques of stockmanship that foster local adaptation and foraging expertise in a herd can be expected to also produce the healthiest animals and meats for human consumption (Provenza et al., 2003, Villalba and Provenza, 2009). That these mechanisms also involve better environmental performance including higher biodiversity and soil health (Ampt, 2011) will come as no surprise to the natural health community.

Producers of healthy meat can be identified

Such producers exist in Australia, but locating them with confidence is currently difficult due to lack of regulatory mechanisms including

¹ Epigenetics is the study of heritable changes in gene activity that are not caused by changes in the DNA sequence.

certification methods and appropriate labelling. They can be, but are not necessarily found under certification standards such as Organic or Biodynamic or via Farmers' markets. Organic and Biodynamic certification standards proscribe and prescribe certain inputs and activities and do not yet incorporate the body of knowledge described above or inspect for the characteristics of these production systems. Farmers' markets focus on local direct supply and are also not a certification method for healthy livestock or healthy landscapes.

Producers of healthy livestock from healthy landscapes can be identified and objectively assessed. They have a highly functional landscape that naturally retains and cycles resources such as water and nutrients. Their grasslands have high species richness of high quality perennial grasses, forbs and herbs and healthy distribution of plant ages. Their livestock have plentiful shade and shelter from shrubs and trees and are locally bred, born and raised animals. Young animals are late or self-weaned and the herd is calm and confident during stock moves.

Conclusion

Methods of livestock production significantly affect the nutritive qualities of meat for human consumption. Dominant methods of production (CAFO) may be contributing to population level ill health through the consumption of meat, but this is a factor of the production method and not the inherent properties of meat. Production methods exist that provide the naturally beneficial nutritive characteristics of meat (as well as the landscape health and biodiversity). However, current certification methods (such as Organic and Biodynamic) do not yet distinguish the critical characteristics of these systems to allow informed choice. Research and development of techniques for healthy (and sustainable) meat production are in progress and being trialled by a My Farm Shop, a Canberra-based social enterprise.

My Farm Shop

My Farm Shop (www.myfarmshop.com.au) is a leader in the supply of healthy, ethical and sustainable meat to Australians. We supply our customers with meat that is tasty, tender and rich in natural nutrients. To do this, we have created a supply chain for meat that makes sure that the livestock are managed for optimal natural health. We use scientifically proven methods to assess our producers and ensure they are creating agricultural landscapes with high biodiversity and species richness maximising local adaptation and foraging expertise in a landscape. (Contact us for more details about these.) These certification methods are leading industry and community in developing emerging criteria for sustainable food production. Under this program it is developing and testing methods of certifying producers' achievement of key landscape function, grassland biodiversity and animal husbandry standards. It is also developing and testing methods of reporting on these factors as part of its sustainable accounting and sourcing strategy.



My Farm Shop
Healthy, ethical, sustainable meat

You order online
&
We deliver

My Farm Shop is a social enterprise supporting consumers, farmers and distributors to assure healthy, resourceful Australian landscapes and communities for current and future generations.

Scientifically validated

My Farm Shop uses scientifically validated techniques for assessing the healthy functioning of a landscape for optimal animal health and sustainability of the agricultural ecosystem.

www.myfarmshop.com.au

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