



This month's Digest is all about the nutritional value of dairy protein in yogurt.

# What added value does yogurt bring to dairy protein?

## Quality matters

We've heard since school days that protein is needed for growth and development. But there's more to this macronutrient than meets the eye. Protein is an essential nutrient that plays a vital role not only in growth, repair and development, but also in immunity, and the health of bones, muscle, skin, and nerves <sup>(1)</sup>.

Amino acids are the building blocks of protein. Of the 20 or so used by the body, 9 are considered "essential" or "indispensable" – those that the human body can't manufacture on its own – and must be obtained from the diet. High quality proteins contain all 9 essential amino acids in the proportions that cells need for protein synthesis. In contrast, lower quality proteins are missing or low in one or more essential amino acids – referred to as 'limiting amino acids'. The digestibility of a protein is also an important aspect of its quality <sup>(2) (3)</sup>.

Protein quality measurement is an assessment of the ability of a dietary protein source to fulfill our body's requirement for indispensable (or essential) amino acids. Not all proteins are equal – quality can make a difference. The better the score, the better the protein meets our body's needs.

There are several methods for rating protein quality. Currently, the most widely used method is the Protein Digestibility-Corrected Amino Acid Score (PDCAAS), which rates proteins from 0 to 1.0 (1 represents the highest). With this method, whole wheat has a score of 0.40, and cow's milk 1.0 <sup>(5)</sup>.

Recently the Food & Agriculture Organisation (FAO) recommended using the Digestible Indispensable Amino Acid Score (DIAAS) because it more accurately measures protein quality and the body's ability to absorb essential/indispensable amino acids e.g. it can measure digestibility of individual amino acids rather than the crude protein levels measured by PDCAAS <sup>(5)</sup>.

$\frac{\text{Amino Acid in protein}}{\text{Amino Acid requirement}} \times \text{Protein digestibility} = \text{PDCAAS score truncated to max.1.0}$	$\frac{\text{Amino Acid in protein}}{\text{Amino Acid requirement}} \times \text{Amino Acid digestibility} = \text{DIAAS score (no truncation)}$
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Figure 1: Methods for rating protein quality

**Milk protein**  
in yogurt score  
highly in both  
the methods  
currently available  
on assessing  
protein quality

A key difference is that unlike PDCAAS, DIAAS scores may be greater than 1.0 (or 100%) if the protein contains a relatively high content of indispensable amino acids e.g. milk powder has a DIAAS of 1.22, whey protein isolate of 1.25, milk protein concentrate of 1.31, soy protein isolate of 1.00, peas 0.64, and wheat 0.4<sup>(5)</sup>.

The high PDCAAS and DIAAS for milk indicates that dairy proteins are well digested and absorbed (good bioavailability), and its mix of amino acids (including all of the 9 essential amino acids), supports efficient protein synthesis. A DIAAS over 100% for an individual food (high protein quality food such as milk) also indicates its potential to complement the protein contribution of a food with a lower DIAAS value, namely a food such as cereal or vegetable protein, of lower protein quality and therefore with a 'limiting' amino acid<sup>(5)</sup>.

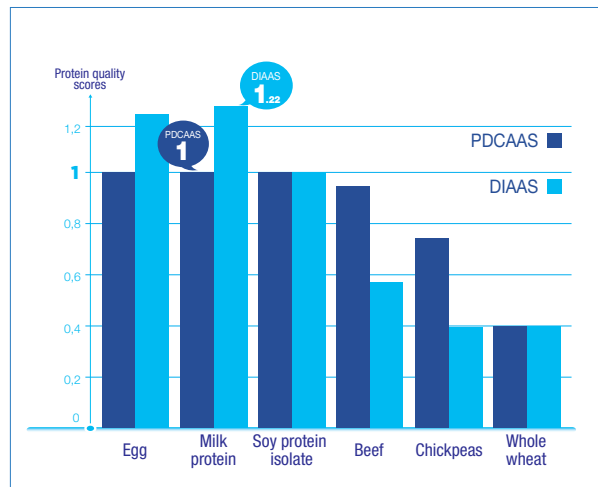
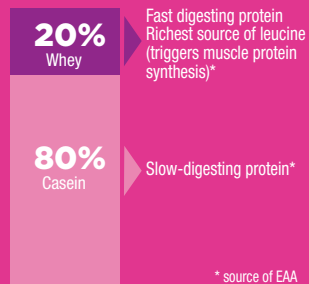


Figure 2: PDCAAS/DIAAS comparison<sup>(4) (5)</sup>

## Yogurt digestibility benefits

### Spotlight on casein and whey

Casein & whey protein are both excellent sources of all the essential amino acids (EAA), but they differ in one important aspect – whey is a fast-digesting protein and casein is a slow-digesting protein<sup>(6) (7) (8) (9)</sup>



\* source of EAA  
**PROTEIN CONSTITUENTS  
OF COW'S MILK**

### Protein in yogurt has higher digestibility

Milk and yogurt are excellent sources of high quality protein, which is roughly made up of 80% casein and 20% whey protein. The high nutritional value of milk proteins is well preserved during the fermentation process involved in yogurt production. The protein content of yogurt is generally higher than that of milk because of the addition of non-fat dry milk during production<sup>(10)</sup>.

Proteins in yogurt have been found to be more digestible than proteins in unfermented (standard) milk. Both the heat treatment and acid production involved in fermentation appear to start breaking down milk proteins, producing smaller, more easily digested forms of the milk protein casein, and releasing some free amino acids into yogurt<sup>(10)</sup>. Cultured yogurt also has a higher protein quality than the mix it is made from<sup>(10)</sup>.

### Yogurt Benefits for Lactose Intolerance

There appears to be a growing trend for people, particularly women, self-diagnosing lactose intolerance. Regardless of whether a diagnosis is correct or not, it is often wrongly assumed that sufferers cannot tolerate yogurt.

Lactose is a type of sugar found in milk. Lactose intolerance occurs when there isn't enough of the enzyme lactase available in the gut to digest lactose. This leads to undigested lactose passing into the large intestine where it can be fermented by the bacteria in the colon causing unpleasant symptoms, such as flatulence, diarrhoea and abdominal pain. As a result, people with lactose intolerance may avoid all dairy products; putting their intake of vital nutrients at risk.

Research has consistently shown that most people with lactose intolerance can better tolerate yogurt compared to standard/unfermented milks<sup>(11) (12) (13)</sup>, meaning that nutrient dense yogurt can still be included in the diet and people will have the health benefit of high quality protein from dairy. There appears to be a number of possible reasons for this including the activity of live bacteria in the yogurt<sup>(10) (14)</sup>.

#### MORE INFORMATION:

INFOGRAPHIC <http://yogurtinnutrition.com/wp-content/uploads/VF-Fiche-medecins-Lactose-v8.pdf>

PRACTICAL SHEET FOR HCP <http://yogurtinnutrition.com/wp-content/uploads/VF-Fiche-patients-Lactose-v6.pdf>

PRACTICAL SHEET FOR PATIENT <http://yogurtinnutrition.com/wp-content/uploads/Yini-infographie-3.pdf>

# Is dairy protein in the form of yogurt a more nutritious choice?

It's fair to say that we would probably be a healthier population if we ate more nutrient-rich foods. Nutrient density is typically described as a measure of the positive nutrients provided per calorie of food. Nutrient-dense food choices, therefore, provide a high proportion of positive nutrients relative to calories, helping people to meet their nutritional requirements without encouraging weight gain. Nutrient-dense foods are the opposite of "empty-calorie" foods <sup>(15)</sup>.

Energy density is the amount of energy (calories) per gram of food. Foods with a high water content tend to have a lower energy density e.g. vegetables, low fat yogurt, milk and fruit. Foods with a lower energy density provide fewer calories per gram or weight of food so more of the food can be eaten and still help to keep our calorie intake in check <sup>(15)</sup>.

A number of studies amongst different age and population groups <sup>(16)</sup><sup>(17)</sup> link better nutrient intakes, for example, of protein, calcium, magnesium, zinc, vitamin D and riboflavin, and higher overall diet quality with increased intake of dairy foods including yogurt.

People who choose more dairy foods, also tend to make other more nutrient-rich food choices <sup>(16)</sup>

Eating yogurt is a good marker of diet quality <sup>(17)</sup>. Compared to non-consumers, yogurt consumers:

- Were nearly twice as likely to have a healthier dietary pattern as non-consumers.
- Had higher potassium intakes and were less likely to have inadequate intakes of riboflavin, vitamin B12, calcium, magnesium, and zinc.

Nutrient profiling systems such as the SAIN/LIM system may help to identify foods of good nutritional quality. This system <sup>(15)</sup> is based on 2 independent scores :

- The SAIN (meaning healthy) is a score of nutritional adequacy based on the content in 5 nutrients : proteins, fiber, ascorbic acid, calcium, and iron + 4 potential optional nutrient when needed.
- The LIM score is the mean percentage of the maximal recommended values for 3 nutrients, the intakes of which should be limited in a healthy diet : saturated fats, added sugars and salt.

Finally a high SAIN score represents more nutrient-rich foods, whereas the LIM score represents the unhealthy aspects of the food.

Plain low fat yogurt has a good nutrient density with a low energy density

The authors of this system propose 4 classes of food that can be categorised according to this SAIN-LIM system:

- **Class 1:** High SAIN, low LIM foods, which are higher in nutrient density and lower in energy density, sugar, saturates and salt and are thus recommended for health
- **Class 2:** Low SAIN, low LIM foods that can be termed as "neutral"
- **Class 3:** High SAIN, high LIM foods that are recommended "from time to time" because they do offer nutritional benefits but in addition may be high in salt, sugar or saturated fats
- **Class 4:** Low SAIN, high LIM foods that are best eaten on occasions

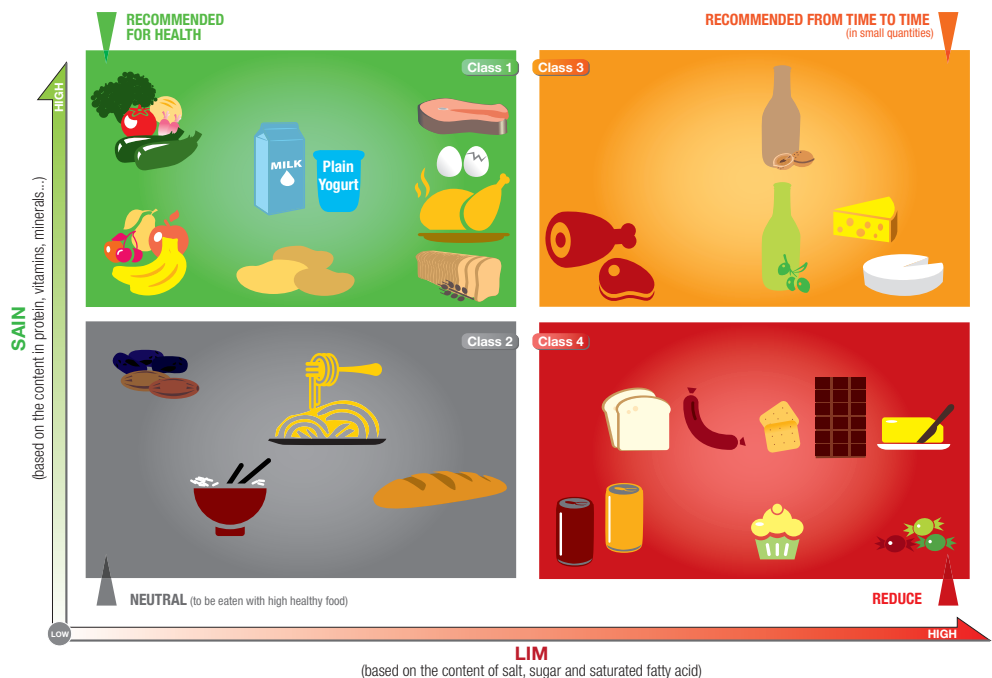


Figure 3: Classification of selected foods <sup>(15)</sup>

MORE INFORMATION: INFOGRAPHIC <http://yogurtinnutrition.com/wp-content/uploads/HCP-healthy-snack.pdf>

# Dairy protein: Why it is recommended worldwide?

Yogurt is a nutrient-rich food and, along with other dairy foods, helps to meet requirements for a range of nutrients especially calcium and protein

Dairy foods provide high quality protein wrapped up in a robust nutrient package, and a regular intake can be a marker for diet quality. Most countries recommend consumption of dairy products; and when amounts are specified, 2 or 3 servings per day are typically recommended<sup>(18)</sup>. Dietary guideline recommendations for dairy products are based partly on culture and availability, but the key reason is for meeting nutrient requirements<sup>(18)</sup>.

- For example, amongst US adults, the 2003-2006 National Health and Nutrition Examination Survey (NHANES) found that milk was the 4th highest ranked food source of protein, and the highest ranked food source of calcium (22.5%), vitamin D (45.1%), and potassium (9.6%)<sup>(19)</sup> <sup>(20)</sup>.
- In France, 125ml of natural yogurt provides, amongst other nutrients, 20% of calcium, 20% of vitamin B2, 11% of vitamin B12, 16% of phosphorus of an adult's recommended daily intakes<sup>(21)</sup>.

	125g Intake for a plain semi-skimmed yogurt	% DRV adult woman	% DRV child 7 to 9 years		125g Intake for a plain semi-skimmed yogurt	% DRV adult woman	% DRV child 7 to 9 years
Protein	4,0 g/100g	-	-	Vitamin B1	0,06 mg	6%	8%
Fat	1,0 g/100g	-	-	B2	0,31 mg	21%	24%
Carbohydrates	4,8 g/100g	-	-	B3	0,28 mg	3%	3%
Potassium	223 mg	-	-	B5	0,53 mg	11%	15%
Calcium	179 mg	20%	20%	B6	0,06 mg	4%	6%
Phosphore	124 mg	16%	21%	B9	31 µg	10%	16%
Magnesium	16 mg	4%	8%	B12	0,28 µg	11%	20%
Zinc	0,79 mg	8%	9%				

Table 1 : Yogurt Nutritional composition & contribution to requirements<sup>(21)</sup>

## IN CONCLUSION...

- Study after study points to the benefits of dairy protein in terms of quality and digestibility. Yogurt is a nutrient-rich food with high quality protein.
- Yogurt, and especially protein-rich yogurt, provides a convenient vehicle that contributes to a nutritionally balanced day.
- People who choose more dairy foods also appear to make other more nutrient rich food choices.
- Professionals and key influencers have an important role to play in helping the public to incorporate more dairy foods making yogurt one of them, in an aim to improve overall dietary patterns.

Look out for your next issue of Digest: Protein & Appetite Control

What did you think of Digest 1? Tweet us your feedback @YogurtNutrition !

**References :** 1. First Global Summit on the Health Effects of Yogurt. 2014, Am J Clin Nutr, p. 99(suppl):1203S. 2. Tome D. Criteria and markers for protein quality assessment - a review. Br J Nutr. 2012; 108 Suppl. 2: S222-9. 3. Boye J, Wijesinha-Bettoni R, Burlingame B. Protein quality evaluation twenty years after the introduction of the protein digestibility corrected amino acid score method. Br J Nutr. 2012; 108 Suppl. 2: S183-211. 4. Protein quality evaluation : report of the joint FAO/WHO expert consultation, FAO Food and Nutrition Paper No. 51, 1989 5. Protein quality evaluation in human nutrition. FAO Food and Nutrition Paper No. 92. 2013. <http://www.fao.org/ag/humannutrition/35978-02317b979a686a57aa4593304ffcf17f06.pdf>. 6. Moore DR, Robinson MJ, Fry JL, Tang JE, Glover EI, Wilkinson SB, Prior T, Tarnopolsky MA, Phillips SM. Ingested protein dose response of muscle and albumin protein synthesis after resistance exercise in young men. Am J Clin Nutr. 2009;89:161-168. 7. Tang JE, Moore DR, Kujbida GW, Tarnopolsky MA, Phillips SM. Ingestion of whey hydrolysate, casein, or soy protein isolate: effects on mixed muscle protein synthesis at rest and following resistance exercise in young men. J Appl Physiol. 2009;107:987-99. 8. Penning B, Boirie Y, Sendan JM, Gijzen AP, Kuipers H, van Loon LJ. Whey protein stimulates postprandial muscle protein accretion more effectively than do casein and casein hydrolysate in older men. Am J Clin Nutr. 2011;93:997-1005. 9. Wilkinson SB, Tarnopolsky MA, Macdonald MJ, Macdonald JR, Armstrong D, Phillips SM. Consumption of fluid skim milk promotes greater muscle protein accretion after resistance exercise than does consumption of an isonitrogenous and isoenergetic soy-protein beverage. Am J Clin Nutr. 2007;85:1031-1040. 10. Adolfsson O, Meydani SN, Russell RM. Yogurt and gut function. Am J Clin Nutr. 2004; 80(2):245-56. 11. Scientific Opinion on the substantiation of health claims related to live yoghurt cultures and improved lactose digestion (ID 1143, 2976) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. 12. Rosado JL, Solomons NW, Allen LH. Lactose digestion from unmodified, low-fat and lactose-hydrolyzed yogurt in adult lactose maldigesters. Eur J Clin Nutr 1992;46:61-7. 13. Kolars JC, Levitt MD, Aouji M, Savaiano DA. Yogurt—an autogestive source of lactose. N Engl J Med 1984;310:1-3. 14. Savaiano DA, AbouElAnouar A, Smith DE, Levitt MD. Lactose malabsorption from yogurt, pasteurized yogurt, sweet acidophilus milk, and cultured milk in lactase-deficient individuals. Am J Clin Nutr 1984;40:1219-23. 15. Darmon N, Vieux F, Maillot M, Volatier JL, Martin A. Nutrient profiles discriminate between foods according to their contribution to nutritionally adequate diets: a validation study using linear programming and the SAINLIM system. Am J Clin Nutr. 2009; 89(4):1227-36. 16. Weinberg LG, Berner LA, Groves JE. Nutrient contributions of dairy foods in the United States. Continuing Survey of Food Intakes by Individuals, 1994-1996. 1998. J Am Diet Assoc. 2004; 104(6):895-902. 17. Wang H, Livingston KA, Fox CS, Meigs JB, Jacques PF. Yogurt consumption is associated with better diet quality and metabolic profile in American men and women. Nutr Res. 2013; 33(1):18-26. 18. Weaver CW. How sound is the science behind the dietary recommendations for dairy? Am J Clin Nutr. ajcn.073007; First published online March 19, 2014. doi:10.3945/ajcn.113.073007. 19. McGill CR, Fulgoni VL 3rd, DiRienzo D, Huth PJ, Kunlich AC, Miller GD. Contribution of dairy products to dietary potassium intake in the United States population. J Am Coll Nutr. 2008; 27(1):44-50. 20. O'Neil CE, Keast DR, Fulgoni VL, Nicklas TA. Food sources of energy and nutrients among adults in the US: NHANES 2003-2006. Nutrients. 2012; 4(12):2097-120. 21. Source : Table Ciquel des aliments 2008, ANSES ; Directive européenne (90/496/CEE) ; Martin A et al. 2007. Apports nutritionnels conseillés pour la population française, 3e édition, Ed. TEC&DOC. 605 pp.