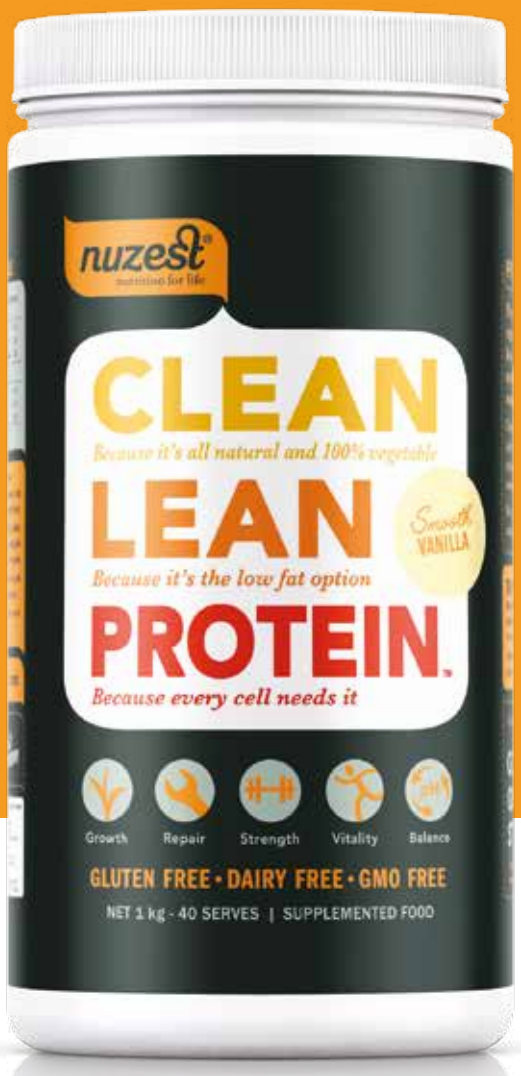
SEPT 2015

nuzest®
nutrition for life

CLEAN LEAN PROTEIN

TECHNICAL BULLETIN



ULTRA-HIGH BIOLOGICAL VALUE GOLDEN PEA PROTEIN, ALKALINE, NO ADDED MALTODEXTRIN, LACTOSE, POLYOLS OR FODMAPS

All 9 essential amino acids. High glutamine. Very low carbs and low fat. No fillers, no artificial additives, preservatives, sweeteners, flavours or colours

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CONTENTS

INTRODUCTION & PRODUCT JUSTIFICATION

NUZEST'S CLEAN LEAN PROTEIN (CLP) IS A UNIQUE, VEGETARIAN AND VEGAN, PROTEIN CHARACTERISED BY ITS TASTE (4 NATURAL FLAVOURS AND AN UNFLAVOURED), LACK OF FILLERS OR FOOD ADDITIVES, AND VERY HIGH DIGESTIBILITY.

The protein is derived from sustainably-sourced European golden peas *(Pisum sativum)*. None of the product variants (Smooth Vanilla, Wild Strawberry, Creamy Cappuccino, Rich Chocolate or Just Natural) contain any artificial colours, preservatives, sweeteners or fillers. All products are also free from gluten, dairy, soy and lectins, which can act as anti-nutritional factors.

CLP is 100% vegan with a protein content of nearly 90%, over 4 times greater than that of animal protein sources such as meat, chicken or fish. The protein, sourced from French-grown golden peas is isolated in a patented, all-natural, water-based process that ensures the protein is not denatured during extraction and manufacture. CLP is a rich source of all 9 essential amino acids and with a pH of 7.8, is one of very few alkaline protein products available. Its 98% digestibility rating makes it gentle on the gastro-intestinal tract and increases its absorption. CLP is suitable for everyone, is very low in carbohydrates and fat and is the perfect recovery shake or meal replacement whilst providing key building blocks needed for vitality, repair and muscle growth.

PEA PROTEIN ISOLATE

THE PEA PROTEIN IN CLP IS DERIVED FROM THE GOLDEN PEA, *Pisum sativum*, AND HAS A LONG HISTORY OF USE AS A FOOD SOURCE SINCE ANCIENT CULTURES DATING BACK TO 6000 BC.

With a well-balanced nutritional profile containing around 23% protein, it is the perfect base for a concentrated protein ingredient. The pea protein in CLP is Pisane®, one, if not the, hi*ghest quality pea protein on the market today.* Pea proteins typically have a protein content of 80-85%, however Pisane® contains around 88-90% protein and is produced in Cosucra's state-of-the-art Belgian facility using an environmentally friendly, aqueous process, using no organic solvents, hexane or denaturing heat treatments.

Pisane® is one of the few 'clean label' vegetable proteins available globally and is free from any GMOs (in the finished product as well as at any stage of manufacture), gluten, crustaceans, molluscs, eggs, fish, peanuts, soya, milk, nuts, celery, mustard, sesame seeds, lupin, sulphur dioxide and sulphites. No GMO technology and is also Kosher and Halal certified.

PEA VS WHEY RESEARCH

While whey protein has long been favoured as the protein of choice for athletes owing to its high biological value, there are many additional factors that can affect a protein's role in muscle repair and growth. These include digestibility and absorption, that can themselves be affected by other components in a formulation, such as inflammatory proteins, lipids, sugars and other carbohydrates, including FODMAPs. In a recent randomised clinical trial carried out by the National Institute for Health and Medical Research (INSERM) in Dijon, France, pea and whey protein were compared against a placebo. The 161 male athletes enrolled in the study, aged 18 to 35, consumed 25 g of each protein twice daily over a 12 week period of resistance training targeting the upper body. The researchers found that, in general, both protein types contributed to equivalent muscle growth, and significantly more than the placebo. Additionally, in a sub-group with the lowest biceps muscle force at the start of the trial, those taking pea protein showed a considerably greater increase in muscle thickness (mass) over the 84 days of the trial compared with those on whey.[1]

NUTRITIONAL PROFILE

Protein serves crucial functions in virtually every physiological and metabolic process in the body. Proteins are comprised of monomer units made up from up to 20 amino acids, of which 9 are regarded as essential because they cannot be synthesised in the body and must be ingested in the diet (Table 1). Others are conditionally essential, being required in the diet at times of particular need (e.g., growth, intense activity, stress, illness), whereas a third group are considered non-essential because they can be synthesised within the body (Table 1). Proteins may be bound to a wide range of functional groups, they may be quite rigid or highly flexible and they can respond in very different ways to heat or acid environments.[2]

Table 1. Essential, conditionally essential and non-essential amino acids

Essential Amino Acids	Conditionally Essential Amino Acids	Non-Essential Amino Acids
Histidine	Arginine	Alanine
Isoleucine	Cysteine	Asparagine
Leucine	Glutamine	Aspartic Acid
Lysine	Tyrosine	Glutamic Acid
Methionine	Glycine	
Phenylalanine	Ornithine	
Threonine	Proline	
Tryptophan	Serine	
Valine		

NUTRITIONAL PROFILE

Table 2 shows a comparison of the amino acid profile of Pisane®, the protein source in CLP, with the profiles of casein, whey, brown rice and egg albumen. Cow's milk is typically comprised of about 80% casein and 20% whey.

Table 2. Average amino acid content (% of protein) of various protein sources

Amino acid	Whey[a]	Casein[a]	Rice[b]	Egg[c]	Pisane®[d]
Alanine	3.3	2.8	4.5	5.7	4.3
Arginine	2.4	3.5	6.3	5.9	8.7
Aspartic acid	10.3	6.6	6.9	9.2	11.5
Cysteine	2.4	0.3	1.7	-	1.0
Glutamic acid	16.6	20.3	13.9	15.7	16.8
Glycine	1.7	1.8	3.5	3.2	4.1
Histidine	1.9	2.7	1.8	2.41	2.5
Isoleucine	6.4	4.9	3.5	7.1	4.5
Leucine	9.9	8.7	6.4	9.9	8.4
Lysine	9.5	7.5	2.4	6.4	7.2
Methionine	2.0	2.6	2.3	5.4	1.1
Phenylalanine	3.0	4.8	4.4	7.5	5.5
Proline	6.1	10.6	2.9	3.8	4.5
Serine	5.1	5.6	3.9	8.5	5.3
Threonine	7.1	4.3	2.9	4.0	3.9
Tryptophan	2.0	1.5	1.2	-	1.0
Tyrosine	2.9	5.3	4.3	3.75	3.8
Valine	6.1	6.2	4.6	8.8	5.0

Data sources:

[a] Hercules, Inc., Wilmington, Delaware, USA.
[b] Salman D. *Foods* 2014, 3, 394-402.
[c] Lewis JC, *et al. Biol Chem.* 1950; 186(1): 23-35.
[d] Cosucra, Belgium.

MANAGING THE BODY'S AMINO ACID POOL

Without sufficient protein in the diet to provide AAs to support crucial functions such as cell structure and tissue biosynthesis, transportation and storage of nutrients and hormones, organ and tissue function, immune function, tissue and cellular repair, detoxification and metabolism, health and vitality cannot be maintained. Nutritional need for protein also increases dramatically during times of physiological stress, such as during endurance exercise[3] or immune challenge.[4]

As much as 20% of the human body is comprised of protein, which equates to around 14 kg for a 70 kg adult. Free AAs distributed throughout the body are sequestered in an amino acid pool. This 'pool', which circulates in the bloodstream, needs to be maintained at a nitrogen concentration of between 40 to 80 mg/L for healthy physiological function. The pool fluctuates according either to the fed or post absorptive (resting, fasted) states, or demand, such as stress, illness, strenuous or endurance exercise.

The circulating, free AA pool is regulated by a complex nutrient sensing kinase network known as mTOR ('mammalian target of rapamycin').[5] Dysregulation of the mTOR kinase system leads to abnormal protein (mRNA) translation, which can in turn manifest into various pathological states if it persists.

KEY AMINO ACID BENEFITS

AAs are not just derived from dietary proteins, but also from the breakdown of tissue proteins and the biosynthesis of non-essential amino acids. However, ensuring that sufficient dietary AAs are consumed on a daily basis is an essential step in maintaining a healthy, fully functioning, disease-free state. The high quality protein isolate in CLP allows for the maintenance of a complete amino acid pool, which is transformed and 'exchanged' or turned-over at least 3 to 4 times a day.

Branched chain amino acids

The level of branched chain amino acids (BCAAs) (leucine, isoleucine, valine) in CLP is higher than in some other vegetable proteins and is generally comparable to those in milk and egg protein. These BCAAs are of particular interest in sports products because they have beneficial effects for decreasing exercise-induced muscle damage and promoting muscle-protein synthesis. BCAAs also modify the pattern of exercise-related cytokine production, leading to a diversion of the lymphocyte immune response towards a Th1 type, making them indispensible for post sport/exercise muscle recovery and immune regulation.[6]

MANAGING THE BODY'S AMINO ACID POOL

Glutamine

Strenuous exercise may be associated with immune suppression and thus increased risk of infections.[7] Glutamine is an important amino acid involved in the functioning of the immune system,[8] as well as for regulating muscle protein synthesis and breakdown. Glutamine can be produced in muscles starting from glutamic acid or branched chain amino acids, however the demand for glutamine increases with demand from exercise. Research shows that consuming an amino acid formula that includes glutamine increases glutamine availability and uptake by skeletal muscle in healthy subjects without causing an increase in the intramuscular free glutamine pool. However, ingesting glucose (carbohydrate) at the same time diminishes the intramuscular glutamine concentration, despite the increased glutamine availability in the blood due to decreased glutamine production.[9] CLP provides an extremely good source of glutamic acid, without the additional glutamine-depleting carbohydrate and lactose, the latter to which many individuals exhibit intolerance.

Glutamine is also involved in maintaining a favourable acid/base balance in the body and plays an important role in staving off age-related muscle wasting (sarcopenia). Although glutamine can be produced in the body, this ability decreases with age, causing the necessary protein to be leached from muscles in order to make it. Ensuring adequate supplies of glutamine can slow this process down, which is why this AA has long been referred to as *"the fountain of youth from within"*.[10]

Arginine

The arginine content of CLP is very high as compared to most other proteins (Table 2). Arginine supports the production of nitric oxide in the body, which results in improved vasodilation,[11] improved wound healing[12] and enhanced immune responses. Arginine is essential for healthy muscle metabolism,[13] maintaining the body's nitrogen balance and helping with weight control, given its role in increasing muscle mass, whilst reducing body fat.[14] Strength and power athletes benefit from having a high lean muscle mass to low fat mass. Endurance athletes benefit particularly from the improved vasodilation and enhanced immune response.

Lysine

The lysine level in CLP is complementary to the low levels found in cereal-derived proteins. Lysine also helps with the building of muscle protein. Findings show that young males given 1.2 g of arginine with 1.2 g of lysine (1 serving of CLP gives 2.1 g and 1.8 g respectively) had an 8-fold increase in peak plasma growth hormone concentrations at 90 minutes post-ingestion. However, when arginine and lysine were consumed independently no such increases in growth hormone were observed.[15]

WHAT'S IN CLEAN LEAN PROTEIN?

NUTRITION FACTS (Per 25g serve)	Just NATURAL	Smooth VANILLA	Real COFFEE	Rich CHOCOLATE	Wild STRAWBERRY
Energy	388 kJ	386 kJ	380 kJ	389 kJ	386 kJ
	93 Cal	92 Cal	91 Cal	93 Cal	92 Cal
Protein	20.9 g	19.9 g	19.5 g	19.2 g	19.7 g
Fat	1.0 g	1.0 g	1.0 g	1.4 g	0.9 g
-saturated	0.2 g	0.1 g	0.2 g	0.5 g	0.1 g
Carbohydrate	0.2 g	1.0 g	0.8 g	0.7 g	1.2 g
-sugar	0.0 g	0.0 g	0.1 g	<0.1 g	0.1 g
Dietary Fibre	0.6 g	0.6 g	1.0 g	1.2 g	0.6 g
Sodium	375 mg	357 mg	351 mg	338 mg	354 mg

Specified values are average.
Numbers can vary slightly between batches - always refer to the label.

INGREDIENTS

Pea Protein Isolate	Pea Protein Isolate	Pea Protein Isolate	Pea Protein Isolate	Pea Protein Isolate
	Natural Vanilla	Coffee	Natural Chocolate	Natural Strawberry
	Natural Fruit Protein	Natural Vanilla	Natural Vanilla	Red Beet Powder
		Natural Fruit Protein	Natural Fruit Protein	Natural Vanilla
		Cocoa Extract	Cocoa Extract	Natural Fruit Protein

AVERAGE AMINO ACID CONTENT OF CLEAN LEAN PROTEIN
(grams per 100g of protein)

All 9 Essential Amino Acids					
Leucine	8.4	Valine	5.0	Lysine	7.2
Isoleucine	4.5	Methionine	1.1	Threonine	3.9
Tryptophan	1.0	Histidine	2.5	Phenylalanine	5.5
As well as all these...					
Arginine	8.7	Cystine	1.0	Glycine	4.1
Aspartic Acid	11.5	Proline	4.5	Serine	5.3
Glutamic Acid	16.8	Tyrosine	3.8	Alanine	4.3

FUNCTIONAL CAPACITY

Amino acid composition and digestibility are important parameters for determining the nutritional quality of a protein source, as well as its applicability for long-term use. Another important characteristic, especially for sports use, is the percentage of the protein that can be utilised by the body for the maintenance, growth and building of muscles. This is reflected in the biological value (BV), which refers to the proportion of absorbed nitrogen that is retained in the body or the net protein utilisation (NPU), reflecting the nitrogen retention or proportion of nitrogen intake retained in the body.

It is generally accepted that pea proteins have a BV of 79% in healthy humans and a NPU of 70.9% as an isolate.[20,21] For comparison, casein and soy have BVs of 80%, rice protein 79% and whey 100%, making it the protein powder of choice for many sports products. However, it's not all about horsepower ratings. Digestibility and nutritional factors must be taken into account. Many people have sensitivities to dairy derivatives that can create irritation and inflammation of the gut lining over time, as well as reducing the absorption capability of the gut to whey protein and thereby lessening the BV. Additionally, a high consumption of animal protein can lead to an increase in calcium loss through urine, which can in turn affect bone health over time. This is of particular importance to those heavily using whey protein powders on top of a high animal protein diet.

Whey protein products often contain significant amounts of naturally occurring lactose and added maltodextrin (see their ingredients listings) that triggers carbohydrate metabolism and detracts from the benefits of taking in pure protein. CLP contains no maltodextrin or any other additives, fillers or binders. Even the sweetener used in the CLP range is a sweet-tasting, basic plant protein from the fruit of *Thaumatococcus daniellii*, known as thaumatin. Identified in the 1970s and increasingly used in foods and food supplements, thaumatin consists of a mixture of very similar proteins with two predominant forms: Thaumatin I and Thaumatin II. They themselves are made of one single chain of 207 AAs, which barely differ from one another. Despite its sweet taste, thaumatin is metabolised in the body like protein and when used in the small amounts required to lightly sweeten a food barely contributes to the overall caloric value of the product.

WHAT'S IN CLEAN LEAN PROTEIN?

NUTRITION FACTS (Per 25g serve)	Just NATURAL	Smooth VANILLA	Creamy CAPPUCCINO	Rich CHOCOLATE	Wild STRAWBERRY
Energy	402kJ	400kJ	384kJ	394kJ	376kJ
Protein	22.0g	21.07g	20.0g	20.0g	20.79g
Fat	0.33g	0.32g	0.41g	0.49g	0.36g
- saturated	0.05g	0.05g	0.11g	0.17g	0.06g
Carbohydrate	0.68g	1.48g	1.37g	1.66g	0.88g
- sugar	0.00g	0.13g	0.10g	0.17g	0.09g
- dietary fibre	0.58g	0.65g	0.77g	1.17g	0.64g
Sodium	0.50g	0.51g	0.48g	0.47g	0.36g
All specified values are average					

INGREDIENTS

Pea Protein Isolate	Pea Protein Isolate	Pea Protein Isolate	Pea Protein Isolate	Pea Protein Isolate
	Natural Vanilla	Coffee	Natural Chocolate	Natural Strawberry
	Natural Fruit Protein	Natural Vanilla	Natural Vanilla	Red Beet Powder
		Natural Fruit Protein	Natural Fruit Protein	Natural Vanilla
		Cocoa Extract	Cocoa Extract	Natural Fruit Protein

AVERAGE AMINO ACID CONTENT OF CLEAN LEAN PROTEIN
(grams per 100g of protein)

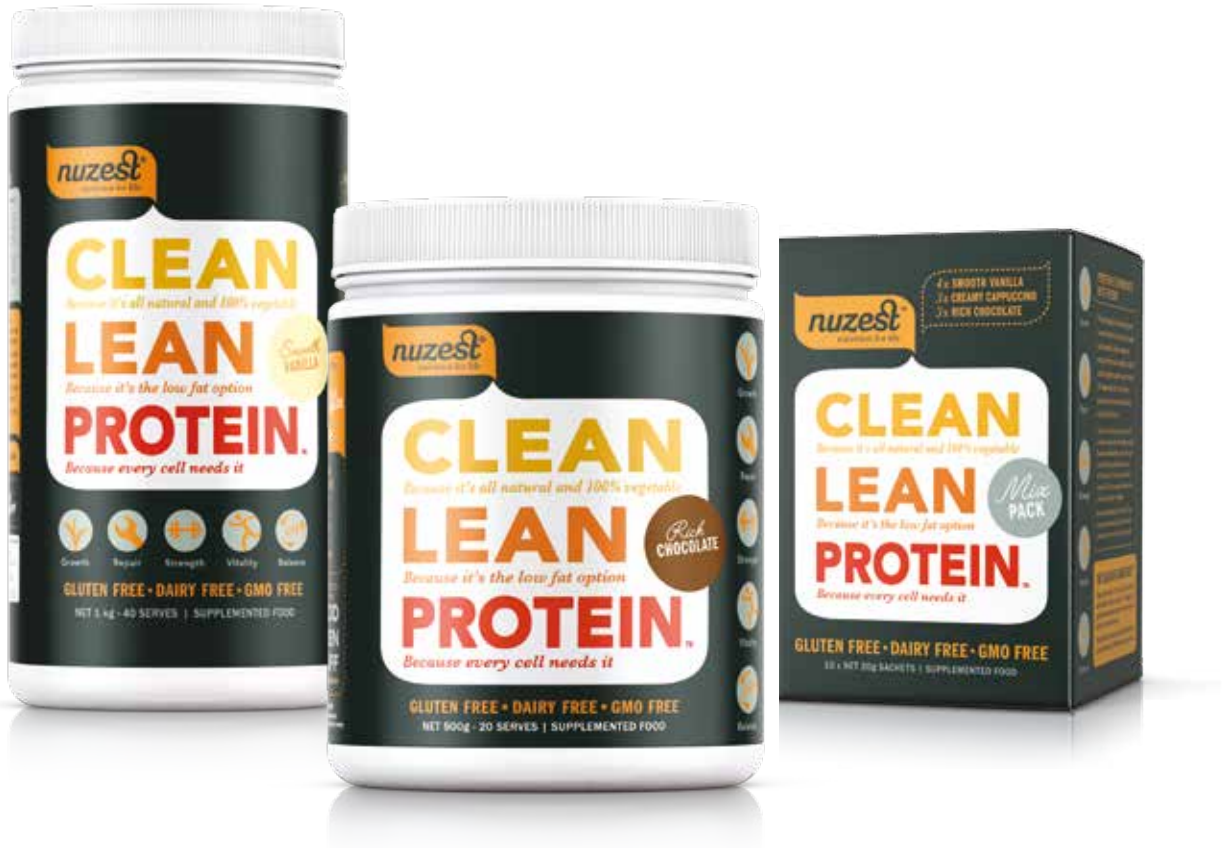
All 9 Essential Amino Acids					
Leucine	8.4	Valine	5.0	Lysine	7.2
Isoleucine	4.5	Methionine	1.1	Threonine	3.9
Tryptophan	1.0	Histidine	2.5	Phenylalanine	5.5
As well as all these...					
Arginine	8.7	Cystine	1.0	Glycine	4.1
Aspartic Acid	11.5	Proline	4.5	Serine	5.3
Glutamic Acid	16.8	Tyrosine	3.8	Alanine	4.3

CLEAN LEAN PROTEIN

USAGE & PRECAUTIONS

The standard serving suggestion is 2 scoops, providing 25 g of CLP, added to a shaker containing up to 350 mL of water, coconut, rice, almond or cow's milk. At this dosage one serving of CLP will provide 20 g of pure protein. Increase the number of scoops and frequency of use as necessary. CLP is gentle on the gut, highly digestible and with a pH of 7.8 may positively impact the acid/base balance in the body. There is a multitude of ways in which CLP can be incorporated into treatment protocols, nutritional programmes and training regimens. Please visit the Recipes Section of www.nuzest.com.au for the regularly updated range of recipes.

Given the absence of allergens or technological additives, there are no known precautions to using NuZest's Clean Lean Protein range of products.



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