nuzest®

Technical Bulletin

CLEAN LEAN PROTEIN

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DISCLAIMER

The information contained in this document has been prepared independently as a guide to Health Practitioners considering Clean Lean Protein as a recommended supplement to clients and/or patients. It draws upon existing scientific research on the human biosystem, and on nutritional supplementation in general.

This document is not a guide to or an endorsement of Clean Lean Protein, or any supplement or individual ingredient, for use as a prevention or cure for any illness or disease.

The opinions and conclusions expressed in this document are those of the authors, reached after analysis of available scientific research papers and personal experience in clinical practice. Health Practitioners should not rely solely on the opinions expressed or information contained in this document but are encouraged to conduct independent research to reach their own conclusions.

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nutrition for life
CLEAN LEAN PROTEIN™
PREMIUM EUROPEAN PEA PROTEIN
Plant-based Food Supplement
JUST NATURAL
500g
VEGAN
GLUTEN FREE
DAIRY FREE
SOY FREE
LECTIN FREE
NON GMO
PER 25g SERVE*
*Approx.
21g PROTEIN
0g CARBS
0g SUGAR
20 SERVES

PRODUCT INTRODUCTION

Clean Lean Protein is a unique plant protein characterised by its taste, smooth texture and all-natural ingredients. It is noted for its hypoallergenic nature and very high digestibility rating, as well as the absence of fillers, gums, preservatives and anything artificial.

Clean Lean Protein is derived from the highest-quality European Golden Peas (*Pisum sativum*), grown sustainably in France under the strictest conditions and processed in Belgium by Cosucra, a private family business regarded as the world leaders in pea protein isolation. These peas are believed to be the best available in the world, and the process used to create Clean Lean Protein, the finest.

In addition to being certified gluten, soy and dairy-free through independent laboratory testing, Clean Lean Protein is also genetically modified organisms (GMO)-free and Non-GMO Project verified. No other common allergens are present in any of the raw materials or ingredients we use. The finished products are regularly tested for herbicides and pesticides, and for naturally occurring heavy metals to ensure they are well within safe limits.

A patented water-based extraction process ensures the removal of anti-nutrients like phytic acid, lectins and trypsin inhibitors, and increases protein content and availability in a similar way to sprouting and fermenting, but more effectively. No chemicals are used at any stage of the process.

As a food that is extracted using a low-heat process, Clean Lean Protein can also be considered 'raw' and used as part of a raw-food diet. The common definition of a 'raw food' is that it has not been cooked or processed at temperatures of 49°C or higher. Due to the process used, Clean Lean Protein can deliver a superior, high-quality, high-protein product with an extremely low carbohydrate level and zero sugar; important for those looking to maintain healthy body weight or to maximise the protein content of their protein supplement.

Clean Lean Protein is 100% vegan with a protein content of nearly 90%; over four times greater than that of animal protein sources such as meat, chicken or fish. It is a rich source of all 9 essential amino acids and, with a pH of 7.8, is one of the very few alkaline protein products available. Its 98% digestibility rating makes it gentle on the gastrointestinal tract and increases its absorption.

Clean Lean Protein is suitable for everyone, is very low in carbohydrates and fat, and is the perfect recovery shake, providing key building blocks needed for vitality, repair, and muscle growth. The quality of the isolation process removes any strong pea aftertaste, making it easier to flavour and therefore contributing to its very favourably reported taste. It consistently outperforms in taste comparisons with other plant proteins. Thaumatin, a protein extracted from the African Serendipity Berry (the fruit of the West African Katemfe tree), helps to provide a great level of natural sweetness, without adding sugar or artificial sweeteners. It also acts as a 'flavour modulator,' further reducing any pea aftertaste.

HIGH PROTEIN | **LOW** CARB | **ZERO** SUGAR | **ALL NATURAL** INGREDIENTS | **100%** PLANT-BASED | **NON** GMO

WHAT DOES PROTEIN DO?

Protein is essential for health as it provides the amino acids that are the 'building blocks' of all cells, tissue, and organs within the body. Therefore, getting enough protein in the diet is essential to performing and feeling at your very best.

Protein is made up of amino acid chains, which are arranged according to the proteins purpose. For example it might be a protein structure of a muscle, a protein structure making up a receptor site on a cell, a chemical messenger like a neurotransmitter hormone, or the protein structure in legumes and other vegetables consumed as food. When protein is consumed, it is broken down during digestion into individual amino acids, which are then absorbed and used by the body's cells to build protein chains that make up the fundamental structures of the body. Thus, it is critical to consume adequate protein everyday to ensure proper functioning of each system of the body.

Optimising protein intake is especially critical for muscle-gain,[1] reducing soreness after exercise,[2] and reducing muscle loss and improving fat-loss while dieting.[3,4,5] Taking in sufficient protein is also important for cardiometabolic and general health,[6] and helping to modulate blood pressure and other cardiac risk factors.[7,8]

Who should supplement with protein?

While most people consume 'enough' protein according to the recommended daily intake (RDI) of 0.8 grams (per kg of body weight), many do not consume enough protein for their body to perform and recover at its best. The average daily intake of protein is around 100 g for males and 70 g for females.[9,10] While this is higher than the RDI, it is still well below the recommended levels for both performance and offsetting the risk of age-related muscle loss. Analysis of US eating patterns has suggested that people should be more aware of under-eating protein, rather than over-eating it, particularly because protein intakes decline as we age and there is an increased requirement to consume more to preserve muscle mass.[11]

People particularly at risk of not eating enough protein to thrive can include:

- Athletes with higher protein requirements
- People who are trying to lose weight (as higher protein intakes are necessary to offset muscle loss and preserve satiety)
- Those who are extremely busy or stressed and might be more at risk of missing meals or eating convenience foods
- Those on lower budgets who may not always consume sufficient protein-rich foods
- Older people who are at greater risk of age-related muscle loss and who typically under-consume protein

How much protein do you need?

Protein requirements vary depending on individual goals and lifestyle factors. Some specific recommendations are:

- Minimum RDI level: 0.8 g per kg of body weight (bw) per day
- For sports performance: 1.4-2 g per kg bw per day[12]
- If dieting or wanting to put on or retain muscle: 2-2.8 g per kg bw per day[13] or more[14]

So, for performance (and retaining muscle as we age), protein intake should be at least 75% higher than the RDI. For the average person, this would equate to ~120 g protein per day for a male and ~100 g protein per day for a woman. This in turn would require around 25-30 g protein per meal for a woman and man respectively (in three meals and one snack per day).

Examples of protein-rich foods

Food	Protein g (per 100g)	Carbs	Fat
Firm tofu	8	1.9	4.8
Sprouted lentils	9	22	1
Walnuts	15	14	65
Tempeh	19	9	11
Beef	~20	0	~20
Chicken	~20	0	~25
Fish	~20	0	~5
Almonds	21	22	49
Pea protein isolate	83.4	0.7	9

How do protein supplements help?

Protein powders are an affordable and convenient way to supplement your dietary intake of protein if you are not consistently consuming enough through food (which most of us aren't), or require an easily digestible source of protein at times when we might benefit from a protein 'boost', such as after intensive exercise.

Protein powders are convenient
Many people struggle to have good quality meals, consistently. Protein powders can provide a convenient, 'base' for simple, effective, nutrient dense meals when preparation time is short or when you are struggling for meal ideas! Most people use protein smoothies (with healthy fats, veggies and berries added) as convenient, nutrient-dense meals.

Protein supplements are convenient before and after training
Many athletes benefit from protein before, during, or after training. Eating whole foods may not be ideal or palatable during these times, and protein powders offer a convenient, easy-on-the-gut option for pre-training (around training) meals.

Protein supplements can help boost the overall intake of protein
Many people do not get the protein they require to perform at their best or to meet specific needs like increased protein intake during dieting. If the rest of the diet is robust and nutrient-dense, an easy 'fix' can be to simply add a shake or two during the day.

Benefits of protein supplementation

Protein for a healthy heart
Higher protein diets may also be good for our 'cardiometabolic' health. Increased dietary protein has a small, beneficial effect on blood pressure, reduces triglycerides (one of the most important markers of poor cardiovascular and metabolic health), and reduces body fat stores.[7,8]

WHAT DOES PROTEIN DO?

Protein for healthy ageing
Protein is especially important as we age. Age-related muscle loss is common and is a contributing factor to falls and bone and joint injury. It's also likely that muscle loss increases our risk of metabolic disorders like diabetes. In older adults, high-protein nutritional supplements are associated with lower hospital admissions and fewer health complications.[6] Older adults also retained more lean mass and lost more fat mass during weight loss when consuming higher protein.[1,3,4,15]

Bone loss is also a concern as we age. As we get older, our bones can become more brittle and less dense. Higher protein diets have been shown to reduce this bone loss and improve the strength of our bones as we age.[15,16,17]

Protein for immunity
Protein and one of its derivatives, Glutamine, helps the body retain immunity and reduce infection.[18]

Protein for body composition, strength and power
For those dieting, or even those who are just habitual under-eaters, an increased protein intake of up to 2.5 g per kg of body weight can help to offset muscle loss and improve body composition (muscle to fat ratio) resulting in a leaner you.[5] This level of protein is **around 3x higher than the recommended daily allowance** of 0.8 g per kg body weight! In healthy adults, over the long term, protein helps to increase lean muscle and helps to improve strength and power.[1]

Protein for muscle soreness
For 'weekend warriors' training for sports, or at the gym, protein taken after training might reduce muscle soreness.[2]

Pea protein isolate

The pea protein in Clean Lean Protein is derived from the golden pea, *Pisum sativum*, and has a long history of use as a food source in ancient cultures dating back to 6000 BC.

With a well-balanced nutritional profile containing around 23% protein, *Pisum sativum* is the perfect base for a concentrated protein ingredient. The pea protein in Clean Lean Protein is Pisane®, one of the highest (if not the highest) quality pea proteins on the market today. Pea proteins typically have a protein content of 80-85%, however Pisane® contains up to 88% protein.[i] It is produced by the sixth generation family-owned Cosucra Groupe in a new 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, gluten, crustaceans, molluscs, eggs, fish, peanuts, soya, milk, nuts, celery, mustard, sesame seeds, lupin, sulphur dioxide and sulphites. Pisane® is also Kosher and Halal certified.

Pea vs whey research

While whey protein has long been favoured as the protein of choice for athletes due to its high Biological Value[ii], 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[iii].

In one 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, even when compared to 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 mass over the 84 days of the trial compared with those on whey.[19]

i - This is measured on Dry Matter. Depending on the moisture content, the "as is" protein levels could vary from approximately 82% - 85%. Nuzest uses 83.42% for calculating the estimated "as is" protein in its products.

ii - Biological Value (BV) is a measure of protein absorption by the body, based on the relative content of nitrogen in a food vs. how much nitrogen is excreted. BV does not take into account actual digestion and absorption of protein. Protein digestibility-corrected amino acid score (PDCAAS) is the preferred method of calculating protein quality by the US Food and Drug Administration (FDA) and the Food and Agricultural Organization of the United Nations/World Health Organization (FAO/WHO) because it accounts for both the amino acid requirements of humans and their ability to digest a protein type.

iii - FODMAPs: Fructans, oligosaccharides, disaccharides, monosaccharides, and polyols refer to the fermentable sugars, starches and sugar alcohols that can cause gastrointestinal symptoms in people with Irritable Bowel Syndrome (IBS) and other bowel disorders. Low FODMAP diets have proven to be effective in the treatment of IBS when implemented under the guidance of a qualified health practitioner.

NUTRITIONAL PROFILE

Protein serves crucial functions in virtually every physiological and metabolic process in the body. Proteins are comprised of monomor units made up from 20 amino acids (AA), of which nine 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 acidic environments.[20]

Table 2 shows a comparison of the AA profile of Pisane®, the protein source in Clean Lean Protein, 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 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. Average amino acid content (% of protein) of various protein sources.

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

Data sources:

a Cosucra-Groupe Warcoing, Belgium.

b Hercules, Inc., Wilmington, Delaware, USA.

c Salman D. Foods 2014;3:394-402.

d Lewis JC, et al. Biol Chem. 1950;186(1):23-35.

MANAGING THE BODY'S AMINO ACID PROFILE

Health and vitality cannot be maintained without sufficient protein in the diet to provide amino acids (AA) 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. Nutritional need for protein also increases dramatically during times of physiological stress, such as during endurance exercise[21] or immune challenges.[22]

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 isolated in an amino acid pool. This 'pool', which circulates in the bloodstream, needs to be maintained at a nitrogen concentration between 40 and 80mg per litre for healthy physiological function. The pool fluctuates according to either 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').[23] 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 Clean Lean Protein allows for the maintenance of a complete amino acid pool, which is transformed and 'exchanged' or turned-over at least three to four times a day.

Branched chain amino acids

The level of branched chain amino acids (BCAAs) (leucine, isoleucine, valine) in Clean Lean Protein is higher in many 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 indispensable for post sport/exercise muscle recovery and immune regulation.[24]

Glutamine

Strenuous exercise may be associated with immune suppression and thus increased risk of infections.[25] Glutamine is an important AA involved in the functioning of the immune system,[26] as well as for regulating muscle protein synthesis and breakdown. Glutamine can be produced in muscles starting from glutamic acid or BCAAs, however the demand for glutamine increases with demand from exercise. Research shows that consuming an AA 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.[27] Clean Lean Protein 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".[28]

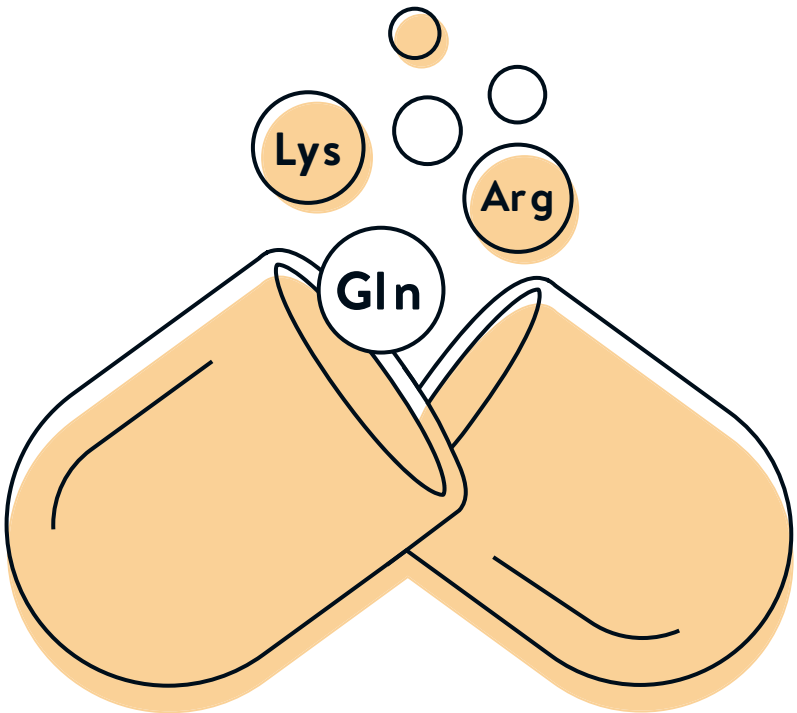
MANAGING THE BODY'S AMINO ACID PROFILE

Arginine

The arginine content of Clean Lean Protein is very high compared to most other proteins (Table 2). Arginine supports the production of nitric oxide (NO) in the body, which results in improved vasodilation (expansion of blood vessels),[29] improved wound healing[30] and enhanced immune responses. Arginine is essential for healthy muscle metabolism,[31] maintaining the body's nitrogen balance and helping with weight control given its role in increasing muscle mass, whilst reducing body fat.[32] Strength and power athletes benefit from having a high lean muscle mass to low fat mass. Endurance athletes benefit from the improved vasodilation and enhanced immune response.

Lysine

The lysine level in Clean Lean Protein 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 (one serving of Clean Lean Protein gives 2.1 g and 1.8 g respectively) had an eight-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.[33]



PEA PROTEIN IN EVERY DIET

A big challenge that comes with trying to adhere to one of the many different diets observed today, is finding ways to consume sufficient high-quality protein that fits within the guidelines of different dietary criterion. Pea protein, however, offers a solution to this concern for many standard and specific diets.

Pea protein on a vegan or vegetarian diet

Both vegan and vegetarian diets are centred around consuming more plant-based foods by either restricting (vegetarian) or eliminating (vegan) the consumption of animal by-products. A challenge for both diets, however is consuming sufficient high-quality protein. As pea protein is plant-based, it is an optimal protein source for those following a vegan or vegetarian diet. Legumes, such as peas, are a great source of nutrients, plant compounds and protein. However, due to a trypsin inhibitor in legumes, the protein is not biologically available to humans. The isolation process removes this inhibitor providing access to the protein. As fibre and starch are also removed from the pea protein isolate, it becomes easily digestible and provides an excellent source of all the essential AAs the human body needs. Furthermore, pea protein offers a natural source of essential vitamins and minerals, including iron, which are often hard to find and consume enough of, when following a vegan and vegetarian diet.

Pea protein on a paleo diet

The paleolithic (paleo) diet is a diet that focuses on eating foods that our hunter-gatherer ancestors would have eaten. Technically, legumes, and as such peas, are not permitted. The reason legumes are avoided on the diet is because of concerns regarding 'anti-nutrients,' such as saponins, lectins and phytates which can inhibit the absorption of other nutrients. However, these aren't an issue for most people. Phytic acid and many of the other anti-nutrients are also reduced markedly during most types of food preparation, including cooking, soaking and sprouting. Nowadays, high-quality pea protein isolates are processed using a low-heat, natural enzymatic isolation process (which is functionally very similar to fermenting or sprouting) and this effectively removes almost all the phytate, lectins, saponins, and trypsin inhibitors, resulting in a highly digestible pea protein that is free from the problems commonly associated with legumes. So, while it's not technically paleo, pea protein isolate is paleo-friendly because it offers a low-allergen, easy to digest, high-protein option that is practically free-from anti-nutrients. Due to its plant-based nature, pea protein is particularly invaluable for those following a vegan paleo diet.

Pea protein on a ketogenic diet

The ketogenic diet, often referred to as a keto-diet, requires adherence to a high-fat, low-carb protocol. However, 20-25% of your energy intake each day is still required to come from good-quality protein. As a source of macronutrients that is high in protein and extremely low in carbs (something you don't get from most plant-based protein sources, including hemp), pea protein can easily fit into a ketogenic diet and is a particularly important source of protein for those following a vegan ketogenic diet. Pea protein is easily added to smoothies that include sources of healthy fats, such as coconut oil, avocado or a handful of nuts, to help boost your fat intake while consuming the high-quality protein isolate.

Pea protein on a gluten-free diet

A gluten-free diet involves completely removing wheat, rye and barley from your diet. Peas are technically free from gluten. However airborne contamination from gluten-containing crops can result in relatively high levels of gluten in many plant proteins, including pea isolates. However, careful sorting and high-quality processing should produce gluten free pea protein isolates providing a great addition to the diet of someone with coeliac disease or following a gluten-free protocol. It is also practically free from other irritants (phytates, lectins, saponins, and trypsin inhibitors) and other potential allergens

like soy, dairy, corn and eggs. These benefits, along with pea protein isolates having very high absorption rates (greater than 89%), can be of benefit to those who have sustained damage to the gut and thus potential absorption issues. It should be noted that Pisane® comes specified gluten free and Nuzest tests for gluten in every batch.

Pea protein on a low FODMAP diet

The low FODMAP diet refers to a temporary eating protocol that restricts the consumption of foods containing fermentable oligo-, di- and monosaccharides and polyols (FODMAPs).

FODMAPs are certain types of carbohydrates which are poorly digested by some people and instead ferment in the large intestine. This fermentation process draws water into the large intestine and produces a combination of gasses that cause the gut to stretch and expand resulting symptoms such as pain, and bloating. Legumes are a group of foods that are typically limited on a low FODMAP diet due to their generally high FODMAP content.

Many protein powders and bars can contain sugars, sugar-alcohols, or other FODMAP carbohydrates (such as sweeteners, fillers, or naturally occurring sugars and fibres), that make them incompatible with a low FODMAP containing diet. Pea protein isolate however, contains virtually no FODMAPs due to the isolation process, which results in an extremely high-protein product (up to 88% protein by dry weight) with no sugar, extremely low total carbohydrates and practically no anti-nutrients that are commonly found in legumes and plant-based proteins. Pea protein isolate is a FODMAP friendly food that provides an effective protein supplement for those following a low FODMAP diet.

Pea protein in every diet

While this briefly touches on some of the more popular diets being followed today, pea protein has a place in almost every diet globally. Other highly suitable diets for pea protein include the Mediterranean diet, a Whole 30 diet and even an anti-candida diet. No matter what type of diet you follow, getting enough protein in your diet is vital for supporting lean body mass, preventing muscle loss and promoting optimal health. Quality protein in your diet is critical for everything from building new muscle to improving the health of hair and nails.

SUPPORTING ATHLETES AND ACTIVE LIFESTYLES

Exercise-induced protein requirements

Muscle mass is maintained through the finely tuned balance between muscle protein synthesis and muscle protein breakdown.[34] A net gain of muscle mass is only possible if the synthesis (anabolism) exceeds the level of breakdown (catabolism).

In the resting, fasted state (post-absorptive), muscle protein net balance is negative. A positive balance is usually achieved via nutritional means, resulting in the replacement of lost protein between meals. The regulation between the use and the intake of protein, as well as the timing of that intake, is responsible for increasing or maintaining a stable muscle mass. While there is a commonly-held view among sports scientists that carbohydrates should be consumed alongside protein (e.g. in 2:1 or 3:1 ratio) in the one hour window after training to promote protein synthesis and protect against protein loss in muscle tissue. Trials underpinning this view are both very limited, conflicting or involve misinterpretation of results from existing trials.[35]

Without nutritional support, athletes face negative muscle protein balance. Critical to both muscle protein anabolism and protection from catabolism is the availability of amino acids and insulin. Insulin is always present in the circulation even in a fasted state, but is triggered to some extent by protein and carbohydrate ingestion. It has been found that consuming protein with a plentiful supply of a diverse array of AAs, especially leucine, is key to increasing synthesis, while raised insulin, alongside AA availability, is important to protect against muscle protein breakdown.[34]

While insulin is required in conjunction with leucine and other AAs to promote synthesis, there is good evidence that the low levels in circulation, even in a fasted state, are sufficient. Raising these by up to 30 times over the fasted level has not been found to further induce protein synthesis.[36]

As far as protecting against protein degradation in muscle following exercise, there is good quality evidence from human trials showing that the small spike in insulin that is triggered by consuming protein alone is sufficient to protect against protein degradation in muscle.[36] This has been confirmed in an important trial that showed no further protection against protein loss was achieved when carbohydrate was consumed alongside protein, as compared with protein alone.[37] However, different athletes have different preferences, requirements and responses, which vary according to numerous factors, including age, gender, activity type, recovery potential, diets, gastrointestinal health and intolerances.

Accordingly, Nuzest argues that a high digestibility, high quality pea protein with a very low carbohydrate content, in the form of Clean Lean Protein, offers athletes ultimate flexibility. It allows the product, with its ideal AA profile, to be consumed either on its own, or it can be combined with different ratios and types of carbohydrate and/or fats as required.

Functional capacity

AA 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 indicated by various measures of protein quality such as biological value (BV) and protein digestibility amino acid score (PDCAAS).

BV is a measure of protein absorption by the body, based on the relative content of nitrogen in a food vs. how much nitrogen is excreted. The problem with BV is that it doesn't take into account actual digestion and absorption of protein.

SUPPORTING ATHLETES AND ACTIVE LIFESTYLES

PDCAAS is now the preferred method of calculating protein quality because it accounts for both the AA requirements of humans and their ability to digest a protein type. Pea protein has a higher PDCAAS value (around 0.93 from a perfect score of 1) than other vegetable proteins like hemp and rice, and exhibits extremely high absorption rates and utilisation.[38,39] But, it's not all about digestion rates and protein utilisation, 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 bioavailability. 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. Clean Lean Protein contains no additives, fillers or binders. Even the sweetener used in the Clean Lean Protein range is a sweet tasting, basic plant protein known as thaumatin, from the fruit of *Thaumatococcus daniellii* the West African katemfe tree.

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. These proteins are made up 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.

NUTRITION FACTS AND INGREDIENTS

NUTRITION FACTS (Per 25g serve)	JUST NATURAL	SMOOTH VANILLA	RICH CHOCOLATE	REAL COFFEE	WILD STRAWBERRY	COFFEE COCONUT + MCTs	CHAI TURMERIC + MACA	VANILLA MATCHA
Energy	447kJ	438kJ	436kJ	434kJ	437kJ	447Cal	422kJ	414kJ
	107Cal	105Cal	104Cal	104Cal	105Cal	107Cal	101Cal	99Cal
Protein	21g	20g	20g	20g	19.4g	18g	18.3g	19g
-gluten	0g	0g	0g	0g	0g	0g	0g	0g
Fat, total	2.3g	2.1g	2.2g	2.2g	2.1g	2.5g	2g	2g
-saturated	0.5g	0.5g	0.6g	0.5g	0.5g	1g	0.5g	0.5g
Carbohydrate	0.2g	1.3g	0.8g	0.6g	1.6g	2.7g	0.7g	0.7g
-sugars	0g	0.3g	0g	0.1g	0.1g	2g	0.1g	0.1g
Dietary fibre	0.4g	0.3g	0.7g	0.5g	0.3g	0.3g	1.1g	1.1g
Sodium	500mg	474mg	467mg	476mg	466mg	430mg	437mg	437mg
Iron	3.8mg	3.6mg	3.5mg	3.6mg	3.5mg	3.2mg	3.3mg	3.3mg

INGREDIENTS								
*The natural sweetener is Thaumatin, the protein from the fruit of the katemfe tree, West Africa.	100% Pea protein isolate.	Pea protein isolate, Natural vanilla flavour, Natural sweetener (Thaumatin*).	Pea protein isolate, Cocoa powder (5.0%), Natural chocolate flavour, Natural sweetener (Thaumatin*).	Pea protein isolate, Coffee powder (1.9%), Cocoa powder, Natural coffee flavour, Natural sweetener (Thaumatin*).	Pea protein isolate, Natural strawberry flavour, Beetroot powder, Natural vanilla flavour, Natural sweetener (Thaumatin*).	Pea protein isolate, Natural coconut flavour, MCT powder (4%), Natural coffee flavour, Coffee powder (1%), Natural sweetener (Thaumatin*).	Pea protein isolate, Natural chai flavour, Organic maca powder (3.5%), Cinnamon powder, Turmeric powder (1.8%), Black pepper ground, Natural sweetener (Thaumatin*).	Pea protein isolate, Matcha green tea powder (8%), Natural vanilla flavour, Natural sweetener (Thaumatin*).

AVERAGE AMINO ACID CONTENT (per 25g serve)					
ALL THE ESSENTIALS...					
Histidine	480mg	**Lysine**	1382mg	**Threonine**	748mg
Isoleucine	864mg	**Methionine**	211mg	**Tryptophan**	192mg
Leucine	1612mg	**Phenylalanine**	1055mg	**Valine**	960mg
AS WELL AS ALL OF THESE...					
Alanine	825mg	**Cysteine**	192mg	**Proline**	864mg
Arginine	1670mg	**Glutamic acid**	3224mg	**Serine**	1017mg
Aspartic acid	2207mg	**Glycine**	787mg	**Tyrosine**	729mg

USAGE AND PRECAUTIONS

The protein content of Pisane® used in Clean Lean Protein can be up to 88%. It comes specified as 86% +/-2% of dry matter. Depending on flavour content and moisture, this means that a 25 g serve of Clean Lean Protein will provide on average 20 g of protein (when assuming a moisture content of 3%). Simply increase the serving size and/or frequency as necessary for optimal supplementation.

Clean Lean Protein 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 Clean Lean Protein can be incorporated into treatment protocols, nutritional programs and training regimens.

Please visit www.nuzest.com for the regularly updated range of recipes.

Given the absence of common allergens or technological additives, there are no known precautions to using Clean Lean Protein.

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