Innovation and Market Opportunities of Yeast Protein in High-Protein Foods

Dr. Winston Sun
Product Manager of Angel Yeast Europe

Angel: Innovator in yeast fermentation

For more than 40 years, Angel continually focused on the research of yeast biotechnology, it has become an important player in the global yeast industry.

WHAT WE DO ▼

MORE THAN
40 YEARS
OF FAST GROWTH

16
PRODUCTION BASES

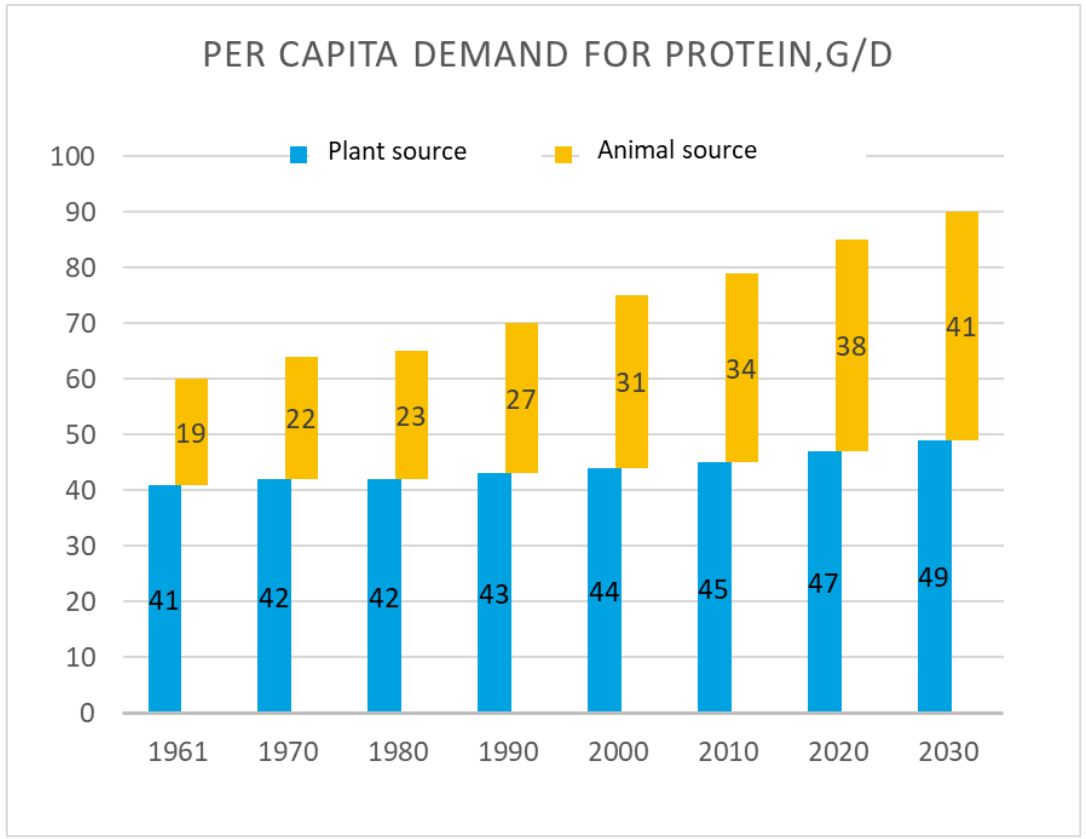
PRODUCTS AVAILABLE IN
170+
COUNTRIES

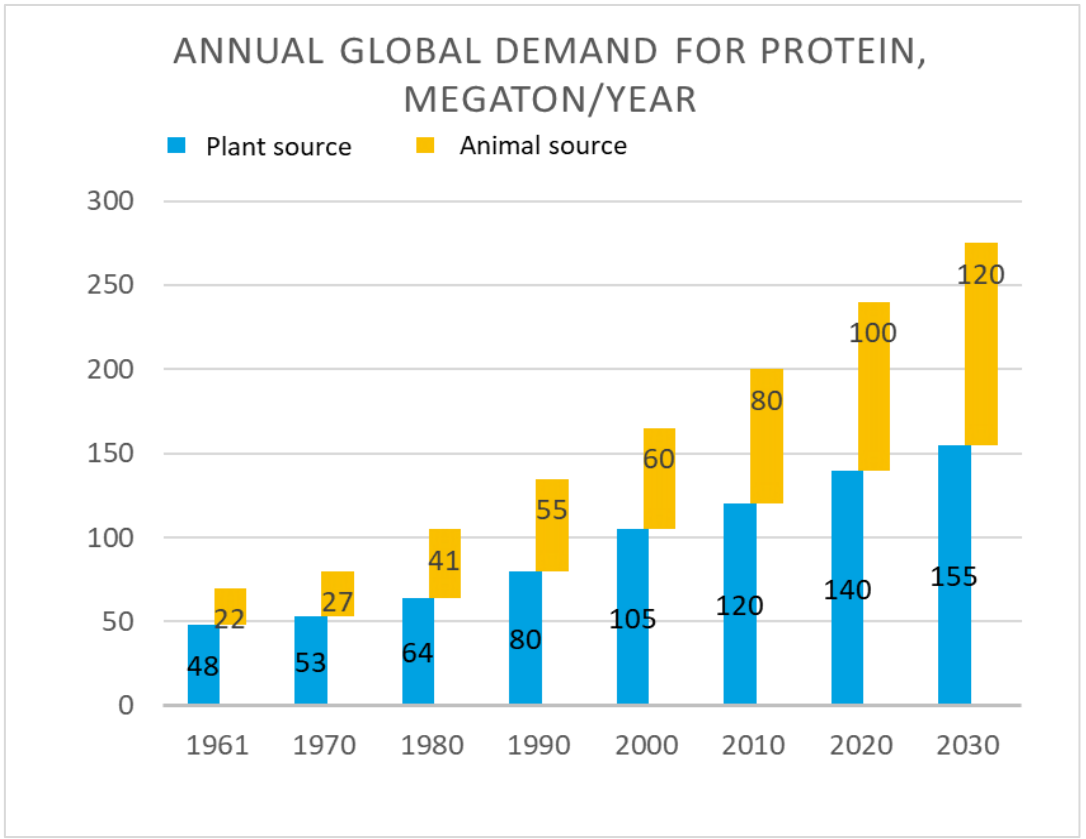
Contents

01

Global Protein Transition and Consumer Expectations

Global Protein Transition





The world's population will grow to

9.7 billion people

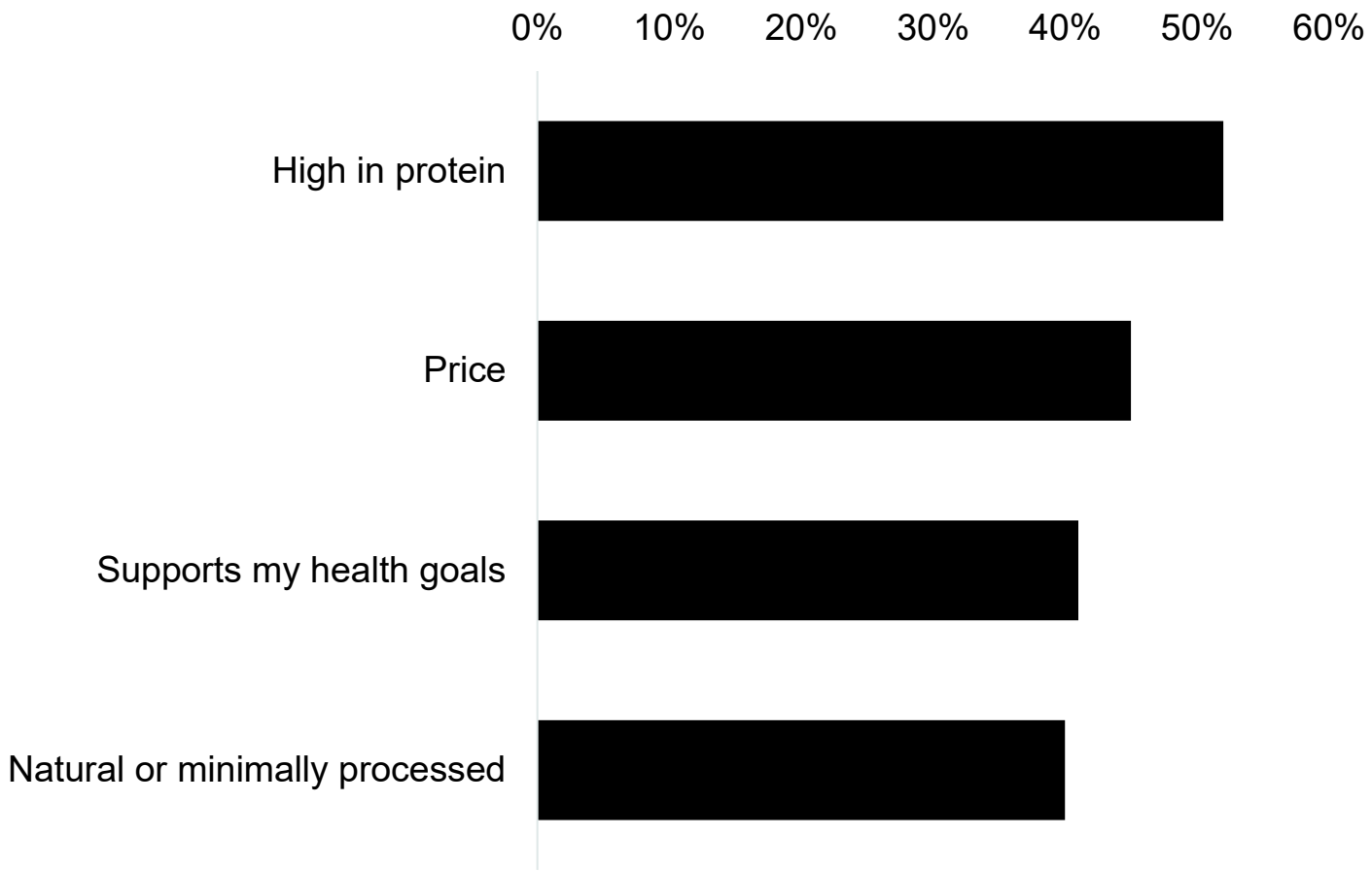
The protein demand gap will reach to

250 million tons

Data from: Nutra ingredients

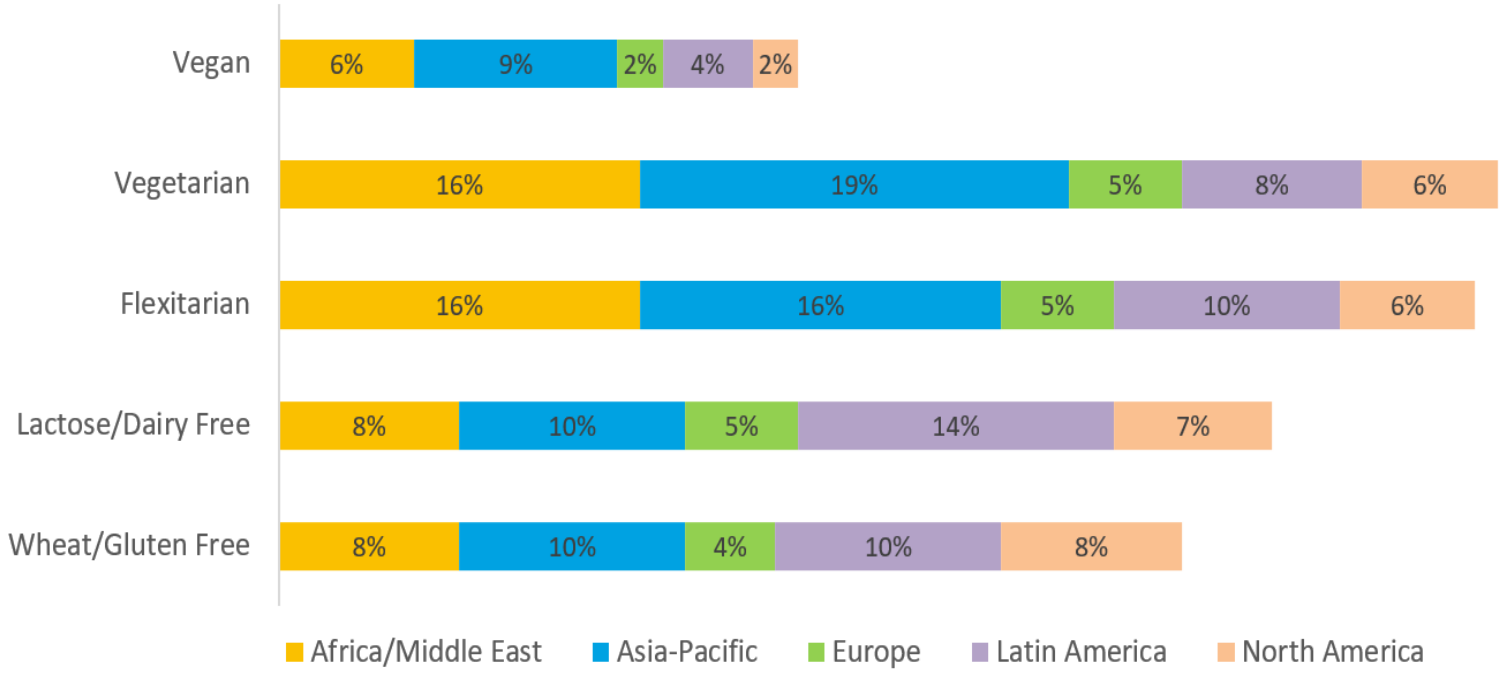
Consumer Expectations

What factors are the most important to you when choosing food and drinks to get protein? Select all that apply (Global, 2026)



Data from: Innova Trends Survey 2026

Trends in High-Protein Diets and Animal-Free Diets



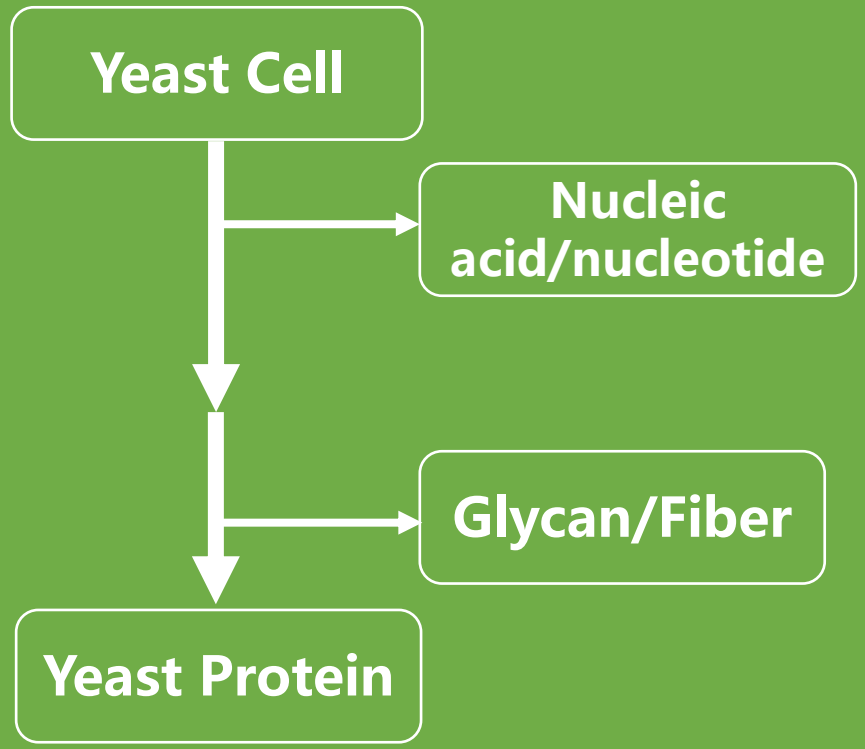
- Under the trend of healthy diet, "low carbon, low fat, **high protein**" seems to have become the golden rule of consumers.
- Consumers are progressively cutting back on their consumption of meat and other animal products and seeking **new protein** sources to fulfill their nutritional needs.

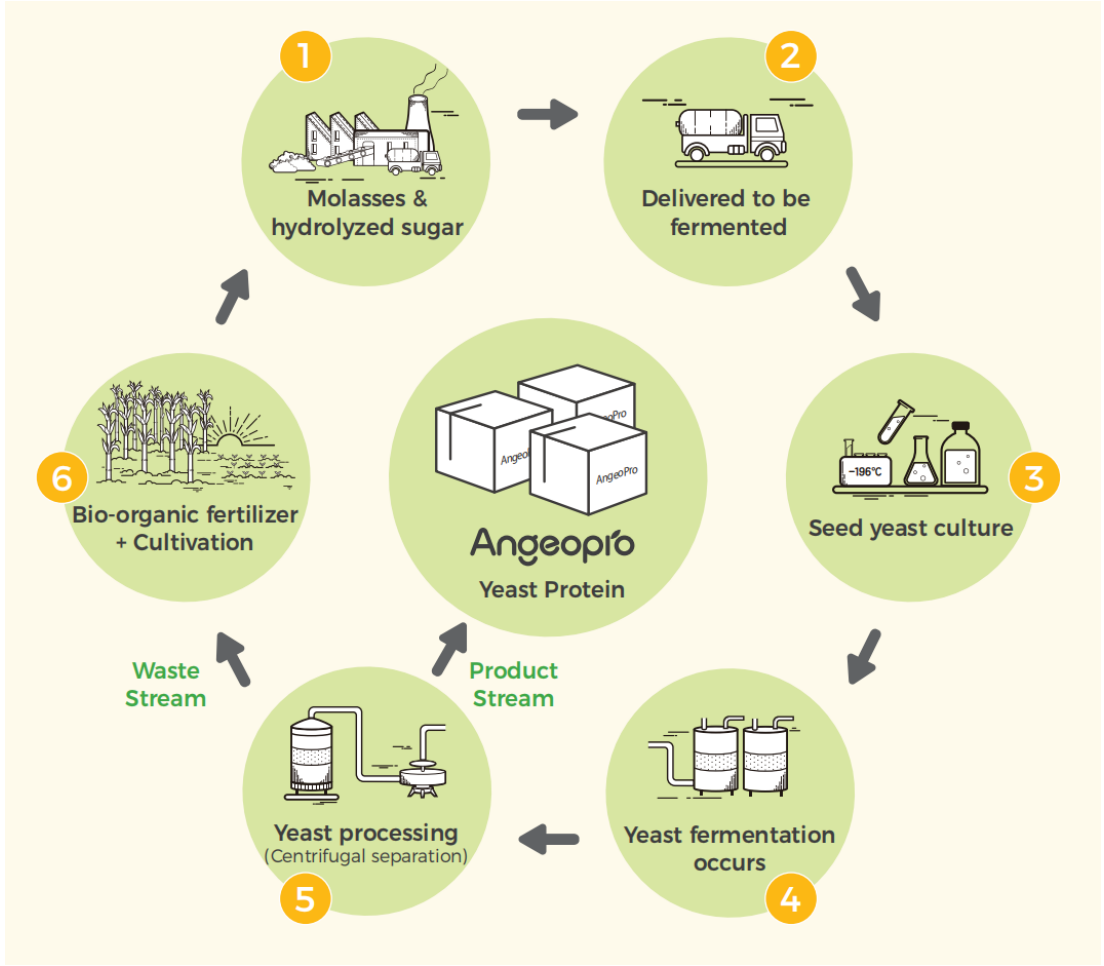
Data from: The Nielsen Global Health and Ingredient-Sentiment Survey, Q1 2016

02

The Advantages of AngeoPro® Yeast Protein

Angeopro™ Yeast Protein





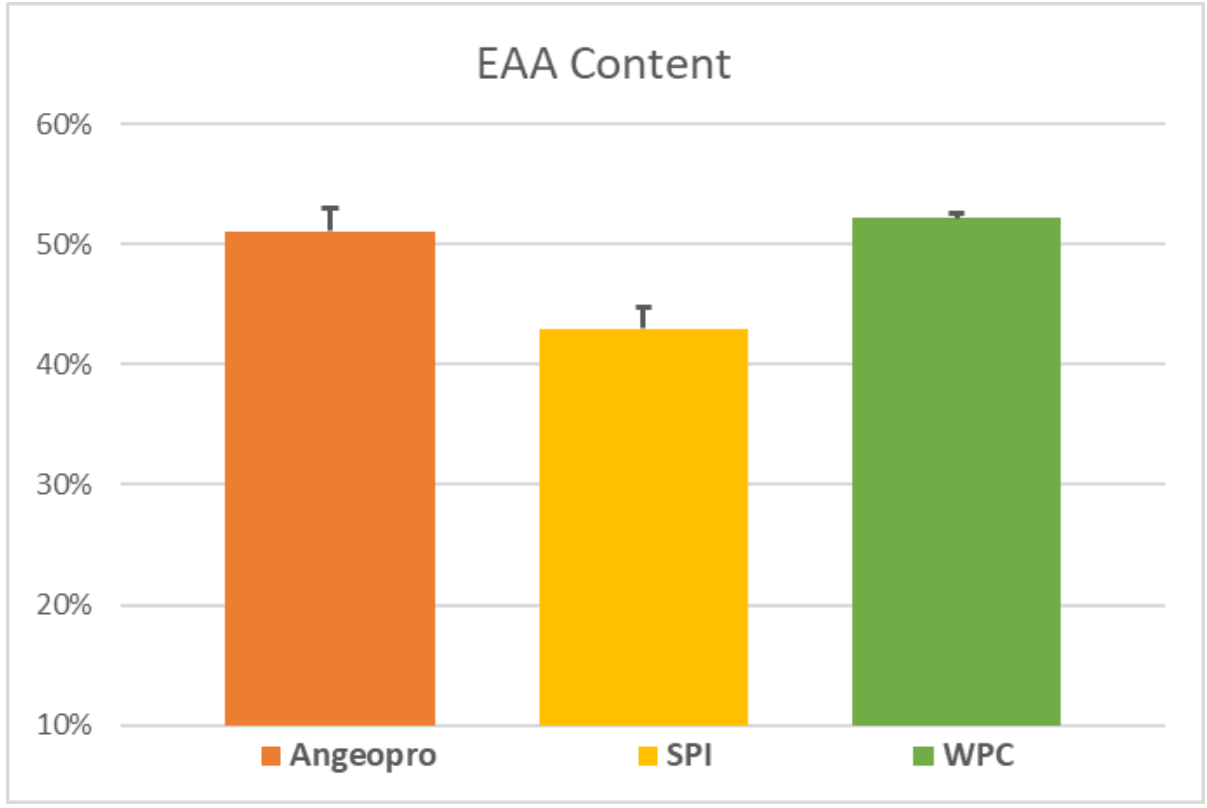
- Angeopro™ Yeast protein is produced from ***Saccharomyces cerevisiae*** by removing nucleic acid and enzymatically removing the cell wall.

Protein Quality Evaluation and Comparison

Evaluation Methods for Protein Quality

- **Complete Protein**
- **Essential Amino Acids (EAA) Content**
- Essential Amino Acids Profile
- **Bioavailability:**
  Protein Digestibility
- **Chemical Score**
  PDCAAS
  DIAAS

Yeast protein is rich in all essential amino acids (or indispensable amino acid), and is a complete protein.



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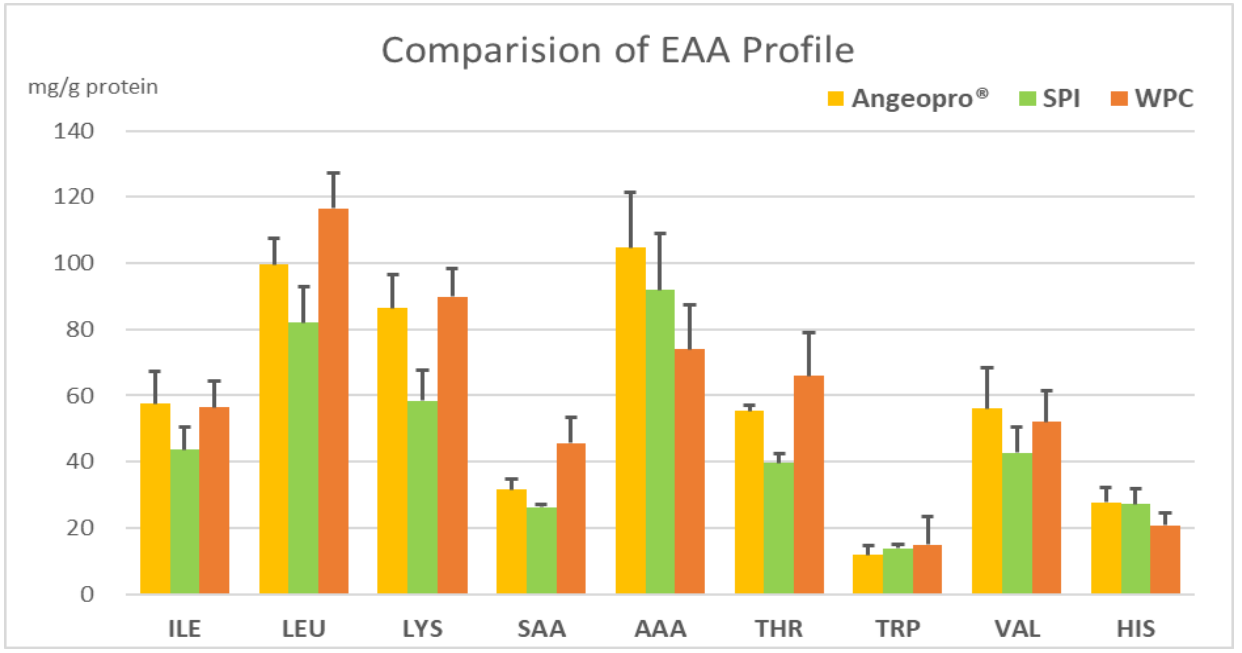

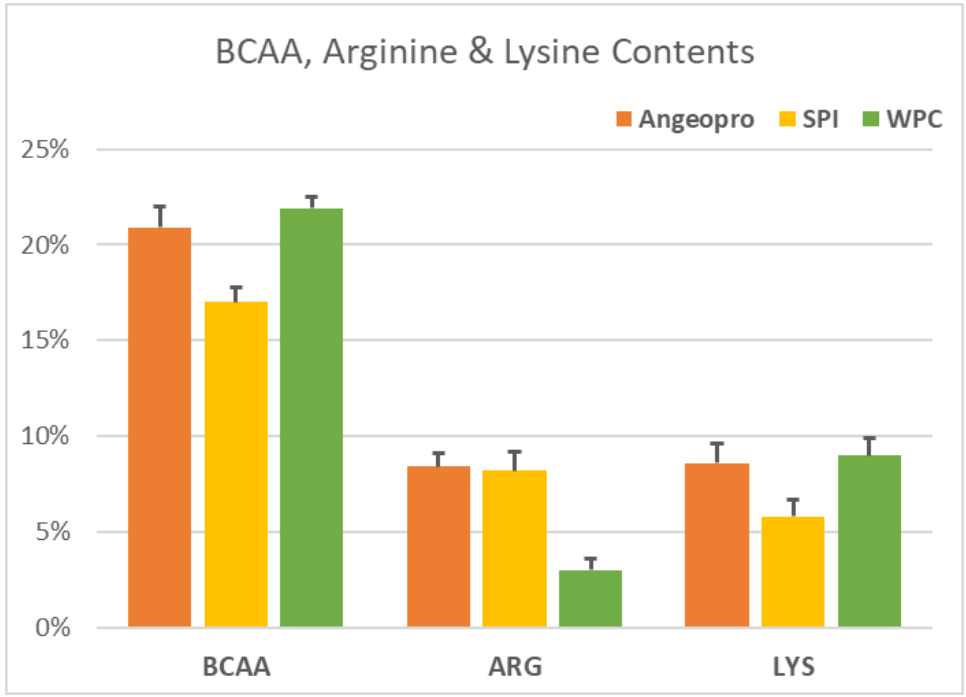

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	Value	Source
True protein digestibility	**85.0%**	Cao, et al. Food Chemistry, 2025.
Digestibility at the end of the small intestine	**92.5%**	Chen, et al. Journal of Henan University of Technology, 2019.
Absorption rate of FAAs	**93.6%**	Qiao, et al. Food Chemistry, 2025.
Digestibility in vitro	**97.7%**	

Cao, et al. Evaluation of the Nutritional Quality of Yeast Protein in Comparison to Animal and Plant Protein using Growing Rats and INFOGEST Model. Food Chemistry, 2025
Chen, et al. Amino Acid Composition Analysis and in Vitro Dynamic Digestion of Proteins from Three Different Sources[J]. Journal of Henan University of Technology 2019.
Qiao, et al. Research on the Release And Absorption Regularities of Free Amino Acids and Peptides in Vitro Digestion of Yeast Protein. Food Chemistry, 2025.

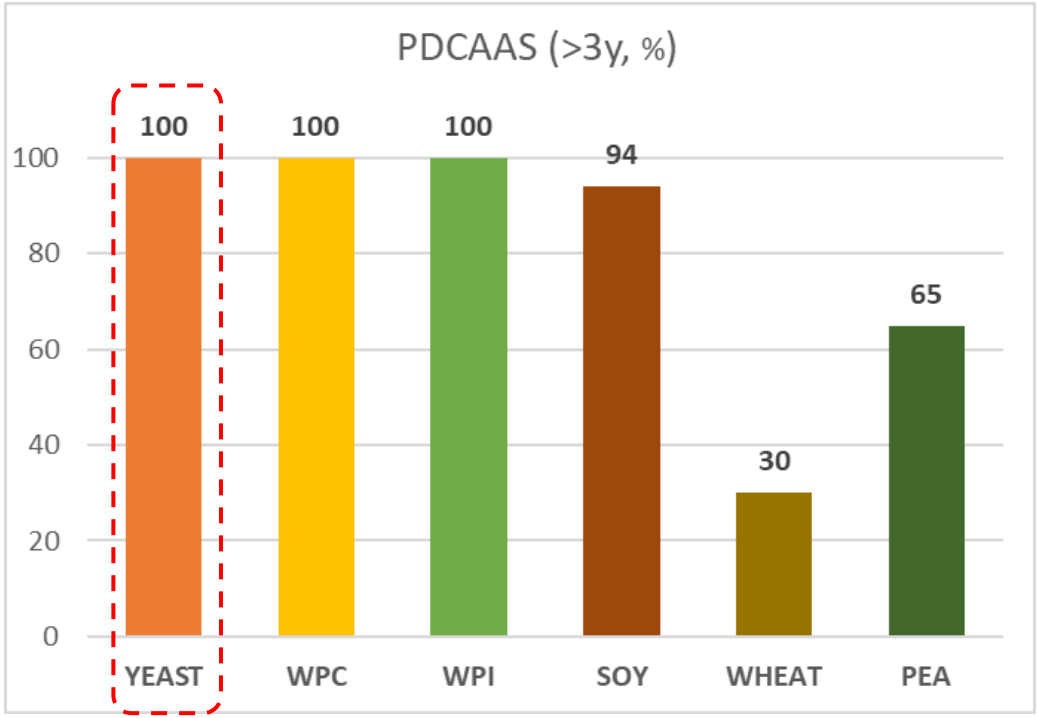
Protein Quality Evaluation and Comparison

Evaluation Methods for Protein Quality

- **Complete Protein**
- **Essential Amino Acids (EAA) Content**
- **Essential Amino Acids Profile**
- **Bioavailability**
  - Protein Digestibility
  - PER (protein efficiency ratio)
- **Chemical Score**
  - **PDCAAS**
  - DIAAS

Protein Digestibility-Corrected Amino Acid Score

PDCAAS=AAS (amino acid score) × TPD (true protein digestibility)



CAO X, et al. Evaluation of the Nutritional Quality of Yeast Protein in Comparison to Animal and Plant Protein using Growing Rats and INFOGEST Model. Food Chemistry, 2025

Protein Quality Evaluation and Comparison

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  - Protein Digestibility
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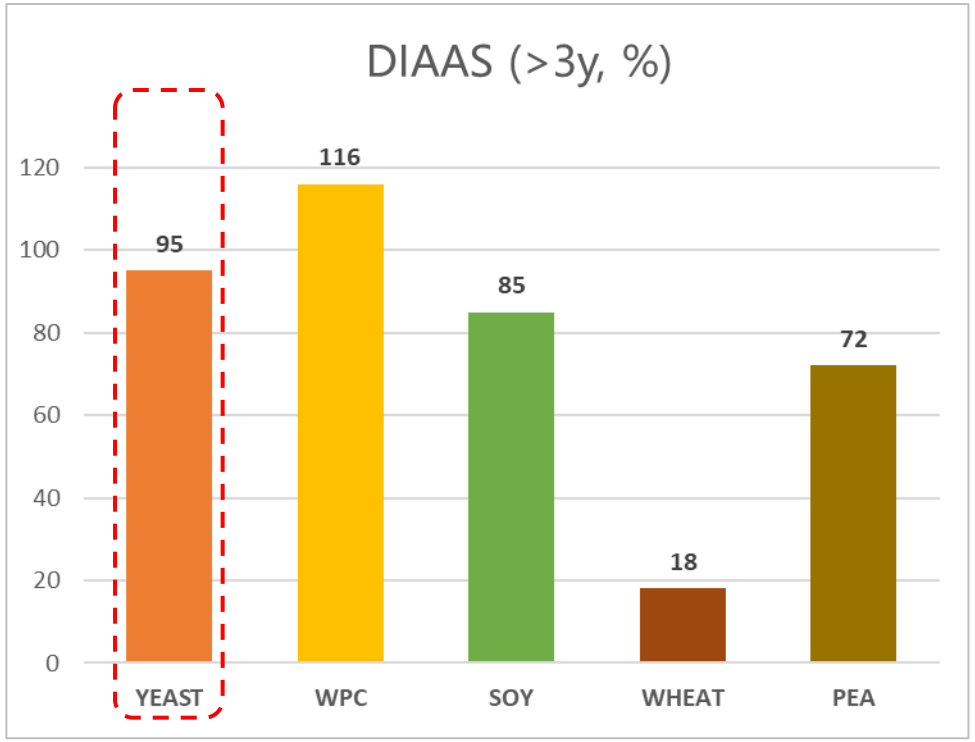
  - PDCAAS
  - **DIAAS**

Digestible Indispensable Amino Acid Score

DIAAS=AAS ×TID (true ileal amino acid digestibility)



CAO X, et al. Evaluation of the Nutritional Quality of Yeast Protein in Comparison to Animal and Plant Protein using Growing Rats and INFOGEST Model. Food Chemistry, 2025

Strengths of Yeast Protein

Product Carbon Footprint Certificate

No.: 04125CFP0448

Product Name : Yeast protein F84

Standard : ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification

Reporting Period : April 1, 2024 –April 30, 2025

Boundary : Cradle-to-Gate

Declared Unit : 1 Kg Yeast protein F84

***GHG Emissions :** 8.071 kgCO_2e

Manufacturer : Angel Yeast (Binzhou) Co., Ltd.

Factory Location : No. 139, Yongxin Road, Binbei, Bincheng District, Binzhou City

Issue Date : September 3, 2025

Life cycle distribution:

★ The carbon footprint data expressed in the certificate is scientifically modeled, calculated and verified according to recognized standards and within a set of strict limits. The data only demonstrates that the responsible party is meeting its responsibility and commitment to combat climate change and is publicly disclosing its efforts to control greenhouse gas emissions over the long term.
Drawing direct comparisons between carbon footprint data from similar products and data from the certificate is unscientific and it is inappropriate to draw conclusions of superiority or inferiority based on such comparisons. Anyone using the carbon footprint data in a misleading manner shall be held responsible for the consequences in accordance with relevant laws and regulations.

CTI

General manager:

CTI Certification Co., LTD.

Zone A 8F CTI Building, No.4 Liu Xian San Road, Xin'an Street, Bao'an District, Shenzhen, Guangdong Province, China.

Certificate of Carbon Footprint

8.071 kg CO_2/kg

Angel Yeast has built an annual production line for 10,000 tons of yeast protein.

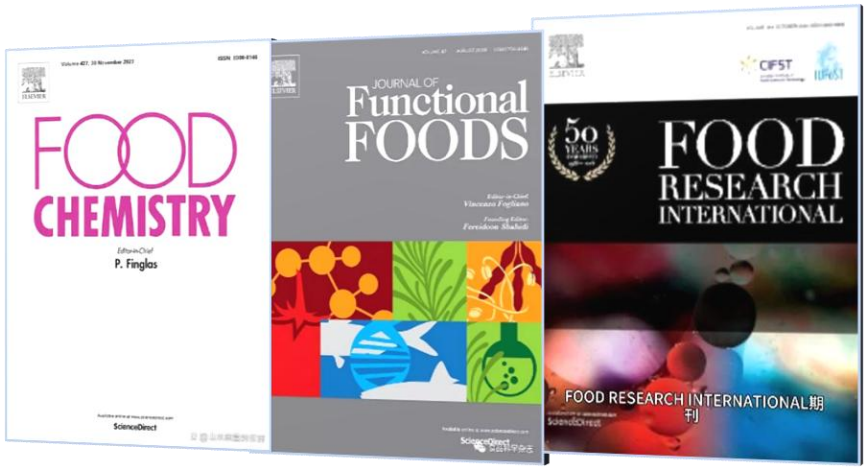
Angel Yeast is building a yeast protein production line with an annual production capacity of 11,000 tons in Baiyang.

Manufacture base of
Angel Yeast (Yichang) Co., Ltd

Intellectual Property Literature

Published, by March 2026

~50	30+	50+
Related Research Papers	SCI Papers	Patents



- Seniors, Improving Muscle Mass & Exercise Performance (Published)
- Seniors, Improving Sarcopenia (In Publication)
- Professional Athletes, Improving athletic performance and promote post-exercise recovery (Trail Finished)

… Promoting muscle synthesis, Canada, 2025

… Improving athletic performance and recovery, Denmark, 2025

… Improving sarcopenia, Shenzhen, 2025

… Promoting skeletal muscle health in Sports people, Wuhan, 2025

Clinical RCT

Published Studies of AngeoPro®

No.	Category	Title	Article
1	in Vitro Test	Using SIFR® technology to study the impact of three proteins on the **gut microbiota** of European populations	Report Available
2	Clinical Trail (RCT)	Effect of Yeast Protein on **Muscle Mass and Performance in an Adult Population** – a Double Blind, Randomised Controlled Trial	Briskey. Journal of Food and Nutrition Research, 2024
3	Nutritional Study	Evaluation of the **nutritional quality** of yeast protein in comparison to animal and plant proteins using growing rats and INFOGEST model	Cao. Food Chemistry, 2025
4	Physicochemical Properties	Characterization of the **Key Aroma Compounds** in Different Yeast Proteins by GC-MS/O, Sensory Evaluation, and E-Nose	Chen J, Foods, 2023
5	Application Research	**Emulsified sausages** with yeast protein as **an animal fat replacer**: Effects on nutritional composition, spatial structure, gel performance, and sensory quality	Guo. Meat Science, 2024
6	Application Research	Effect of yeast protein on **reduced-fat ice cream**: Sensory quality, rheological behaviour, thermal properties and fat destabilisation	Guo. Int J of Dairy Tech, 2024
7	Application Research	**Enhanced O/W emulsion stability** and betanin protection using yeast protein and chitooligosaccharide: Comparative insights from complex coacervation and layer-by-layer methods	Hu. Food Hydrocolloids, 2024
8	Review	Nutritional Values and Bio-Functional Properties of Fungal Proteins: Applications in Foods as a Sustainable Source	Li K, Foods, 2023
9	Animal Experiment	Muscle aging amelioration by yeast protein supplementation was associated with **gut microbiota**	Liao, Journal of Functional Foods, 2022
10	Physicochemical Properties	Ultrasound-assisted pH shift-induced interfacial remodeling for **enhancing soluble yeast protein content**: Effects on structure and interfacial properties of proteins under different treatment conditions	Ma. Food Hydrocolloids, 2024
11	Review	Yeast proteins: The novel and sustainable alternative protein in food applications	Ma. Trends in Food Science & Technology, 2023
12	Nutritional Study	Yeast protein in comparison with four common plant proteins in **physicochemical properties**	Ma, Current Research in Food Science, 2023
13	Nutritional Study	Yeast protein as a novel protein source: **Processing, functional properties, and potential applications** in foods	Ma. Innovative Food Science and Emerging Technologies, 2024

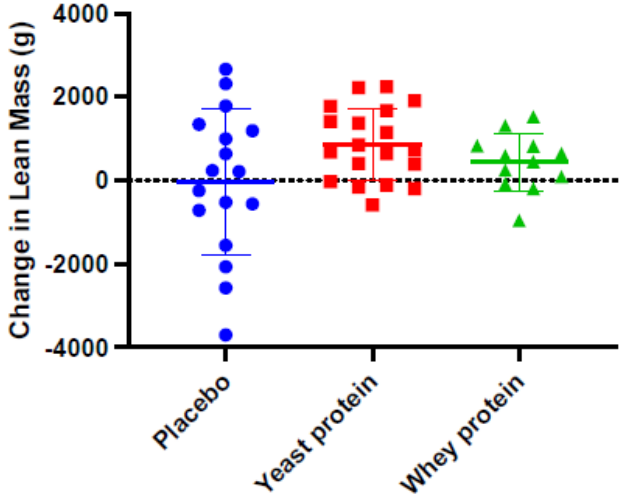
Published Studies of AngeoPro®

No.	Category	Title	Article
14	Physicochemical Properties	The **interaction mechanism and the functionality** of yeast protein with hydrophilic and hydrophobic bioactive molecules	Sun. Food Bioscience, 2023
15	Application Research	3D edible scaffolds with yeast protein: A **novel alternative protein scaffold** for the production of high-quality cell-cultured meat	Wang. Int J Biol Macromol, 2024
16	Nutritional Study	**Slow-digestive yeast protein concentrate**: An investigation of its in vitro digestibility and digestion behavior	Wang, Food Research International, 2023
17	Application Research	**Yeast protein-based meat analogues**: Konjac glucomannan induces the fibrous structure formation by modifying protein structure	Xia, Food Hydrocolloids, 2023
18	Application Research	**Physicochemical and structural properties of meat analogues** from yeast and soy protein prepared via high-moisture extrusion	Xia, Food Chemistry, 2023
19	Application Research	A mechanistic investigation into combined influences of NaCl and extrusion temperature on **fibrous structures of high-moisture textured yeast protein**	Xia, Food Chemistry, 2024
20	Nutritional Study	Yeast protein: In vivo **gastrointestinal digestion and biochemical characteristics**	Xie. Food Bioscience, 2024
21	Application Research	Ultrasound assisted fabrication of the yeast protein-chitooligosaccharide-betanin composite for **stabilization of betanin**	Yang R, Ultrasonics Sonochemistry, 2024
22	Animal Experiment	The Effects of Yeast Protein on **Gut Microbiota** in Mice When Compared with Soybean Protein and Whey Protein Isolates	Zhou, Nutrients, 2024
23	Nutritional Study	**Amino Acid Composition Analysis** and in Vitro Dynamic Digestion of Proteins from Three Different Sources (CN)	陈智仙，河南工业大学学报（自然科学版），2019
24	Physicochemical Properties	Comparative Study on **Flavor Stability** of Four Protein Powder Food Ingredients (CN)	董运海，食品工业，2023
25	Physicochemical Properties	Study on **Amino Acid Determination and Nutritional Evaluation** of 4 Kinds of Proteins from Different Sources (CN)	孙合群，饮料工业，2022
26	Nutritional Study Properties	**Nutritional evaluation** of yeast protein (CN)	唐晓荞，公共卫生与预防医学，2020
27	Psysicochemical Study	Determination and Comparative Analysis of Four **Purines** in Yeast Protein (CN)	武惠敏，食品研究与开发，2023
28	Application Research	Study on preparation technology of light food **prepared chicken breast meat** added with yeast protein (CN)	刘雪姣，肉类工业，2022

RCT1: Improve Muscle Mass & Exercise Performance

- 79 completed the study, with an average age of 59 years old
- **Yeast protein group**, Placebo (carbohydrate) group**, Whey protein group**
- Protein intake: **40g/day, 20 g in the morning and 20 g at lunch, 8 weeks**

Figure 1 – change in lean mass after 8 weeks



Changes Relative to Baselines

N=47	Placebo	AngeoPro®	Whey protein
Max bench press (kg)	2.59	5.78*	5.77*
Lean Total (g)	-50.49	867.14*	357.73
Total Mass(g)	518.24	950.94	654.37

*significant difference compared to placebo

Conclusion

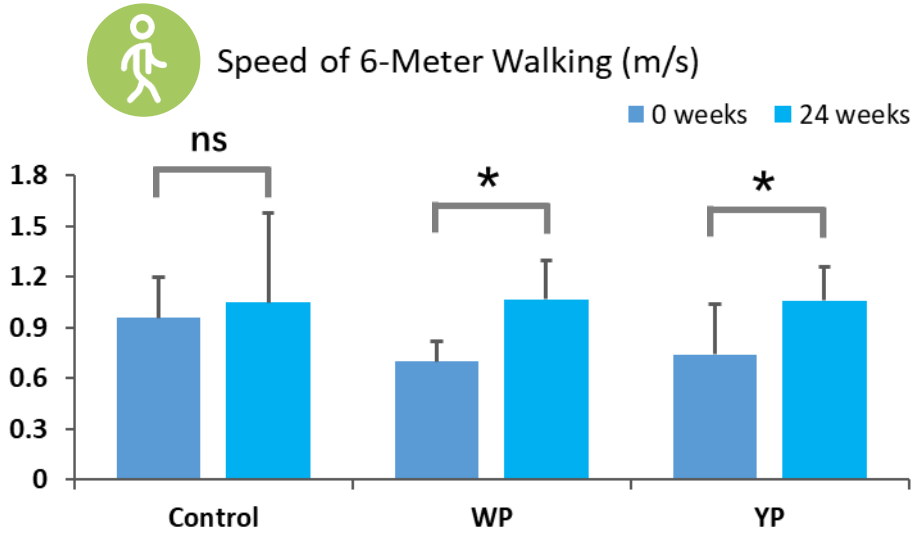
- **AngeoPro® and the whey protein increased lean meat mass and muscle strength, significantly higher than the placebo group.**
- The performance of yeast protein and whey protein is similar, indicating that **yeast protein is equally effective in increasing muscle mass and strength in elderly people as whey protein.**

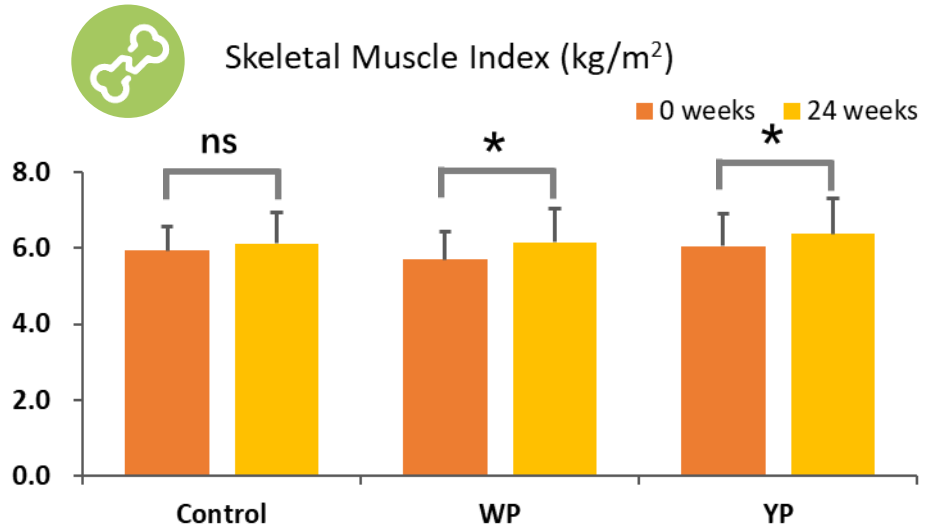
Effect of Yeast Protein compared to whey protein and a placebo on muscle mass and performance in an Adult Population – A double blind, randomised controlled trial, 2022

RCT2: Improve Sarcopenia

- 92 seniors were selected to meet the inclusion criteria.
- Three groups: Control, **Yeast Protein (YP), Whey Protein (WP)**
- Protein intake: **20g/day, 24 weeks**

Key Indicators:





Conclusion:

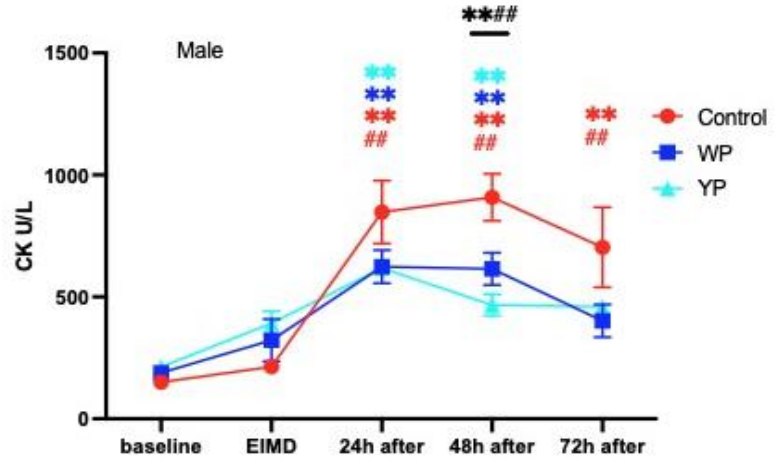
- There were significant differences of 6-meter walking speed and skeletal muscle index before and after intervention in the two test groups.
- Protein supplements increased the skeletal muscle of the elderly subjects and benefited their physical functions.

A clinical study of yeast protein on senile sarcopenia, 2024 (report)

RCT3: Professional Sports Population

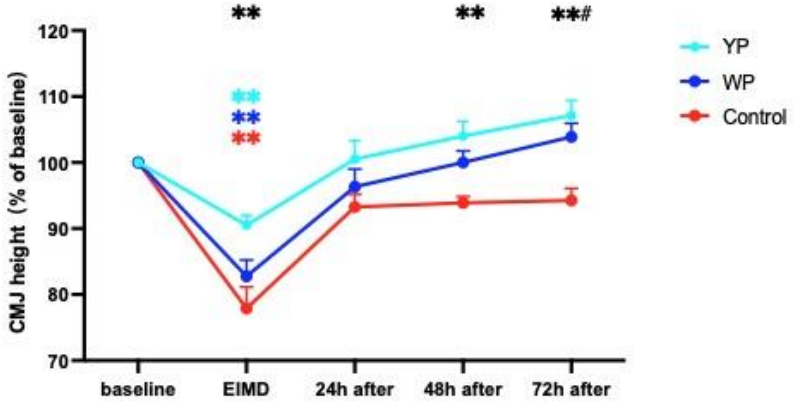
1 Short-term Intervention (7 days+10 days)

- 54 athletes of national first-class level or above from Beijing Sport University.
- Yeast protein-whey protein group (1:1, YP), N=15; Whey protein group (WP), N=17; Control group, only water, N=16;
- 0.9g/kg pre day, 0.3g/kg each in the morning, at noon and in the evening.
- Baseline, 7days; EIMD (Exercise-Induced Muscle Damage); EIMD-post, 10 days.



The Changes of Visual Scale of Muscle Pain Degree Before and After EIMD

** in black represents YP VS Control, p<0.01; ## in black represents WP VS Control, p<0.01;
** in color represents a comparison with each group of baseline; ## in color represents a comparison with each group of EIMD.



The Changes of CMJ (Countermovement Jump) Height Before and After EIMD

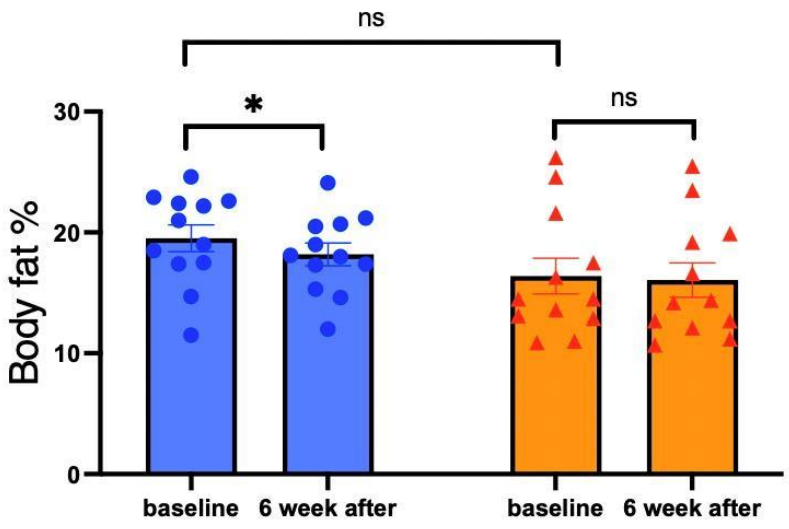
Preliminary Conclusion

Short-term supplementation of yeast-whey complex protein or single whey protein can both reduce the levels of muscle injury markers and inflammation in the serum of athletes, alleviate the degree of pain, and have a good protective effect on skeletal muscle function.

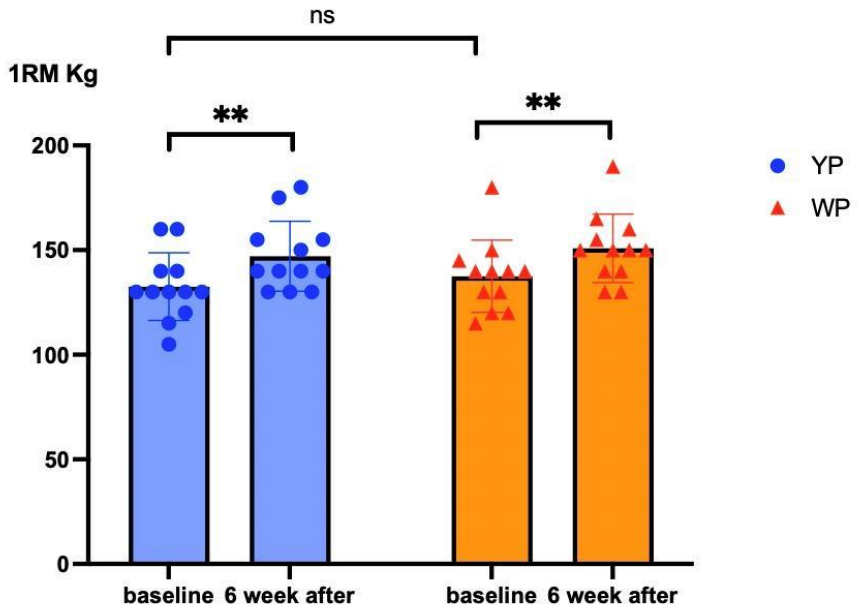
RCT3: Professional Sports Population

2 Long-term Intervention (6 weeks)

- 24 first-class basketball players;
- Yeast protein-whey protein group (1:1, YP), N=12; Whey protein group (WP), N=12
- 30g/day. Strength training Day: Within 30 minutes after training; Non-training day: 1-2 hours before sleep.



The Changes of Body Fat Percentage Before and After 6-week Intervention



The Influence of 6-week Intervention on the Maximum Squat Weight (Squat 1RM) of Athletes

Preliminary Conclusion

Long-term (6 weeks) supplementation of yeast-whey complex protein combined with resistance training will have a good promoting effect on the body composition and sports performance of high-level basketball players.

03

The Application of Yeast Protein

Clear Protein Drink

Item	Details
Name	**Clear Protein Water**
Scenarios	Daily protein supplementation; For individuals with high exercise load and those in urgent need of rapid protein replenishment
Product Features	1. **Protein content ≥ 6%;** 2. Rapid energy replenishment: Rich in small molecular peptides for quick protein supplementation; 3. Anti-fatigue: Added taurine and guarana extract; 4. Metabolism promotion: Contains vitamin B1 and B6; 5. Allergen-free; 6. Sucrose-free; 7. Artificial color-free; 8. Synthetic sweetener-free; 9. Artificial synthetic essence-free
Yeast Protein	Hydrolyzed Yeast Protein Angeopro HC8000
Ingredient Information	Purified water, **hydrolyzed yeast protein (8%)**, fructooligosaccharides, orange powder, cyclodextrin, vitamin B1, vitamin B6, taurine, guarana extract, vitamin C, citric acid, sodium citrate, stevioside, monk fruit extract, yeast extract, natural orange flavor

RTD

Item	Details
Name	Chocolate Flavored High Protein Drink
Scenarios	Daily protein supplementation; People with high-intensity exercise and in urgent need of rapid protein replenishment
Features	• **High protein: ≥12%** • Vegan formula • Allergen-free • No artificial colors • No synthetic sweeteners
Yeast Protein	Angeopro Hi9001
Ingredients	Water, **yeast protein (14%),** sugar, vegetable oil, chocolate mass, cyclodextrin, alkalized cocoa powder, compound stabilizer, edible salt, steviol glycosides, food flavor

Protein Bar

Item	Details
Sample Name	Yogurt strawberry-flavored protein bar
Scenarios	Fitness and weight management groups; Casual gatherings as snacks
Product Features	•Microbial protein source •**high protein (34g/100g)** •Yogurt and strawberry double flavor.
Yeast Protein	Angeopro F90 (Recommended addition, 10%-36%)
Ingredients	Blended protein (**yeast protein（25%）**, whey protein concentrate), maltitol liquid, strawberry cubes, Coconut Powder (coconut milk, maltodextrin, sodium caseinate, trisodium phosphate), milk chocolate, coconut oil, glycerin, yoghurt powder (fermented yoghurt powder, whole milk powder, Limosilactobacillus fermentum), strawberry powder, beetroot powder, lecithin, DL-malic acid, flavorings. Contains: Dairy.

Features of AngeoPro®

1. **Microbial Source**
   Non-animal, non-GMO, suited for vegans
2. **Safe & Reliable**
   From baker's yeast (*Saccharomyces cerevisiae*)
3. **Affordable & Stable**
   Excellent efficiency & Environmental resilience
4. **Eco-Friendly & Sustainable**
   Less resources consumption and circular economy model
5. **55%-90% Protein**
   With a little of fat, glycan, ash & moisture
6. **Premium Quality**
   Complete protein. PDCAAS=1.0
7. **Well-documented Bioactivities**
   Muscle, gut microbiota, immunity
8. **Wide Applicability**
   Clean flavor & Seamless Integration in Foods

THANK YOU

Angeopro

Dr. Winston Sun

sunwz@angelyeast.com