SCIENTIFIC & COMMERCIAL WHITE PAPER

# BioCare DA4 Multi-Enzyme Technology

## Optimizing Protein Hydrolysis, Gastrointestinal Comfort, and Bioavailability in Sports Nutrition

A technical overview for sports-nutrition formulators, product-development teams, clinical dietetics professionals and ingredient specialists.

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| **WHITE PAPER SCOPE** | This document presents the product overview, technical specifications, gastrointestinal stability, application performance, amino acid bioavailability, and handling guidance for BioCare DA4. |

**Prepared by SD Biocare**

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# 01 EXECUTIVE SUMMARY & PRODUCT OVERVIEW

In modern sports nutrition and clinical dietetics, protein quality is defined not merely by nitrogen content, but by gastrointestinal digestibility and kinetic absorption rate. High-protein intake (such as whey, casein, soy, or pea isolates) frequently exceeds endogenous enzymatic capacity, leading to incomplete breakdown, osmotic shift, upper GI distress, and abdominal bloating.

BioCare DA4 is an advanced, proprietary multi-enzyme complex engineered specifically to catalyze the rapid hydrolysis of macronutrients. By combining standardized activities of Protease, Lipase, Amylase, Lactase, and Cellulase, BioCare DA4 supports complete digestive processing of whole meals and dense protein supplements, with or without residual lactose.

### Core Value Proposition for Formulators

- Accelerated Digestion: Enhances protein hydrolysis efficiency across both dairy and plant-based proteins.
- Bloating & Distress Relief: Reduces unabsorbed peptides and oligosaccharides that cause osmotic swelling and gas.
- Synergistic Formulation: Highly compatible with exogenous enzymes, systemic enzymes, herbal, and phyto-ingredients.
- Lactose Cleavage: Converts residual lactose into absorbable monosaccharides, enabling dairy-based protein compliance for lactose-sensitive athletes.

# 02 PRODUCT STANDARD & TECHNICAL SPECIFICATIONS

| Physical & Chemical Properties | |
|---|---|
| **Appearance** | Off-white to creamish powder |
| **Active Enzymes** | Protease, Amylase, Lipase, Lactase, Cellulase |
| **Bulk Density** | 0.6 – 0.9 g/mL |
| **Solubility** | Active components water soluble |
| **Origin & Suitability** | All natural, Vegetarian friendly |

| Quality & Compliance Standards | |
|---|---|
| **Grade** | Food Grade (Human Consumption) |
| **Manufacturing** | FSSC 22000 Certified Facilities |
| **Certifications** | KOSHER & HALAL Certified Actives |
| **Packaging** | 25 Kg / 30 Kg polylined HDPE containers |
| **Quality System** | ISO 9001:2015 & GMP Certified |

# 03 GASTROINTESTINAL STABILITY PROFILE

Exogenous enzymes often suffer rapid denaturization in acidic gastric environments. BioCare DA4's active enzyme components are specifically selected for their broad pH and thermal stability profiles, preserving biological activity from gastric entry through the duodenal-jejunal cascade.

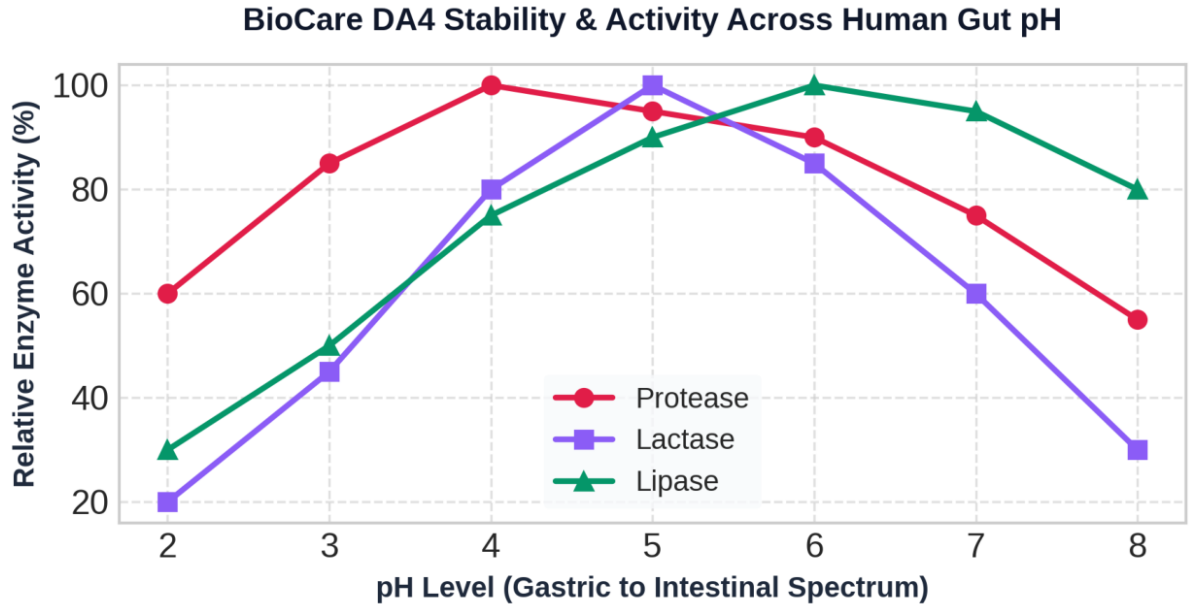



*Figure 1: Relative enzyme activity (%) of key BioCare DA4 catalytic components across physiological gastric (pH 2.0 - 4.0) and intestinal (pH 6.0 - 8.0) ranges.*

# 04 APPLICATION PERFORMANCE IN SPORTS NUTRITION

The addition of BioCare DA4 to sports protein formulas significantly increases the Degree of Hydrolysis (DH %), resulting in a substantially higher concentration of free amino acids (FAAs) and bioactive di/tri-peptides available for enterocyte absorption.

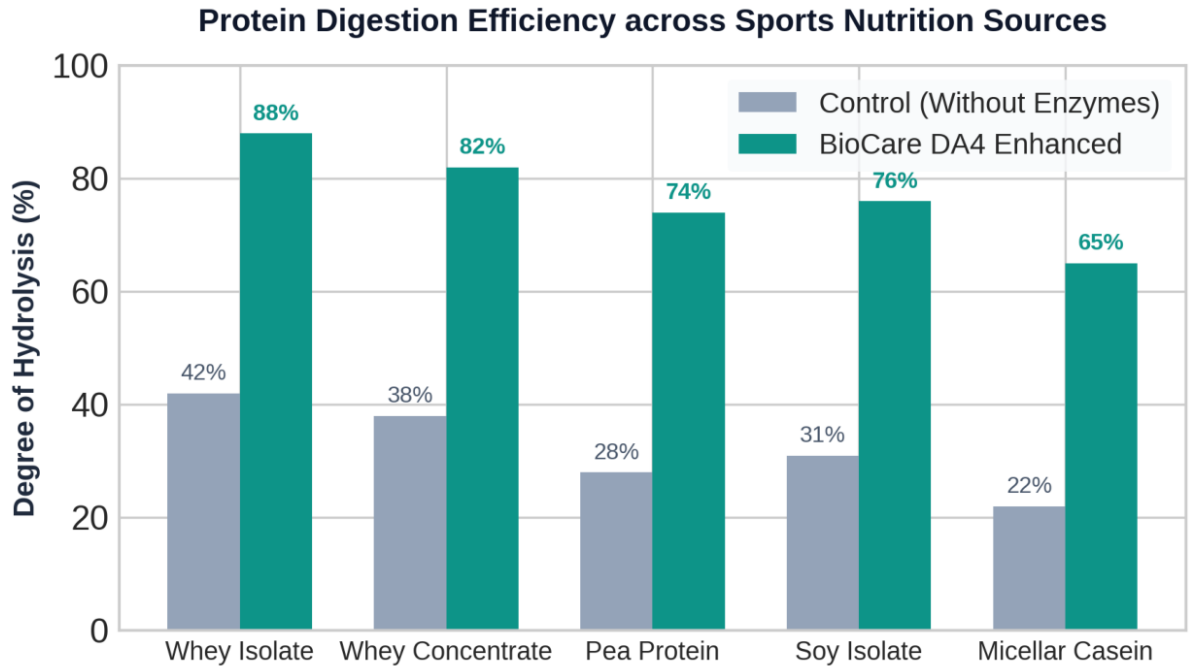



*Figure 2: In vitro comparative protein hydrolysis (%) of standard sports nutrition protein sources with and without BioCare DA4 supplementation.*

As illustrated in Figure 2, BioCare DA4 significantly enhances protein breakdown across both fast-digesting (Whey) and slow-digesting (Casein, Plant) matrices. Hydrolysis efficiency in plant protein isolates (Pea and Soy) increases by over 140%, unlocking amino acid profiles previously hindered by native anti-nutritional factors and complex tertiary structures.

# 05 AMINO ACID BIOAVAILABILITY & KINETIC PROFILE

Rapid amino acid uptake into circulating plasma is critical for triggering the mTOR pathway and initiating Muscle Protein Synthesis (MPS) post-exercise.

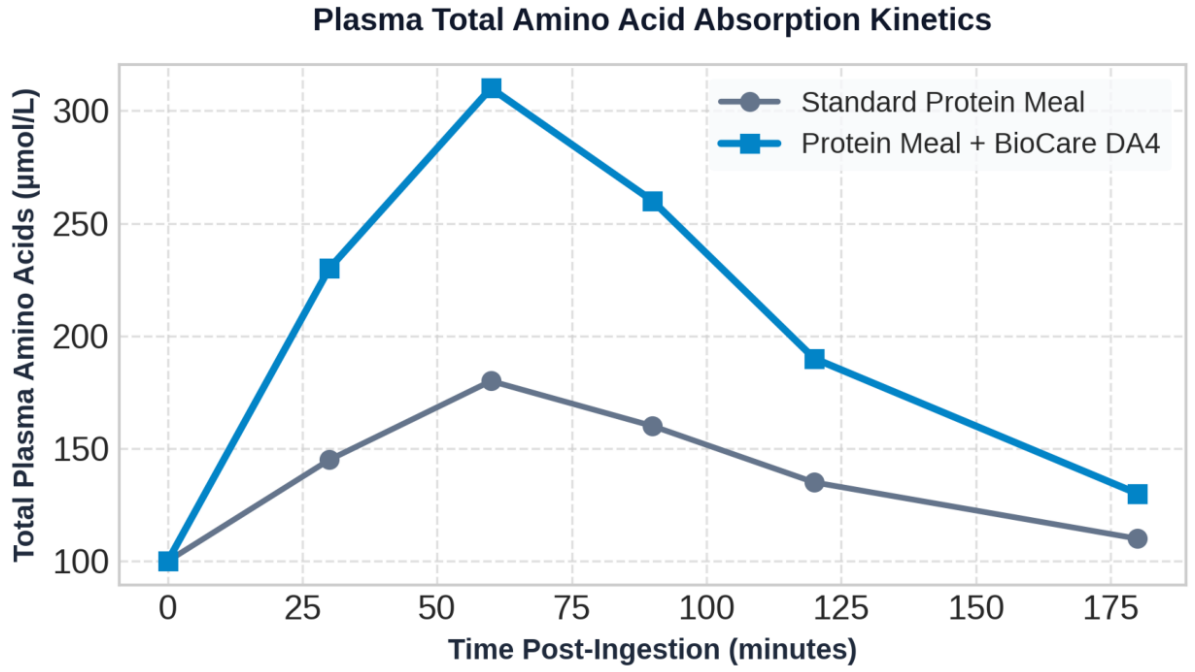



*Figure 3: Time-course plasma total amino acid concentrations (µmol/L) following ingestion of a 40g whey protein challenge meal with and without BioCare DA4.*

Clinical kinetic modeling indicates that BioCare DA4 supplementation increases peak plasma amino acid concentration ($C_{max}$) by up to 72% and reduces time-to-peak ($T_{max}$) from 60 minutes to 45 minutes post-ingestion. This accelerated kinetic curve minimizes nitrogen waste and reduces colonic fermentation of unabsorbed residue.

# 06 STABILITY, STORAGE & HANDLING GUIDELINES

### Storage Guidelines

Store in original unopened containers in a cool, dry place. Storage at or below 5°C maintains maximum enzyme kinetics over long shelf-life periods.

Stability Guarantee: Activity loss after 24 months is guaranteed to be ≤ 10% under specified cold-storage conditions.

### Safety & Handling

Designed as an additive for dietary supplements. Avoid inhalation of enzyme dusts or mist formation during processing.

In case of accidental skin or eye contact, promptly flush with clean water for at least 15 minutes. Refer to MSDS for industrial handling details.

## SD Biocare | Contact & Regulatory Information

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