

# Mevalia

AMINO  
ACIDS



## **GMP-based protein substitutes and a sense of fullness. Powered by Mevalia PKU GMPOWER.**

GMPOWER is a product based on glycomacropeptide, which is naturally free from phenylalanine\*. It is a preferred tasting protein supplement for the dietary management of PKU patients.

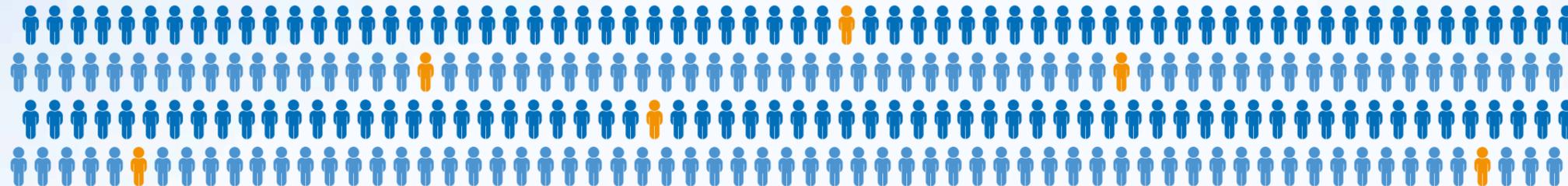
**Endless innovation brings powerful solutions.**

**DrSchär**

\* The residual amount of Phe is due to the presence of minor amounts of other proteins/peptides.



Phenylketonuria (PKU) is an inborn error of amino acid (AA) metabolism due to mutations in the phenylalanine hydroxylase gene. This causes decreased ability or inability to convert the phenylalanine (phe) to tyrosine [1].



## NUTRITIONAL MANAGEMENT OF PKU

- Low Protein food
- Amino Acids mixtures
- GMP-based mixtures

The main stay of treatment is a **lifelong low-Phe diet**. The aim of dietary treatment is to prevent excessive Phe accumulation in the blood by strict control of natural protein intake in combination with the administration of a Phe-free protein substitute [17].

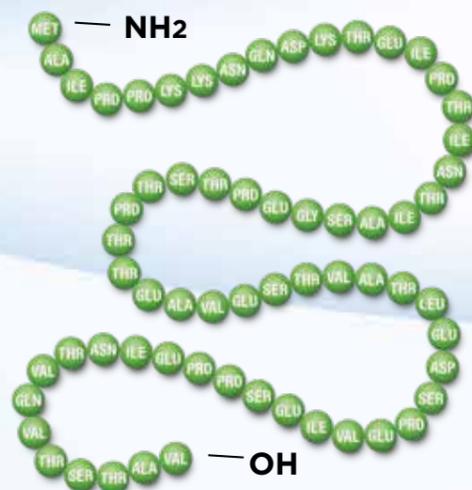
**Compliance to the nutritional therapy:** in Europe and North America up to 50% of adult PKU patients are lost to follow-up [2]<sup>1</sup>. **Typical issues linked to poor diet compliance in PKU patients:** metabolic control and neurologic outcomes.

Recent studies show that patients express a **strong preference to consume GMP based products** rather than their usual AAs [3;4;5;16].

**GMP medical foods, are ideally suited to the PKU diet** as an alternative to the Phe-free amino-acid medical foods currently required to control Phe levels in individuals with PKU [6].

### Protein source is glycomacropeptide

GMP is a 64-amino-acid (AA) peptide produced during cheesemaking when bovine kappa (k)-casein is cleaved by chymosin into para-k-casein, which remains with the curd, and GMP, which remains with the whey [7].



<sup>1</sup> Of the remainder, 30-90% are "off diet". Of those on diet, 70% are not in good control.

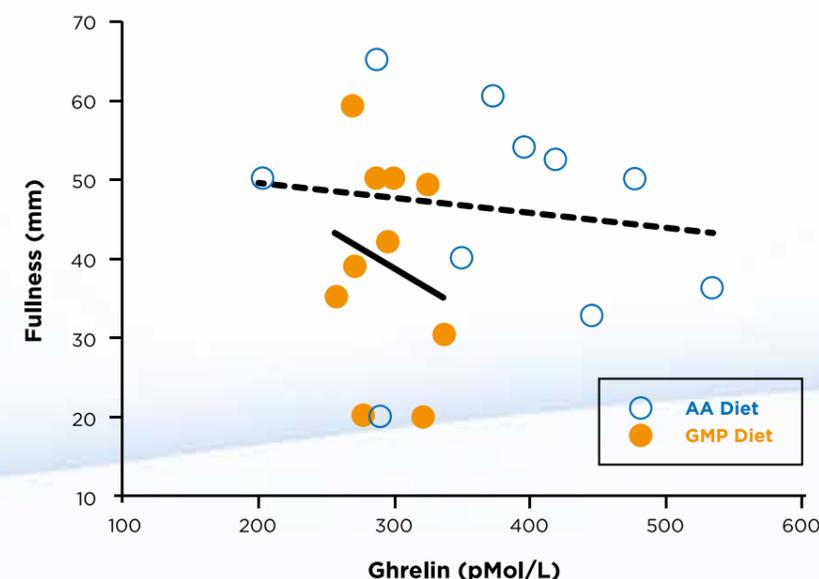
## BENEFITS OF GMP FOR PKU PATIENTS (1)

**GMP has a better taste and smell compared to traditional AA mixtures [5].**

**Compliance** with the highly restrictive, low-Phe diet required for the management of PKU **remains poor during adolescence and adulthood**, resulting in elevated blood Phe levels and neuropsychological deterioration. **Dietary GMP, provides an innovative approach to improving the nutritional management of PKU.** A more tasty and versatile low-Phe diet **may lead to improved dietary compliance, metabolic control and ultimately quality of life for individuals with PKU [6].**

**GMP provides a protein source that can be more easily spaced throughout the day [1].**

Greater ghrelin suppression following a meal with intact protein compared to AAs may be due to variations in the rate of absorption of synthetic AAs compared with GMP. Fast absorption of AAs has been shown to negatively affect protein retention and utilization in rats and humans [8,9].



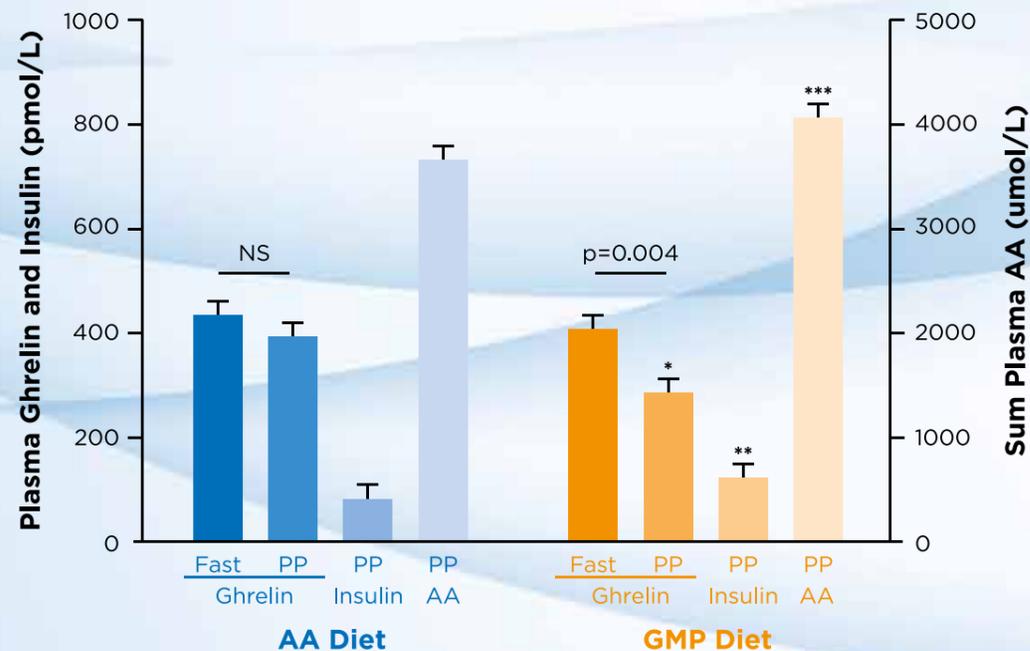
Relationship between plasma ghrelin concentrations 180 minutes after the start of breakfast and feeling of fullness 2 hr after breakfast. Lower postprandial ghrelin was associated with greater feeling of fullness. Lines represent least squares regression lines fitted to individual diet treatment data; AA breakfast is dashed line and GMP breakfast is solid line. Lines are significantly different. Using backward elimination with a mixed effects model, the best model predicting postprandial fullness scores included diet treatment, postprandial ghrelin and the interaction between ghrelin and diet treatment [1].

## BENEFITS OF GMP FOR PKU PATIENTS (2)

GMP intake shows greater ghrelin suppression than AA intake [6].

Whey proteins, such as GMP, may decrease appetite due to sustained levels of plasma AAs [10], whereas synthetic AAs cause an acute rise in plasma AAs which disappear from plasma faster and to a greater extent compared to intact protein, resulting in increased appetite shortly after a meal [11,8].

Supportive of this hypothesis, a breakfast containing GMP induced higher total postprandial plasma AA and lower ghrelin concentrations. Moreover, our data show an association between lower postprandial ghrelin concentration and **greater feelings of fullness suggesting that a GMP meal sustains satiety when compared with AAs.**



Significant changes in plasma concentrations of ghrelin, insulin and amino acids were apparent with the GMP diet. Ghrelin and insulin values represent equal volumes of plasma combined for each subject from days 3+4 for the AA breakfast, days 7+8 for the GMP breakfast. Sum of postprandial (PP) plasma AA values on the last day of the AA diet (day 4) and last day of the GMP diet (day 8). All values are means  $\pm$  3 SEM; n=6 for ghrelin fasting values [1].  
 \*Indicates significantly different from postprandial ghrelin with AA breakfast (p=0.03, paired t-test, pairing on subject; n=10)  
 \*\*Indicates moderately significant difference from insulin with the AA breakfast (p=0.053, paired t-test, pairing on subject; n=10)  
 \*\*\*Indicates significantly different from sum of plasma AAs with the AA breakfast (p=0.049, paired t-test, pairing on subject; n=11)

## GHRELIN AND GMP

GHRELIN



Ghrelin suppression is regulated by postgastric feedback [12], requiring luminal nutrients in the distal intestine, not in the stomach or duodenum [13,14]. The rapid rise of plasma amino acids following consumption of an AA based formula suggests that luminal nutrients are present for a shorter time, therefore **limiting their ability to suppress ghrelin** [15].

GMP provides a protein source that can be more easily spaced throughout the day [1].

Greater ghrelin suppression following a meal with intact protein compared to AAs may be due to variations in the rate of absorption of synthetic AAs compared with GMP.

## CONCLUSIONS

Studies conducted on food saturation show the importance of protein consumption in a meal to improve satiety, and provide evidence that a GMP intake suppresses plasma levels of ghrelin for a longer period of time compared with an AA intake.

GMP-based protein substitutes can be an alternative to amino acids mixtures that can provide a more physiologically complete diet, improve dietary options, and facilitates protein distribution and metabolic control of PKU.

### References

- Erin L. MacLeoda, Murray K. Claytonb, Sandra C. van Calcarc, and Denise M. Neya. Breakfast with glycomacropeptide compared with amino acids suppresses plasma ghrelin levels in individuals with phenylketonuria. Mol Genet Metab. 2010
- Hanley WB. Adult Phenylketonuria. Am J Med 2004
- Van Calcar, S.C.; MacLeod, E.L.; Gleason, S.T.; Etzel, M.R.; Clayton, M.K.; Wolff, J.A.; Ney, D.M. Improved nutritional management of phenylketonuria by using a diet containing glycomacropeptide compared with amino acids. Am. J. Clin. Nutr. 2009
- Zaki, O.K.; El-Wakeel, L.; Ebeid, Y.; Ez Elarab, H.S.; Moustafa, A.; Abdulazim, N.; Karara, H.; Elghawaby, A. The use of glycomacropeptide in dietary management of phenylketonuria. J. Nutr. MeTab. 2016
- Daly, A.; Evans, S.; Chahal, S.; Santra, S.; MacDonald, A. Glycomacropeptide in children with phenylketonuria: Does its phenylalanine content affect blood phenylalanine control? J. Hum. Nutr. Diet. 2017
- D. M. Ney, S. T. Gleason, S. C. van Calcar, E. L. MacLeod, K. L. Nelson, M. R. Etzel, G. M. Rice, and J. A. Wolff. Nutritional management of PKU with glycomacropeptide from cheese whey. J Inheret Metab Dis. 2009
- Doultani S, Turhan KN, Etzel MR. Whey protein isolate and glycomacropeptide recovery from whey using ion exchange chromatography. J Food Sci. 2003
- Deglaire A, Fromentin C, Fouillet H, Airinei G, Gaudichon C, Boutry C, Benamouzig R, Moughan PJ, Tome D, Bos C. Hydrolyzed dietary casein as compared with the intact protein reduces postprandial peripheral, but not whole-body, uptake of nitrogen in humans. Am J Clin Nutr 2009
- Daenzer M, Petzke KJ, Bequette BJ, Metges CC. Whole-body nitrogen and splanchnic amino acid metabolism differ in rats fed mixed diets containing casein or its corresponding amino acid mixture. J Nutr 2001
- Hall WL, Millward DJ, Long SJ, Morgan LM. Casein and whey exert different effects on plasma amino acid profiles, gastrointestinal hormone secretion and appetite. Br J Nutr 2003
- Gropper SS, Acosta PB. Effect of simultaneous ingestion of L-amino acids and whole protein on plasma amino acid and urea nitrogen concentrations in humans. JPEN J Parenter Enteral Nutr 1991
- Williams DL, Cummings DE, Grill HJ, Kaplan JM. Meal-related ghrelin suppression requires postgastric feedback. Endocrinology 2003
- Cummings DE. Ghrelin and the short- and long-term regulation of appetite and body weight. Physiol Behav 2006
- Overduin J, Frayo RS, Grill HJ, Kaplan JM, Cummings DE. Role of the duodenum and macronutrient type in ghrelin regulation. Endocrinology 2005
- Cummings DE, Purnell JQ, Frayo RS, Schmidova K, Wisse BE, Weigle DS. A preprandial rise in plasma ghrelin levels suggests a role in meal initiation in humans. Diabetes 2001
- Maria João Pena, Alex Pinto, Anne Daly, Anita MacDonald, Luís Azevedo, Júlio César Rocha and Nuno Borges. The Use of Glycomacropeptide in Patients with Phenylketonuria: A Systematic Review and Meta-Analysis. Nutrients 2018
- Rocha J. and MacDonald A. Dietary intervention in the management of phenylketonuria: current perspectives. Pediatric Health Med Ther. 2016

| Nutrition declaration:      |            | Per portion |           |
|-----------------------------|------------|-------------|-----------|
|                             |            | 100 g       | 23,4 g    |
| <b>Energy</b>               | KJ<br>kcal | 1352<br>319 | 316<br>75 |
| <b>Fat</b>                  | g          | 1,7         | 0,4       |
| of which saturates          | g          | 0,7         | 0,2       |
| Docosahexaenoic (DHA)       | mg         | 290         | 68        |
| Eicosapentaenoic acid (EPA) | mg         | 64          | 15        |
| <b>Carbohydrate</b>         | g          | 32          | 7,4       |
| of which sugars             | g          | 19          | 4,5       |
| Fibre                       | g          | 3,0         | 0,7       |
| of which GOS                | g          | 1,6         | 0,4       |
| of which FOS                | g          | 0,2         | 0,05      |
| <b>Protein Equivalent</b>   | <b>g</b>   | <b>43</b>   | <b>10</b> |
| Salt                        | g          | 0,82        | 0,19      |
| <b>Amino Acids</b>          |            |             |           |
| L-Alanine                   | g          | 2,76        | 0,65      |
| L-Arginine                  | g          | 2,02        | 0,47      |
| L-Aspartic Acid             | g          | 4,80        | 1,12      |
| L-Cystine                   | g          | 0,25        | 0,06      |
| L-Histidine                 | g          | 1,28        | 0,30      |
| L-Glutamic acid             | g          | 4,17        | 0,98      |
| L-Glutamine                 | g          | 2,76        | 0,65      |
| Glycine                     | g          | 3,36        | 0,79      |
| L-Isoleucine                | g          | 1,84        | 0,43      |
| L-Leucine                   | g          | 2,65        | 0,62      |
| L-Lysine                    | g          | 3,47        | 0,81      |
| L-Methionine                | g          | 0,79        | 0,18      |
| L-Phenylalanine             | mg         | 61          | 14        |
| L-Proline                   | g          | 5,39        | 1,26      |
| L-Threonine                 | g          | 4,03        | 0,94      |
| L-Tryptophan                | g          | 0,77        | 0,18      |
| L-Tyrosine                  | g          | 6,63        | 1,55      |

Osmolality: 825 mOsm/kg



| MEVALIA PKU GMPOWER - IN BOX            |             |
|---|-------------|
| PACKAGING                               | ITEM NUMBER |
| Monoportion 10 g Protein<br>20 x 23,4 g | 5653150700  |

| Nutrition declaration: |    | Per portion |        |
|------------------------|----|-------------|--------|
|                        |    | 100 g       | 23,4 g |
| L-Valine               | g  | 1,48        | 0,35   |
| L-Serine               | g  | 1,42        | 0,33   |
| <b>Vitamins</b>        |    |             |        |
| Vitamin A              | µg | 1248        | 292    |
| Vitamin D              | µg | 37          | 8,75   |
| Vitamin E              | mg | 25          | 5,85   |
| Vitamin K              | µg | 75          | 18     |
| Vitamin C              | mg | 187         | 44     |
| Thiamin B1             | mg | 2,50        | 0,59   |
| Riboflavin B2          | mg | 3,12        | 0,73   |
| Niacin                 | mg | 15          | 3,51   |
| Vitamin B6             | mg | 2,50        | 0,59   |
| Folic acid             | µg | 312         | 73     |
| Vitamin B12            | µg | 5,00        | 1,17   |
| Biotin                 | µg | 75          | 18     |
| Pantothenic Acid       | mg | 8,74        | 2,05   |
| <b>Minerals</b>        |    |             |        |
| Sodium                 | mg | 329         | 77     |
| Potassium              | mg | 1753        | 410    |
| Calcium                | mg | 1774        | 415    |
| Phosphorus             | mg | 1391        | 325    |
| Magnesium              | mg | 329         | 77     |
| <b>Trace Elements</b>  |    |             |        |
| Iron                   | mg | 25          | 5,87   |
| Zinc                   | mg | 13          | 3,07   |
| Copper                 | mg | 1,31        | 0,31   |
| Manganese              | mg | 1,31        | 0,31   |
| Selenium               | µg | 62          | 15     |
| Chromium               | µg | 50          | 12     |
| Molybdenum             | µg | 73          | 17     |
| Iodine                 | µg | 276         | 65     |
| <b>Other Nutrients</b> |    |             |        |
| L-Carnitine            | mg | 25          | 5,86   |
| Choline                | mg | 438         | 102    |
| Inositol               | mg | 125         | 29     |

| MEVALIA PKU GMPOWER - IN TIN |             |
|------------------------------|-------------|
| PACKAGING                    | ITEM NUMBER |
| 468 g TIN                    | 5653360701  |

## MEVALIA GMP-BASED PROTEIN SUBSTITUTE

- ✓ Preferred tasting
- ✓ Enriched with EPA and DHA (essential fatty acids) combined with GOS and FOS (prebiotics)
- ✓ With natural ingredients and a pleasant vanilla flavour



# MEVALIA AMINO ACIDS

2019/07

Dr. Schär develops preferred tasting amino acid mixtures, in liquid and powder form, for the dietary management of PKU patients.

- ✓ Preferred tasting
- ✓ With natural ingredients and free from preservatives
- ✓ Convenience



Foods for special medical purposes for use in the dietary management of phenylketonuria (PKU) and hyperphenylalaninemia (HPA) in children, adolescents and adults.

**Mevalia** | AMINO ACIDS

Dr. Schär AG / SPA  
Winkelau 9  
39014 Burgstall / Postal (BZ) Italy

Tel. +39 0473 293 300  
hcp@drschar-medical.com  
www.drschaer.com

Dr. Schär © 2019

W56\_EN1419

**DrSchär**