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EVALUATION OF A NEW 'MIX-IN' STYLE GLYCOMACROPEPTIDE-BASED PROTEIN SUBSTITUTE FOR FOOD AND DRINKS IN PATIENTS WITH PHENYL-KETONURIA AND TYROSINEMIA

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Introduction:

Poor palatability, large volume and lack of variety of some liquid and powdered protein substitutes (PS) for patients with phenylketonuria (PKU) and tyrosinemia (TYR) can result in poor adherence. This study aimed to evaluate a new unflavoured, powdered GMP-based PS designed to be mixed into drinks, foods or with other PS, in patients with PKU and TYR.

Method:

Paediatric and adult community-based patients were recruited from 8 metabolic centres and prescribed ≥1 sachet/day (10g protein equivalent (PE)) of the Mix-In style PS over 28 days. Adherence, palatability, GI tolerance, and metabolic control were recorded at baseline and follow-up. Patients who completed at least 7 days intervention were included in the final analysis.

Results:

Eighteen patients (3-45 years, 9 males) with PKU (n=12), and TYR (n=6) used the Mix-In style PS for ≥7 days (mean 26.4days (SD 4.6), range 11-28days) alongside their previous PS, with a mean intake of 16.7g (SD 7.7) PE/day. Adherence was 86% (SD 25) and GI tolerance was stable, with n=14 experiencing no/no new symptoms and n=3 showing improved symptoms compared to baseline. Overall palatability was rated satisfactory by 78% of patients, who successfully used the Mix-In style PS in various foods and drinks, including smoothies, squash, and milk-alternatives, as a top-up to meet their protein needs. There was no concern regarding safe-ty/metabolic control during the intervention.

Conclusion:

The 'Mix-In' style PS was well adhered to, accepted, and tolerated. Collectively, these data show that providing a flexible, convenient, and novel format of PS can help with adherence and meet patients' protein needs.

EVALUATION OF A NEW GLYCOMACROPEPTIDE-BASED PROTEIN SUBSTITUTE IN POWDERED AND LIQUID FORMAT IN PATIENTS WITH PKU

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Introduction:

Good adherence to a Phe-restricted diet supplemented with an adequate amount of a protein substitute (PS) is important for good clinical outcomes in PKU. Glycomacropeptide (cGMP)-PS are innovative, palatable alternatives to amino acid-based PS (AA-PS). This study aimed to evaluate a new cGMP-PS in a liquid and powder format in PKU.

Method:

Children and adults with PKU recruited from 8 centres were prescribed at least one serving/day of cGMP-PS for 28 days. Adherence, acceptability and gastrointestinal tolerance were recorded at baseline and end of intervention. Blood Phe levels reported as part of routine care during the intervention were recorded.

Results:

23 patients (powder group, n = 13; liquid group, n=10) completed the study. The majority assessed the products to be palatable (77% of powder group; 100% of liquid group) and well tolerated; adherence to the product prescription was good. Fourteen patients provided blood Phe results during the intervention, which were within the target therapeutic range for most patients (n = 11) at baseline and during the intervention.

Conclusion:

These cGMP-PS were well accepted and tolerated, and their use did not adversely affect blood Phe control.

NEW CONDITION-SPECIFIC PROTEIN SUBSTITUTES DEMONSTRATE GOOD ACCEPTABILITY WITH IMPROVED COMPLIANCE, STABLE TOLERANCE AND METABOLIC CONTROL IN CHILDREN AND ADULTS WITH HCU, MSUD AND TYR

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Introduction:

Dietary protein restriction and intake of condition-specific protein substitutes (CSPS) is necessary to protect against the consequences of Homocystinuria (HCU), Maple Syrup Urine Disease (MSUD) and Tyrosinemia (TYR). Though successful, dietary management is challenging, with little variety, and compliance largely impacted by poor acceptability to CSPS. A new range of powder-based CSPS has been made available for patients with HCU, MSUD and TYR, therefore the acceptability, compliance, tolerance and metabolic control to these was explored.

Method:

New powder-based, low volume, DHA- and amino acid-containing CSPS providing 20g PE/29g serving were assessed at five specialist UK metabolic centres in patients with HCU (n=5; mean age 27yrs (range 19-33)), MSUD (n=8; mean age 25yrs (range 5-42)) and TYR (n=5; mean age 18yrs (range 3-27); n=1 tube-fed). Data on acceptability (organoleptic properties, usability), compliance, tolerance and metabolic-control were collected retrospectively whilst on existing CSPS (n=11 liquid; n=4 powder; n=3 both) and after 28-days of using the new CSPS.

Results:

Acceptability to new CSPS was positively rated by 88% (n=16) of patients and 78% (n=14) of managing Dietitians. Compliance to the new CSPS improved in 60% of HCU, 20% of TYR and 75% of MSUD patients. New CSPS were well tolerated and no metabolic control issues were reported across all patients including in enteral tube feeding.

Conclusion:

The new CSPS demonstrate good acceptability, improved compliance in children and adults with HCU, MSUD and TYR which may better support restricted dietary regimens. Furthermore, the new CSPS supports stable tolerance and metabolic control.

NUTRITIONAL AND METABOLIC CHARACTERISTICS OF UK ADULT PHENYLKETONURIA PATIENTS WITH VARYING DIETARY ADHERENCE

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Introduction:

The nutritional and metabolic characteristics of adult phenylketonuria (PKU) patients in the UK with varying dietary adherence is unknown. In other countries, nutritional and metabolic abnormalities have been reported in nonadherent patients compared to adherent counterparts.

Method:

A pooled analysis of primary baseline data from two UK multi-centre studies was therefore performed to establish whether this is true from a UK perspective. Adult PKU patients who had provided 3-day food records and amino acid blood samples were included and grouped according to dietary adherence (adherent; n = 16 vs. nonadherent; n = 14).

Results:

Nonadherent patients consumed greater amounts of natural protein compared to adherent patients (61.6 ± 30.7 vs. 18.3 ± 7.7g/day; q < 0.001). In contrast, the contribution of protein substitutes to total protein intake was lower in nonadherent compared to adherent patients (3.9 ± 9.2g/day vs. 58.6 ± 10.2g/day; q < 0.001). Intakes of iron, zinc, vitamin D3, magnesium, calcium, selenium, iodine, vitamin C, vitamin A and copper were significantly lower in nonadherent compared to adherent patients and were below UK Reference Nutrient Intakes. Similarly, intakes of thiamin, riboflavin, niacin, vitamin B6 and phosphorus were significantly lower in nonadherent compared to adherent patients but met the UK Reference Nutrient Intakes. Phenylalanine concentrations in nonadherent patients were significantly higher than adherent patients (861 ± 348 vs. 464 ± 196 μmol/L; q = 0.040) and fell outside of European treatment target ranges.

Conclusion:

This study shows the nutritional and metabolic consequences of deviation from phenylalanine restriction and intake of PKU protein substitutes in nonadherent adult PKU patients. Collectively, these data further underlie the importance of life-long adherence to the PKU diet.

IMPROVED EATING BEHAVIOUR AND NUTRIENT INTAKE IN NONCOMPLIANT PATIENTS WITH PHENYLKETONURIA AFTER REINTRODUCING A PROTEIN SUBSTITUTE: OBSERVATIONS FROM A MULTICENTRE STUDY

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Introduction:

Noncompliance is widespread in adults with PKU and is associated with adverse metabolic, nutritional and cognitive abnormalities. Returning to the PKU diet is important for this at-risk population, yet for many this is challenging to achieve. Strategies that ease the return to the PKU diet, while offering nutritional and cognitive advantages, are needed.

Method:

Twelve PKU adults (33.7 ± 2.6 years), who had been noncompliant for 4.5 years (range: 1 to 11 years), took 33g of a low-volume, nutrient-enriched, protein substitute daily for 28 days. Outcomes of eating behaviour, nutrient intake and mood were assessed at entry (baseline, days 1–3) and after the intervention period (days 29–31).

Results:

At baseline, intakes of natural protein and estimated phenylalanine were high (66.4g and 3318.5mg, respectively) and intakes of calcium, magnesium, iron, zinc, iodine and vitamin D were below country-specific recommendations. With use of the experimental protein substitute, natural protein and estimated phenylalanine intake declined ($p = 0.043$ for both). Fat and saturated fat intakes also decreased ($p = 0.019$ and $p = 0.041$, respectively), while energy and carbohydrate intake remained unchanged. Micronutrient intake increased ($p \leq 0.05$ for all aforementioned) to levels well within reference nutrient intake recommendations. Blood vitamin B12 and vitamin D increased by 19.8% and 10.4%, respectively. Reductions in anxiety and confusion were also observed during the course of the study yet should be handled as preliminary data.

Conclusion:

This study demonstrates that reintroducing a low-volume, nutrient-enriched protein substitute delivers favourable nutritional and possible mood benefits in noncompliant PKU patients, yet longer-term studies are needed to further confirm this. This preliminary knowledge should be used in the design of new strategies to better facilitate patients' return to the PKU diet, with the approach described here as a foundation.

A GLYCOMACROPEPTIDE BASED PROTEIN SUBSTITUTE HELPS PROMOTE STABLE BLOOD PHENYLALANINE AND BRANCHED CHAIN AMINO ACIDS IN PATIENTS WITH PHENYLKETONURIA

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Introduction:

Glycomacropeptide (GMP) based protein substitutes (PS) offer a promising alternative to 100% amino acid (AA) based PS for the dietary management of Phenylketonuria (PKU), due largely to the improved palatability of GMP. However to date there is relatively limited data regarding how currently available GMP-based protein substitutes may influence blood AA profiles of patients with PKU. Therefore the aim of this study was to evaluate the blood AA profile of patients introducing PKU GMPro* (Nutricia) into their diet for 28 days.

Method:

Twelve patients with PKU (mean age: 28yrs; range 5-50yrs) were recruited across 6 specialist hospitals in the UK. Patients undertook a 3 day baseline period, before introducing the study product (PKU GMPro*, 33.3g sachets, 10g Protein Equivalent), as advised by their Dietitian for a 28 day intervention period. The study product could either wholly or partially replace their current AA-based PS and patients were advised to reduce the amount of Phe they consumed from food by an amount approximate to the residual Phe in the study product (15.3mg Phe/10g PE), to the nearest 25mg. Fasting dried blood spots were collected on the morning after the baseline period, and days 7 and 28 of the intervention period, and blood AAs were analysed via HPLC.

Results:

The mean prescription of the study product in grams of protein equivalent was 21.6g PE/d (range 10-60; SD 13.4), which was estimated to provide a mean of 34% of calculated total protein requirements (range 18-81; SD 17). Compliance to the study product was excellent (96%; SD 1.6). Blood Phe remained stable between the baseline and intervention periods ($p=0.51$), whilst there was a small but significant improvement in Tyr ($p=0.02$), although this did not result in a significant change in Phe:Tyr ratio ($p=0.24$). All BCAAs remained stable over the study period ($p>0.05$) and the ratios of Ile:Leu:Val did not significantly change ($p>0.05$), remaining at approximately 1 : 2 : 3.8. Overall, during the intervention period, 95% of results for all 20 amino acids analysed (excluding Phe) were found to be within 95% population reference ranges.

Conclusion:

PKU GMPro resulted in no significant changes in blood AAs over the 28 day intervention period, with the exception of a significant improvement in Tyr levels. BCAA ratios remained within recommended ranges. These results demonstrate that PKU GMPro powder is safe and effective for the dietary management of PKU in adults and children.

*Original abstract refers to PhenylAde® GMP Drink Mix as study product. For clarity the UK brand name 'PKU GMPro' has been used in this booklet.