

# Impact of the vegetable pea protein NUTRALYS® on Satiety, Food intake and Gut Hormones in humans Ref: 149/1067

## PEA PROTEIN, WHEY PROTEIN, SATIETY, GASTROINTESTINAL PEPTIDES, CALORIC REDUCTION

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### Introduction

Overweight, obesity and lifestyle diseases are still increasingly major public health concerns worldwide. Dietary habits and nutrients intakes recommendations play a key role in prevention and enhancement of satiety is a good support for weight loss and maintenance. Thanks to their higher satiating effect as compared to fat and carbohydrate, proteins such as whey proteins might be good candidates in this context. Nevertheless, consumption of protein from animal source has climbed sharply in correlation to gross domestic product (Combris, 2013) while vegetable protein consumption has increased only by 15%. Over one third of global cereal production is incorporated in the feed of animals reared for their meat (protein); such trends are associated with general changes in lifestyles and standards of living, and related to worrying issues such as the sustainability of food consumption patterns and the preservation of natural resources. These concerns lead us to explore other possibilities in terms of protein sources, such as vegetal ones.

### Objectives

The purpose of this study was to compare the satiating capability of NUTRALYS® pea protein with a commonly used whey protein and establish if it can affect subjective ratings of appetite and some hormones secretion, and therefore if it could be suitable for promoting satiety as a good alternative to whey proteins when added to dietary products.

### Methods / Design

#### Methodology (Leatherhead, UK)

The aim of the present study was to assess the satiating effects of 4 isocaloric vegetable soups (adjusted to 200kcal with carbohydrates) in 33 healthy volunteers (1/3 males and 2/3 females - 18-65 years - 18.5<BMI<25 kg/m<sup>2</sup>). The soups, given as a preload in the morning, and consumed on separate occasions in a randomised order (Figure 1), with a one week wash-out period in between, were respectively:

- Control soup (no added protein): CS
- Soup supplemented with 15g NUTRALYS® pea protein: 15gNS
- Soup supplemented with 30g NUTRALYS® pea protein: 30gNS
- Soup supplemented with 30g whey protein: WPS

In this four arm, double blind, randomised, placebo controlled, cross-over study, satiety and hunger were assessed for three hours post consumption of the soups with visual analogue scale (VAS). The caloric intake at the next *ad libitum* test meal was quantified, and a subset of participants (n=9) also provided blood samples for the analysis of satiety hormone (GLP-1, PYY and CCK) as well as glucose and insulin.

#### Design of the study

Figure 1: Study design on exploration day



On each exploration day, ratings of satiety and blood samples were collected:
 

- prior to consumption of breakfast (baseline ratings) and then at regular intervals of time during the course of the day (Figure 2) after which the volunteers were free to leave the unit.

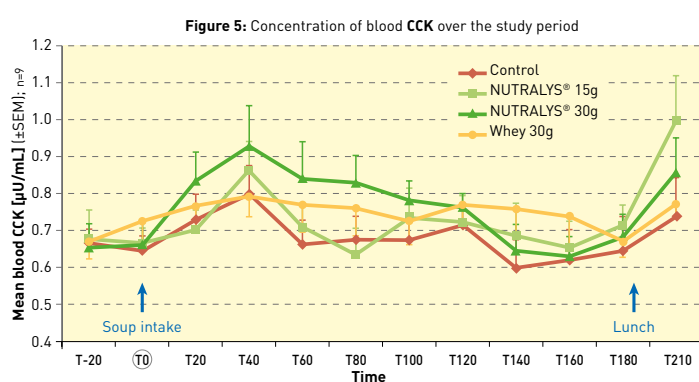
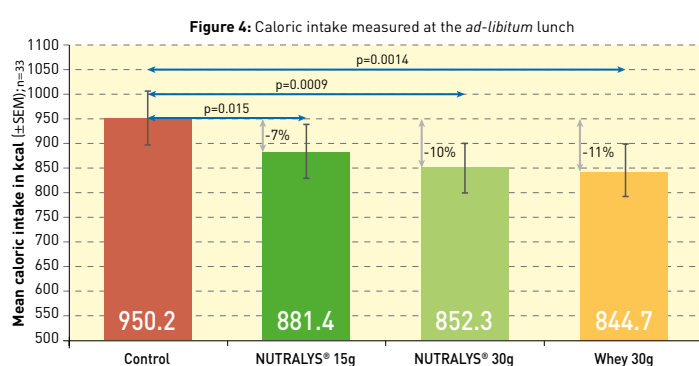
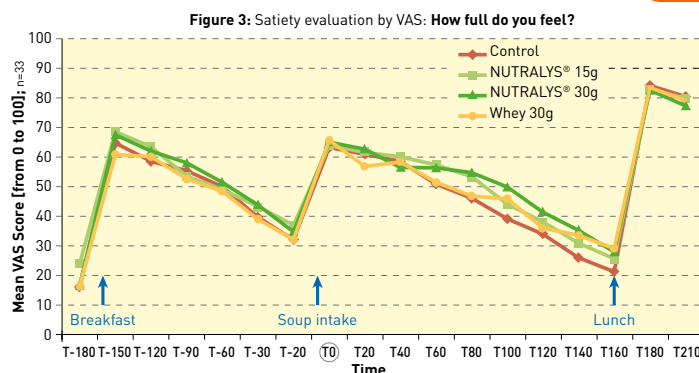
 Blood samples (n=9 participants) for glucose, insulin and gut hormones were collected via cannula:
 

- 20 minutes prior to the consumption of the preload (baseline)
- every 20 minutes following the consumption of the test product, for 3 hours.

Figure 2: Satiety, digestive comfort and blood collection on exploration day

	Breakfast						Preload						Lunch					
Time	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:20	11:40	12:00	12:20	12:40	01:00	01:20	01:40	02:00	02:30	03:00
Minutes	-180	-150	-120	-90	-60	-30	0	20	40	60	80	100	120	140	160	180	210	240
Satiety evaluation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Blood collection							■	■	■	■	■	■	■	■	■	■	■	
Dig. discomfort	■						■									■	■	■

### Results



#### Satiety/hunger evaluation (from T-20 to T+160)

For the question "how full do you feel?" (Figure 3), consumption of the CS preload was equally filling as the WPS or the 15gNS; it tended (p=0.058) to be less filling than the 30gNS. Moreover, the 30gNS had a significantly higher effect (p<0.05) on satiety perception than the 15gNS. There were no other significant differences for this question.

For the question "how hungry do you feel?", following the WPS preload, participants reported being significantly less hungry compared to the CS (p<0.05) and to the 30gNS (p<0.01), with a trend observed for lower ratings following the 15gNS (p=0.05); no other soups differed from control or each other.

For the question "how much do you think you can eat?", participants following the CS believed they could eat more than following the 15gNS (p<0.05), with no other differing from control.

For the other questions, responses showed no particular impact of NUTRALYS® as compared to the control group.

In any case, there wasn't any digestive complaint or adverse event related with the consumption of any soup.

#### Caloric intake evaluation

The caloric intake at the *ad libitum* meal 3 hours after consuming the preload soup (Figure 4) was significantly higher with the CS than with any of the "protein" soups, with differences of 461.5kJ, 287.9 kJ and 409.6kJ, respectively, between CS and the WPS (p<0.01), the 15gNS (p<0.05) and the 30gNS (p<0.001) (Figure 4).

However, there were no significant differences in caloric intakes *ad libitum* meal whatever the protein preload soup ingested.

#### Blood parameters (subset population n=9)

**Glucose:** both the peak plasma glucose and the AUC for the CS were significantly greater than for all other protein soups (p<0.05), with no apparent peak at all for either the 30gNS or WPS. No significant differences were observed between the plasma glucose AUC for the other test products.

**Insulin:** both the CS and 15gNS resulted in higher peak plasma concentrations, while the 30gNS resulted in a comparatively reduced peak insulin concentration and the WPS in no peak over the sampling time. Plasma insulin AUC after consumption of the test products were significantly greater for the CS compared to all other products (p<0.05), and significantly greater after the consumption of both NUTRALYS® soups than after the WPS (both p<0.05). Finally, the 30gNS resulted in significantly lower insulin AUC compared to 15gNS (p<0.05).

**CCK (Figure 5):** a trend for higher CCK levels following the 30gNS was observed when compared to CS (p=0.056). The 30gNS resulted in a higher and more sustained secretion of CCK as compared to the 15gNS, but there was no significant differences between all the products.

**GLP-1:** The WPS or 30gNS soups induced sustained and increased levels of GLP-1 over the whole duration of sampling as compared to that of the CS or 15gNS, but there were no significant differences between all the products.

**PYY:** The 30gNS appeared to delay the peak as compared to the WPs and CS, but differences in AUC values after the consumption of the test products were not significant.

Different factors might have an impact on satiety effects of proteins: the composition of stemming circulating amino acids, the presence of branched chain amino acid (BCAA) and particularly leucine, but also tryptophane.

Among hypothetical mechanisms explaining the results observed, the delayed release of some amino acids such as leucine (with known satiating capability), the release of peptides possibly triggering some specific responses (reduced systemic issues arising from excessive oxidative stress, increased CCK release from the intestinal mucosa) may occur with NUTRALYS® possibly triggering a delayed satiety response not seen in this short term design.

The differences in AUC between the products were not statistically significant for some gut hormones, likely due to some lack of statistical power (small subpopulation) and to a high variation between the plasma levels of these hormones across participants.

All these hypotheses should deserve longer term designed trials to be tested.

### Conclusion

In this study, two concentrations of NUTRALYS® pea protein (30g and 15g) were tested for their satiating effect when incorporated in a preload vegetable soup, and compared to a control soup with no added protein (negative control) and a soup with 30g whey protein (positive control). NUTRALYS® seems to be a good candidate, as it induces, similarly to the whey proteins, a **lower caloric intake** than the control at both dosages and with no significant differences between the three products. Moreover, the NUTRALYS® soups were rated as **modulating in some way the feeling of fullness, and induced modulation of gut hormones production**. Taken together, these results demonstrated that the 30g NUTRALYS® soup led to **increased perceived levels of satiety**.

**NUTRALYS® pea protein** appears to be a high quality alternative candidate to animal protein, with similar bioavailability of amino acids and digestibility and a sustainable way of production (Yang et al., 2012). Moreover, as an intermediate-fast protein, it can offer a better post-prandial utilisation and a better efficacy by inducing a better daily nitrogen balance.

**References:** • Combris P In: "Quelles protéines pour une alimentation saine et durable", Rencontres SIA (INRA Science & Impact), 2013  
• Yang H et al. *Agro Food Industry Hi Tech*, 2012; 23(6): 8-10.

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