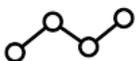


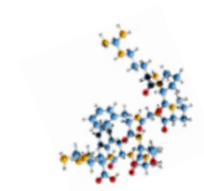
Startup Ingredients Manufacturer Perspective

PhytoPep™ - Rapeseed Peptides for Personal Care



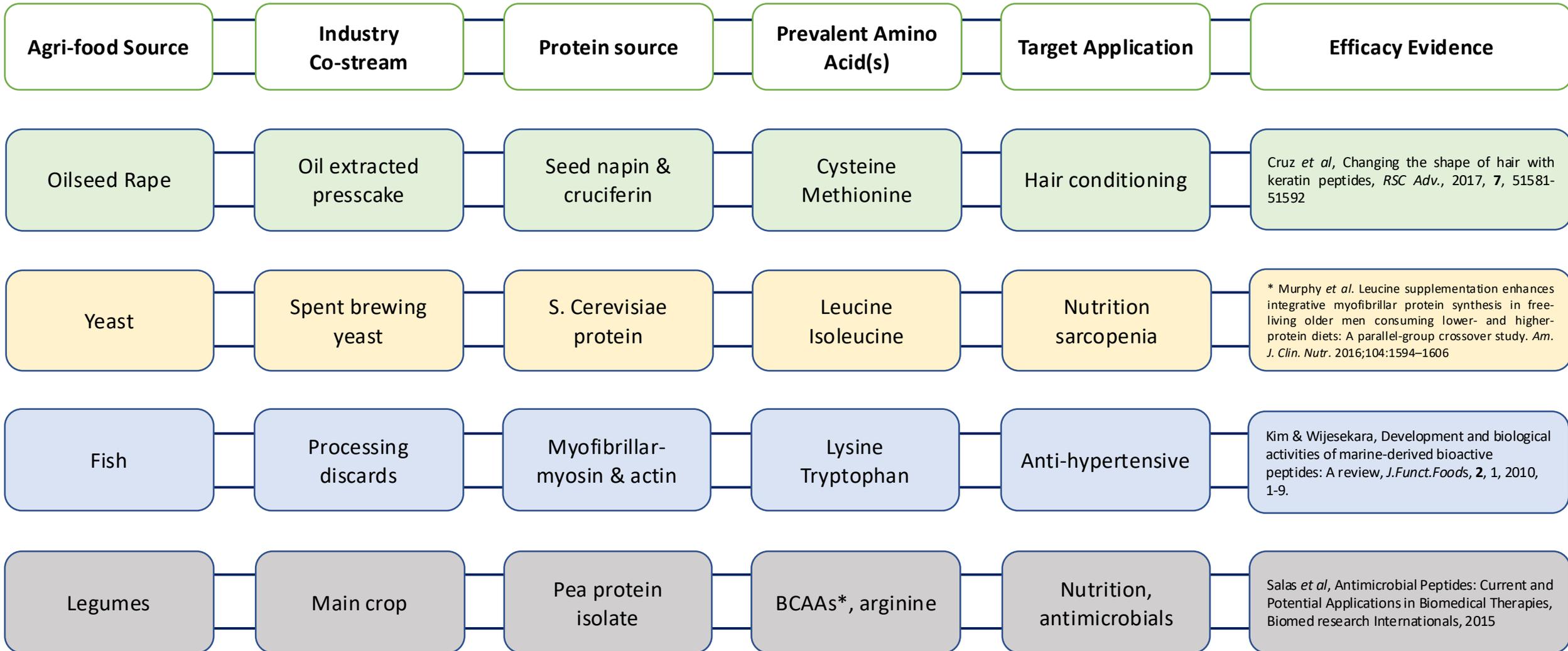
PhytoPep™


COSMETICS
CLUSTER UK



 **valogen**
Naturally Bioactive

Agri-food Co-stream Protein Sources and Commercial Peptide Application Examples



* Branched-chain amino acids

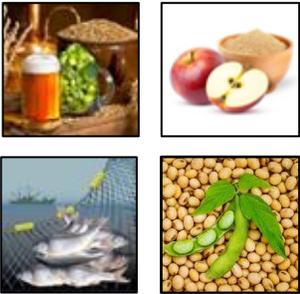
What have we developed?

Abundant & cheap feedstocks



Rapeseed/canola meal

Cost ~ £0.1- 0.3 / kg



Enzymatic hydrolysis and separation of bioactive proteinaceous bioactives



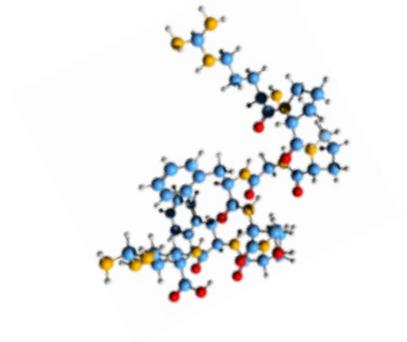
Valogen's Patented Proprietary Process

InnovateUK Smart Grant, IUK BF4A Grant, 4x regional grants, BBSRC, RIPEN Hub

~ 100-1000 times

B2B
Cosme-/nutra-
/pharma- peptides
£100-1000/kg

PhytoPep™



COGs < £5/kg
Gross margins >80%
High Bioactivity*

*capacity of a substance to interact with and produce a measurable response within a biological system

PhytoPep™ Commercial Opportunities

Cosmetic Skincare – Active Ingredients

Market size: \$11.24 billion

CAGR: 6.13%

Market cost: £30-150/kg

Gross margin: 83% ++



Valogen Process

Technoeconomic Assessment  cpi
Energy & materials COGs ~ very low



Cosmetic Haircare – Active Ingredients

Market size: \$5.04 billion

CAGR: 7.31%

Market cost: £30-90/kg

Gross margin: 83% ++



- Market - \$5.04Bn 2025 - \$8.26Bn 2032, CAGR 7.3%.

- Rinse-out conditioners dominate

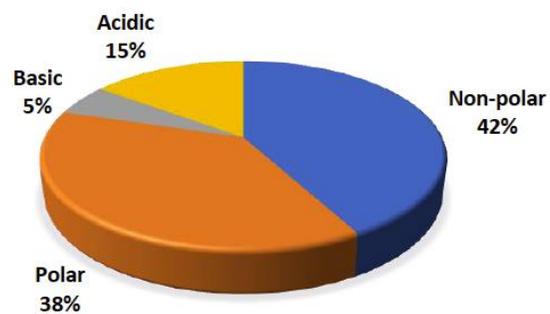
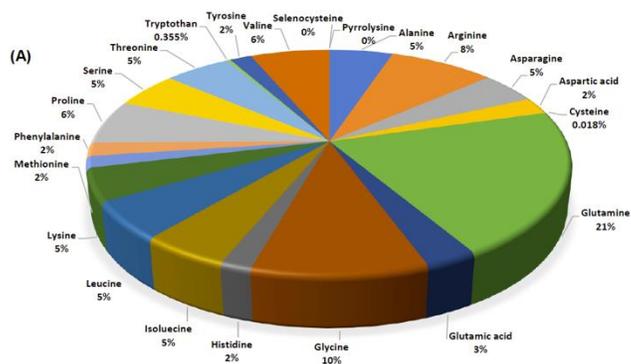
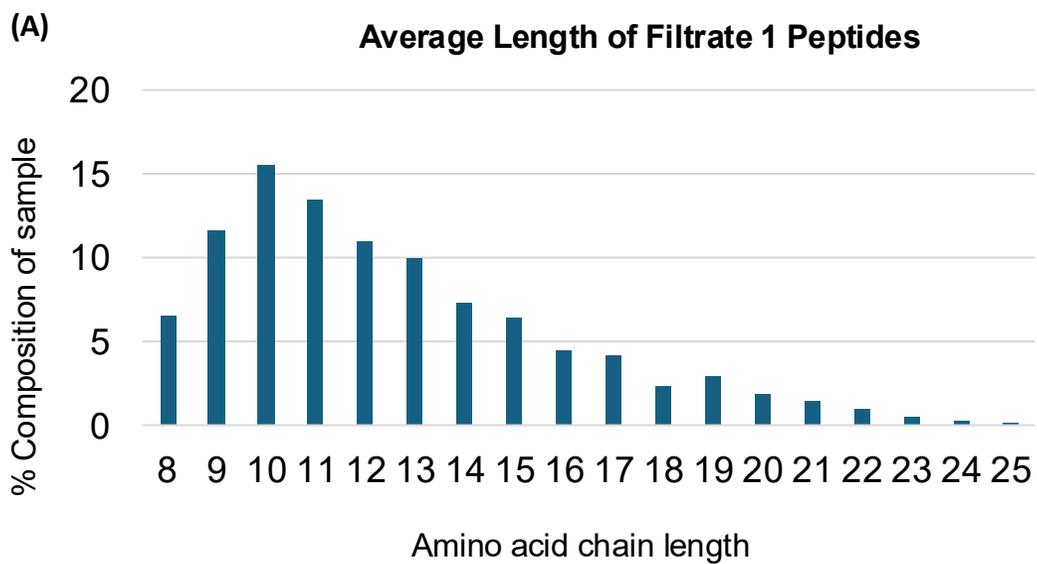
- Leave-in conditioners are growing rapidly

- Consumers seek natural, organic & free-from

- Scalp health ("skinification of hair") - microbiome

- Ingredients inspired by food and wellness

Proteomic Characterisation



RSC Advances

PAPER

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Check for updates

Changing the shape of hair with keratin peptides†

Cite this: *RSC Adv.*, 2017, 7, 51581

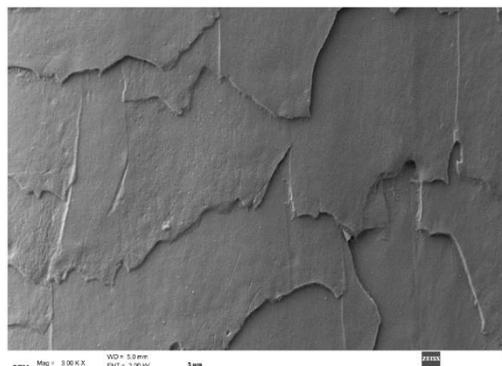
C. F. Cruz,^{‡a} M. Martins,^{‡a} J. Egipto,^a H. Osório,^b A. Ribeiro^a and A. Cavaco-Paulo^{‡*a}

Name	N. aa	MW (Da)	pI	Cys (%)	Hydr. (%)	Polar (%)	Peptides chemical structure
PepA	11	1507	7.83	45%	9%	36%	
PepB	11	1519	7.83	45%	18%	27%	
PepC	10	1670	9.00	20%	20%	30%	
PepD	10	1422	5.82	30%	40%	10%	
PepE	10	1336	5.50	30%	60%	10%	
PepF	10	1410	3.79	30%	40%	10%	
PepG	11	1583	5.49	45%	9%	36%	
KP	13	1601	5.51	15%	38%	46%	

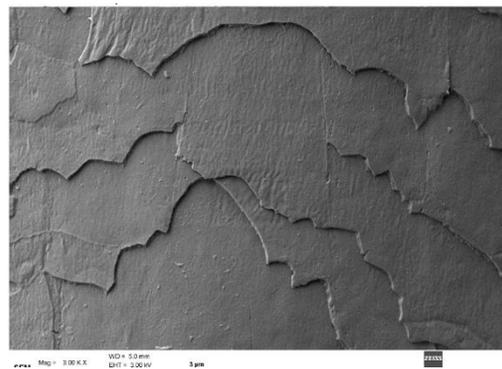
Amino acids legend: ■ Basic ■ Hydrophobic ■ Polar ■ Acidic ■ Cysteine (Polar aa)

Hair Care Efficacy - Microscopy

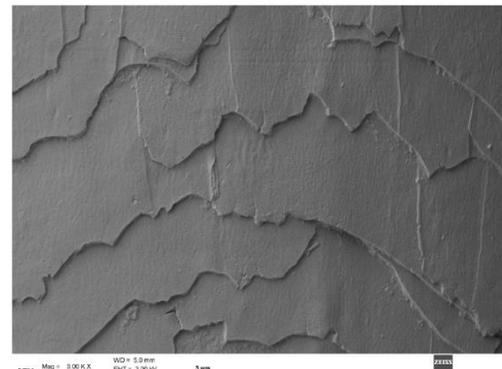
Control (placebo)



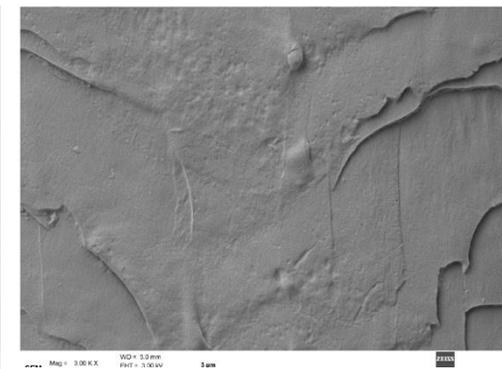
Competitor 1



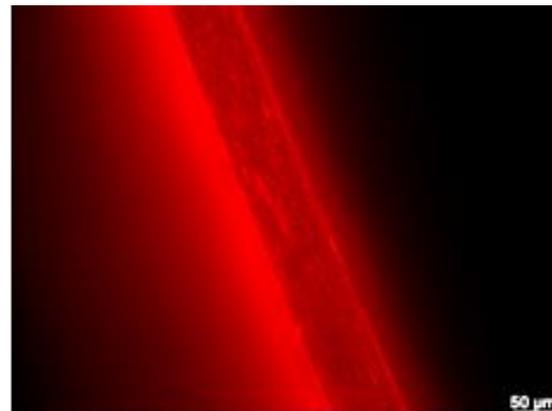
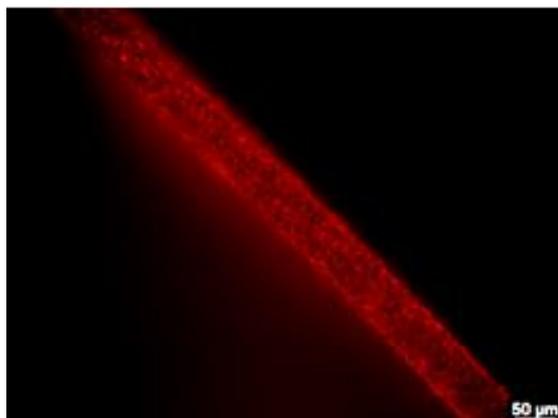
Competitor 2



PhytoPep™



Scanning Electron Microscope (SEM) results showed a coating effect of our material onto the hair cuticle which could explain the conditioning effects previously identified, and enable split end repair applications

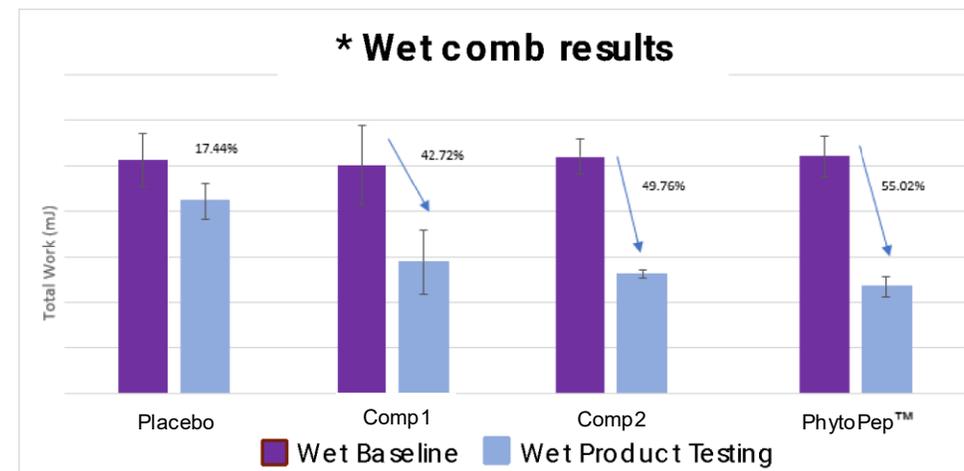


Recent tests using fluorescence microscopy confirm our material's ability to coat the hair cuticle and subsequent thermostability tests indicate the it's potential as a hair styling heat protectant.

Hair Care Efficacy – Amino Acid Composition

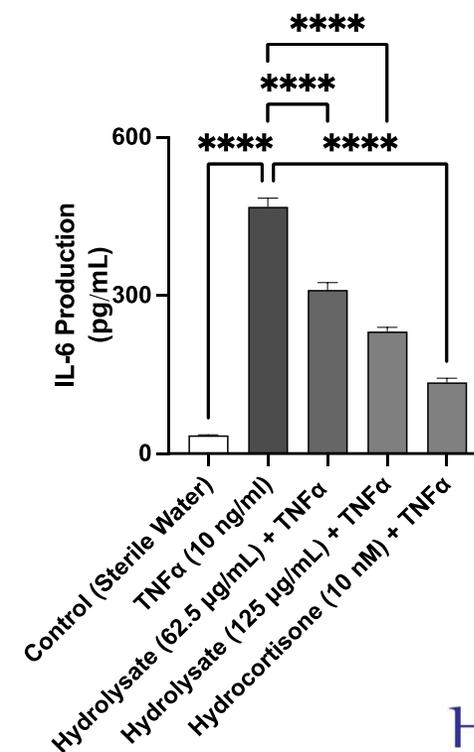
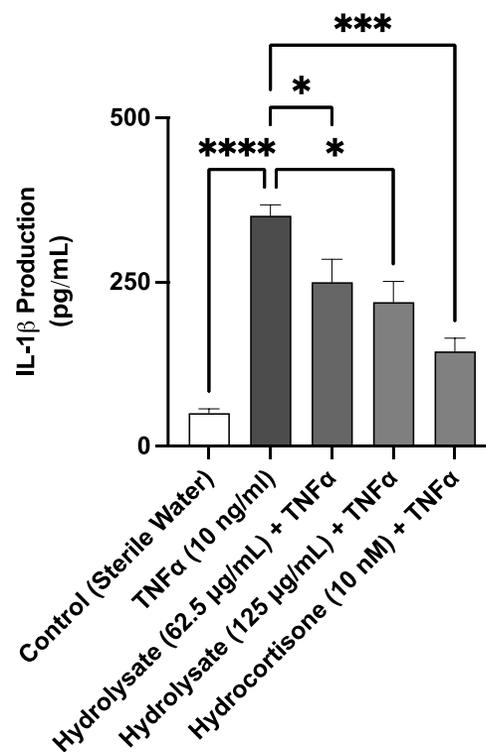
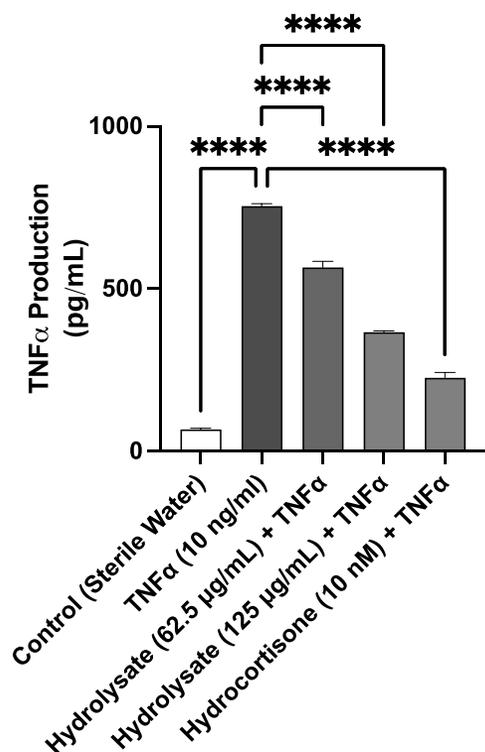
	Competitor 1	PhytoPep™
Cysteine	1.2	4.0
Aspartic acid	12.2	6.0
Methionine	1.6	2.2
Threonine	5.1	3.8
Serine	6.1	4.0
Glutamic acid	16.2	26.5
Glycine	4.1	5.9
Alanine	4.9	4.9
Valine	5.2	4.7
Isoleucine	4.2	3.3
Leucine	8.8	6.6
Tyrosine	3.7	1.7
Phenylalanine	4.2	3.8
Histidine	2.8	3.3
Lysine	8.1	5.9
Arginine	6.8	4.7
Proline	4.9	8.6

Hair Care Efficacy – Comb Resistance



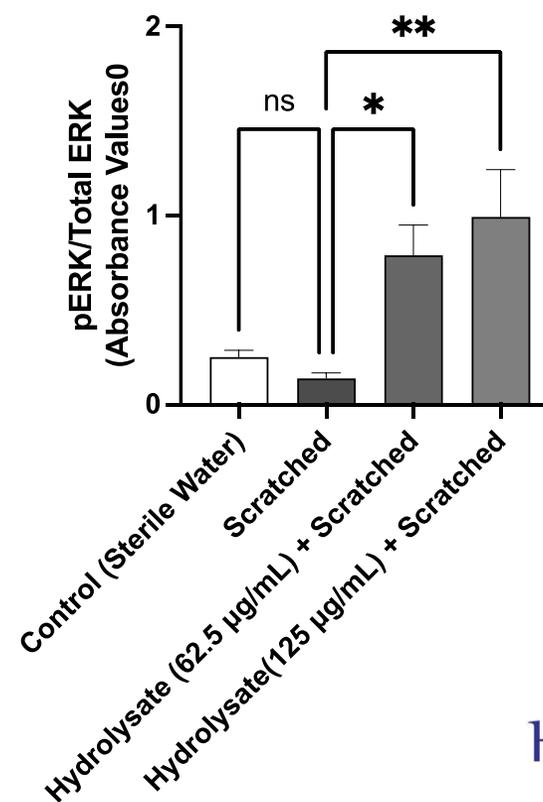
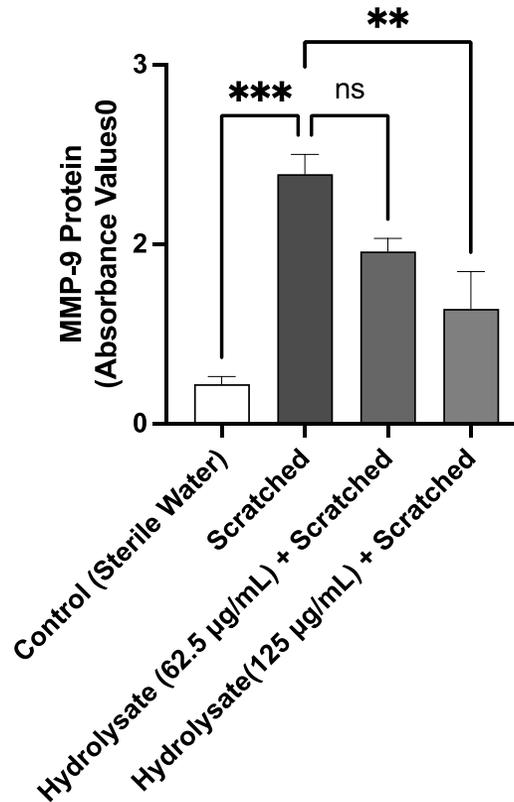
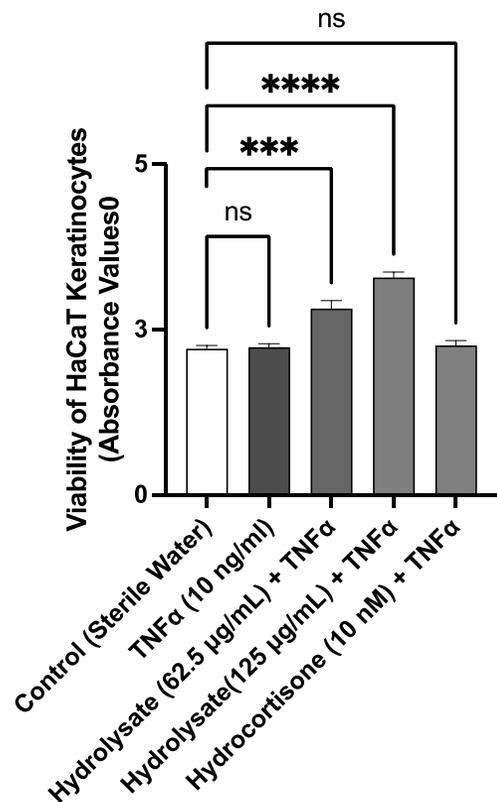
Hair Care Efficacy – Scalp Health

- Increasingly, the ‘skinification’ of hair is being discussed which focuses on scalp health to promote hair quality.
- Another competitor claims scalp-soothing properties via anti-inflammatory activity.
- Valogen’s rapeseed hydrolysate also exhibits significant and dose-dependent reduction in inflammation in human skin keratinocytes as shown later in this presentation.



Effects of hydrolysate (62.5 and 125 $\mu\text{g/mL}$) on elevated cytokine production in HaCaT keratinocytes stimulated with recombinant human TNF α . Values are mean \pm SEM for 3 independent experiments. * $p < 0.05$, *** $p < 0.001$, **** $p < 0.0001$ compared with TNF α -stimulated cells using one-way ANOVA and post hoc Dunnett test for multiple comparisons.

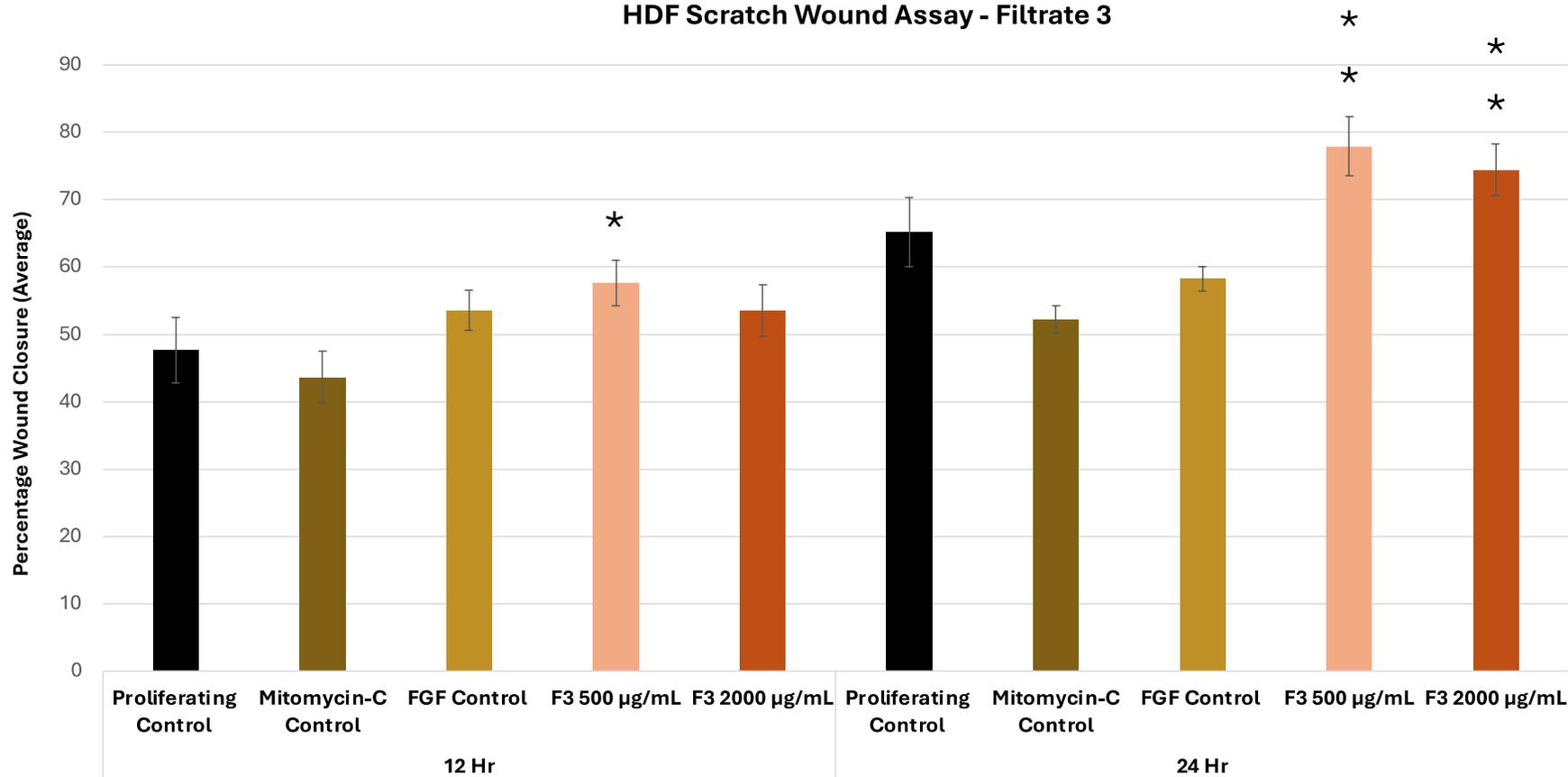
Human epidermal keratinocytes stimulated with inflammatory TNF- α , applied alone and with 2 concentrations of PhytoPep™ (and +ve control hydrocortisone) displaying the dose-dependent reduction of inflammation through measurement of 3 keratinocyte-expressed cytokines



Effects of hydrolysate (62.5 and 125 µg/mL) on the viability of HaCaT keratinocytes stimulated with recombinant human TNF α , the reduction of matrix metalloproteinase-9 (MMP-9) and regulated cell proliferation marker (ERK). Values are mean \pm SEM for 3 independent experiments. * $p < 0.05$, *** $p < 0.001$, **** $p < 0.0001$ using one-way ANOVA and post hoc Dunnett test for multiple comparisons.

PhytoPep™ displaying increased cell viability of human epidermal keratinocytes when stimulated with inflammation-causing TNF- α , reduced MMP-9 that breaks down matrix proteins and an increase in ERK that is a marker of cell proliferation

HDF Scratch Wound Assay - Filtrate 3

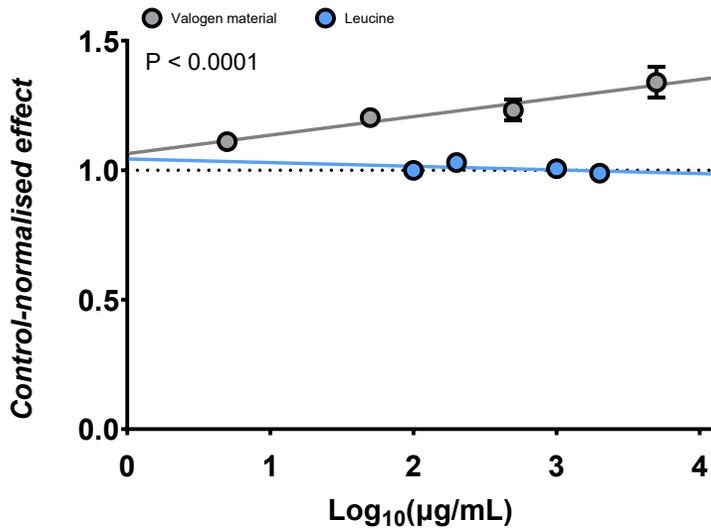


Histogram illustrating the outcomes of a scratch wound healing assay conducted on HDF. The experimental groups included: HDF untreated (proliferating control), treated with mitomycin-C only (mitomycin-C control), inhibited with mitomycin-C and treated with Fibroblast Growth Factor (FGF/positive control), or treated with mitomycin-C along with varying concentrations (500 µg/mL or 2000 µg/mL) of filtrate 3. Each experimental condition was performed in triplicates, with two measurements taken per replicate (on both left and right sides of the wound), resulting in a total sample size of n=6. The percentage wound area, determined using the ImageJ wound healing plugin, at the 0-hour timepoint served as the baseline for normalizing subsequent measurements at 12 and 24-hour timepoints for each experimental group. The data is represented as the mean percentage wound area with corresponding SEMs. A t-test assuming unequal variances was conducted, comparing each experimental group to the appropriate mitomycin-C control at a significance level of 5%. Significance levels are denoted by asterisks, with * indicating $p < 0.05$, ** indicating $p < 0.01$, and *** indicating $p < 0.001$.

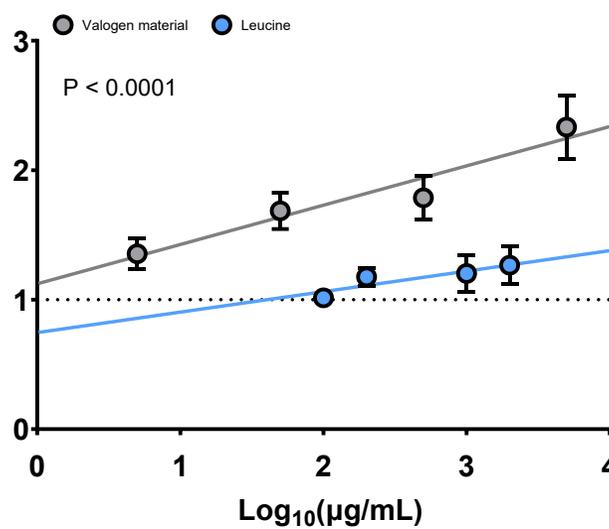
Human dermal fibroblasts in wound closure model subjected to -ve control (mitomycin-C), +ve control (fibroblast growth factor), and 2 concentrations of a batch (F3) of PhytoPep™ which display significant wound closure

Valogen material increases overall ATP supply more strongly than leucine*

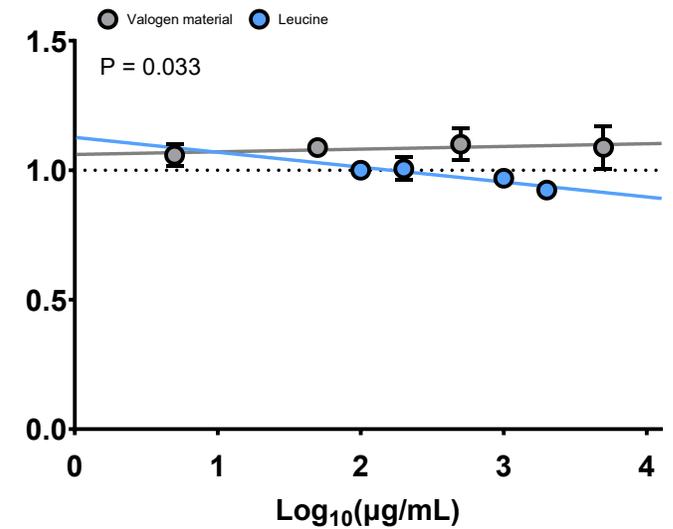
Total ATP supply



Glycolytic ATP supply



Oxidative ATP supply



In-vitro Human Satellite Muscle Cell Activation

“Valogen material provokes a dose-dependent anabolic stimulation in cultured skeletal muscle cells (after 24-h exposure) that is consistent with anticipated (claimed) anti-sarcopenic properties.”

* Leucine, a branched-chain amino acid, is considered a gold-standard in nutritional muscle maintenance and growth.

Competitive Landscape

'Perception' Map



Tri-K Industries	TriQuat Force	Polyquaternium-4
Croda	Crodasone™	Bio-polymer
Croda	KeraMatch™ V	Hydrolysed Pea Protein & Hydrolysed Vegetable Protein
Kalichem	Kerashaft V	selected vegetable oligopeptides
BASF	Gludin® WLM	Hydrolysed wheat protein/gluten
BASF	Caffeine Powder	Caffeine
Bloomage Biotechnology Corp	Hyanutra™ RH	Low molecular weight sodium hyaluronate
Suzhou Greenway Biotech	Hydrolysed Keratin	Keratin peptides

Conclusions

- PhytoPep™ exhibits many health and wellness properties positioning it as a high potential cosmetic ingredient
- Notable attributes include:
 - Strong hair conditioning properties vs competitors
 - Increased cell viability
 - Increased cell mobility
 - Increased bioenergetic function
 - Increased protein expression
 - Reduced inflammation
 - Collective bioactivities indicate likely skin and hair efficacy
- For further information please contact:
 - Dr Peter Luebcke, CEO
 - peter@valogen.bio
 - +44 7866 465414



Naturally Bioactive