Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary results

Characterization of the individual peptides

The peptides were characterized by MALDI-TOF/TOF. From Figure S1, we noticed that PepA, PepB, and PepE underwent amino acid substitutions while PepC and PepF lost some of its amino acids.

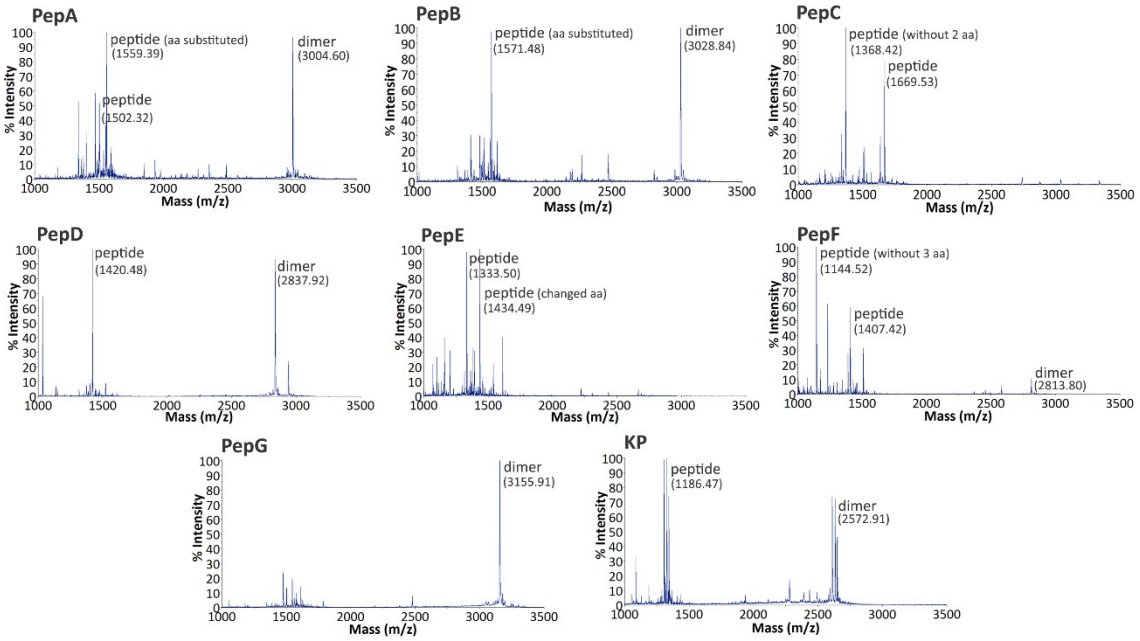
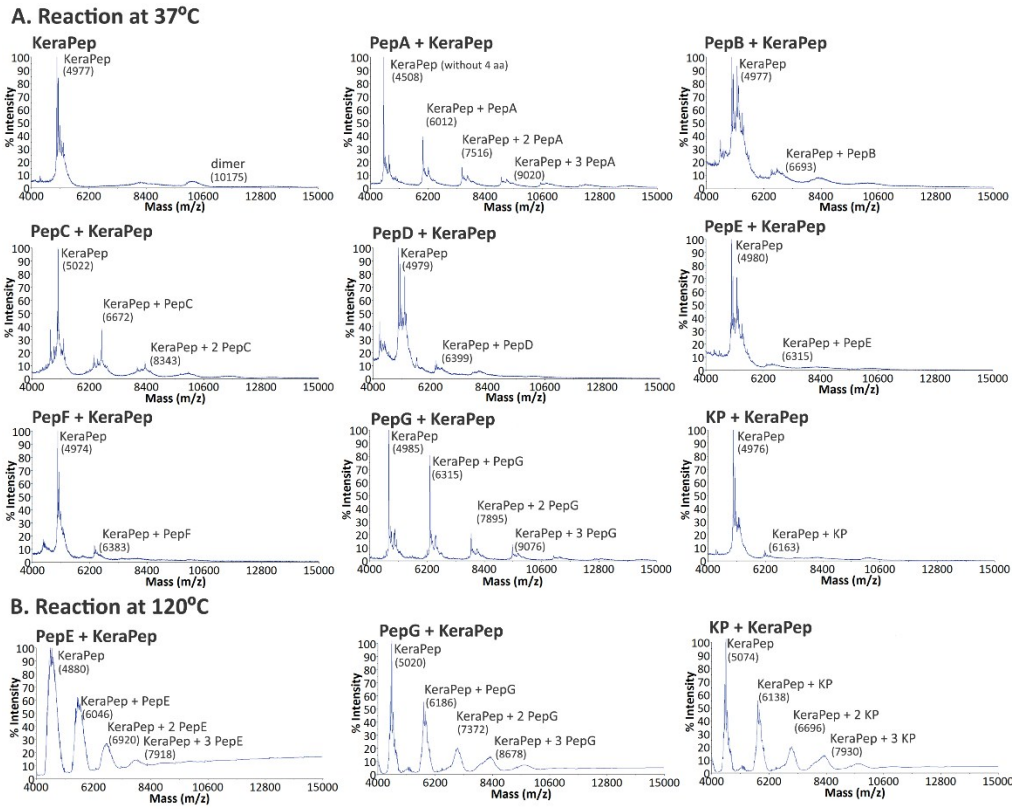


Figure S1. MALDI-TOF/TOF of the different peptides. From top to bottom and left to right: PepA, PepB, PepC, PepD, PepE, PepF, PepG, KP.

Affinity characterization of hair protein model (KeraPep) with each individual peptide by MALDI-TOF/TOF

The affinity of the peptides to hair proteins was tested through their reaction with KeraPep, at two temperatures: 37°C (for all peptides) and 120°C (for PepA, PepE, PepG, and KP), Figure S2. All peptides were shown to interact with KeraPep at both temperatures, showing a higher interaction at 120°C



C. Relative ratio of species at 37°C and 120°C

	Ratio of reaction at 37°C (%)				Ratio of reaction at 120°C (%)			
Peptides	0 peptides conjugated	1 peptide conjugated	2 peptides conjugated	3 peptides conjugated	0 peptides conjugated	1 peptide conjugated	2 peptides conjugated	3 peptides conjugated
PepA	98.33	1.67	-----	-----				
PepB	46.97	39.34	13.64	6.38				
PepC	67.38	28.29	4.33	-----				
PepD	89.4	9.52	1.08	-----				
PepE	97.52	2.48	-----	-----	45.36	32.71	16.95	4.98
PepF	90.68	9.32	-----	-----				
PepG	44.51	38.19	11.00	6.30	45.02	30.41	17.07	7.50
KP	94.47	5.53	-----	-----	43.72	27.86	15.14	13.28

Figure S2. MALDI-TOF/TOF of the products of the reaction of the KeraPep with the different peptides in study with the reaction at 37°C **(A)** and **(B)** 120°C. **(C)** Relative ratio of the reaction of the peptides and the KeraPep at 37°C and at 120°C.

Peptides' penetration into straight Caucasian over-bleached hair fibres

For a more comprehensive study, the peptides were analysed in straight Caucasian over-bleached hair fibres. Fluorescence microscopy of transversal cuts of over-bleached hair confirmed the presence of all peptides in the hair fibre, Figure S3. The peptide uptake by Caucasian over-bleached hair (Figure S4) showed a good penetration profile being the KP, PepC, and PepF the peptides that showed higher uptake by the over-bleached hair fibre.

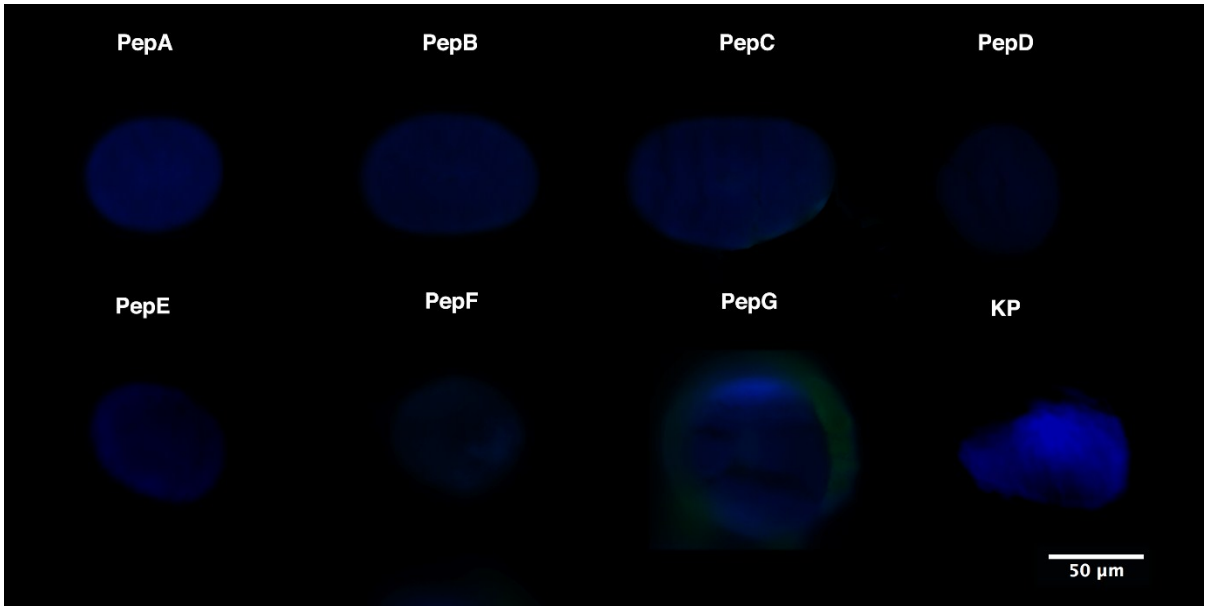


Figure S3. Fluorescence microscopy of cross sections of straight over-bleached hair fibres treated with 0.01% (w/v) of the peptides indicated.

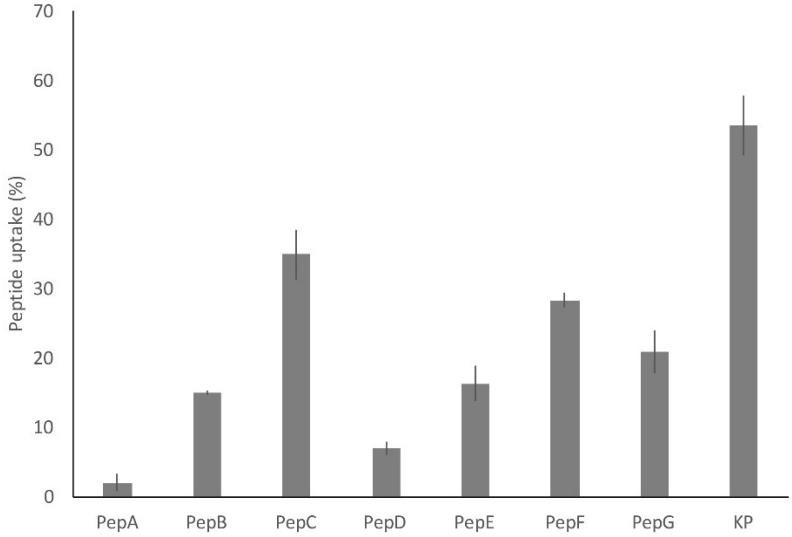


Figure S4. Peptide uptake by straight over-bleached hair. The hair samples analysed are treated with 0.01% (w/v) of the peptides indicated. Data represents the mean ± standard deviation of independent experiments.

Hair treatment analysis: straightening African curly hair fibres

The peptides were applied to single curly hair with forced straightening to fix their conformation and straight the hair. With a concentration of 0.1% (w/v) of each peptide, they showed a high straightening efficiency, which can be observed in Figure S5.

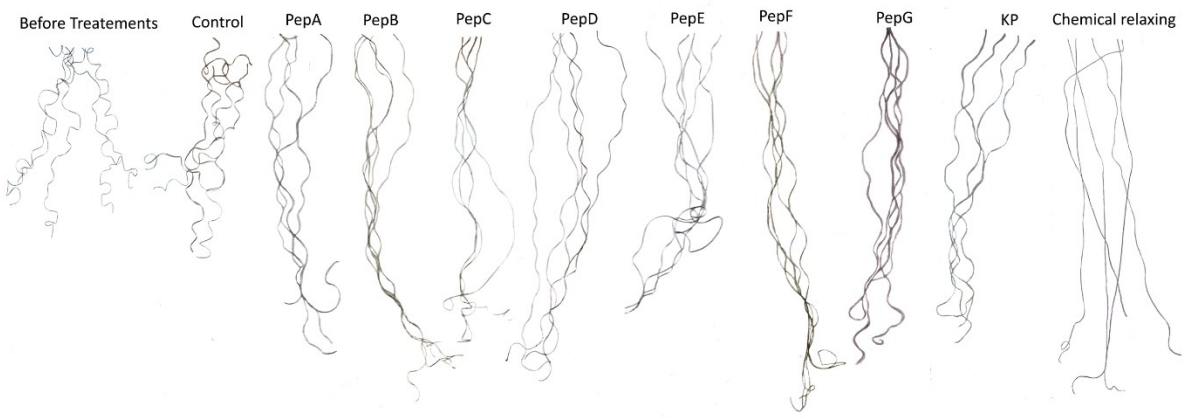


Figure S5. Straighten curly hair by treatment with the peptides. The hair tresses represent (from left to the right): hair tress before the treatments, hair tress treatment without peptides, hair tress treated with 0.1% (w/v): PepA; PepB; PepC; PepD; PepE; PepF; PepG; KP; hair tress treated with typical chemical relaxing.