

Research on the advanced use of keratin derived from pig hair

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Abstract

This study focused on hair (keratin), which is normally discarded in the leather manufacturing process, and the use of microorganisms for peptidation and effective use of the products as functional biomaterials.

Pig's hair cannot be used as a biomaterial in its original form, as it is highly insoluble, physically and chemically very stable and difficult to process. Therefore, the peptides were enzymatically converted into peptides by Trichophyton Ajelloi. The safety of the resulting peptides was assessed by Ames and acute oral toxicity tests, confirming low toxicity. The bioactivity of the peptides was also investigated and shown to have antioxidant and tyrosinase inhibitory effects. What's more, the insoluble, non-peptidised residues were found to be highly effective as a fertilizer when fermented.

The efficacy of a wide range of pig hairs was confirmed, indicating the potential for the use of raw hides and skins in high value-added applications such as pharmaceuticals in the future. Adding value to previously discarded items will help develop a sustainable leather industry and innovate.

Results

1. Decomposition of pig hair caused by T. ajelloi

We managed to isolate bacteria that decompose pig hair from soil and can be chopped into small pieces easily enough using a homogeniser.



Untreated pig hair



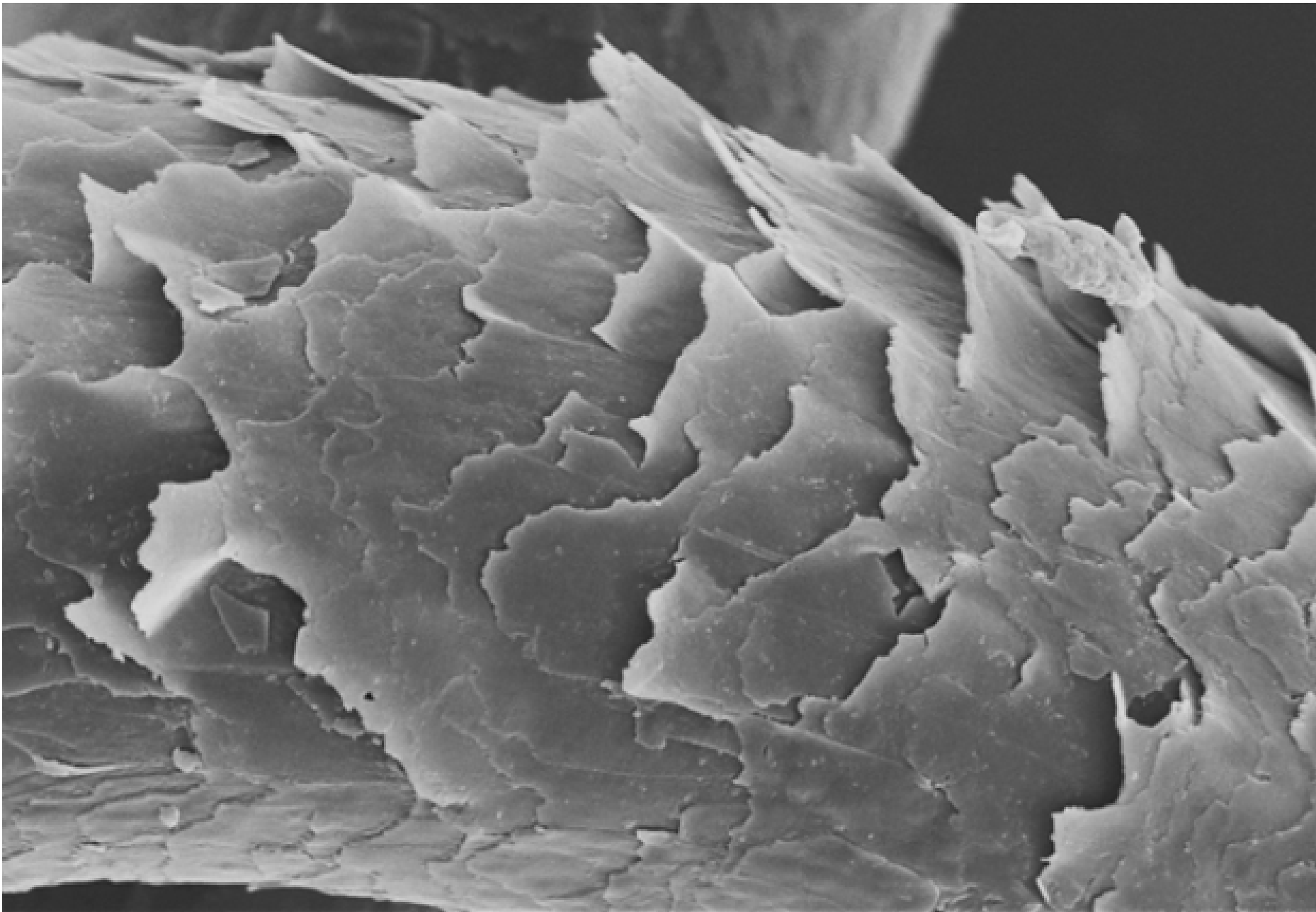
Mouldy Pig Hair



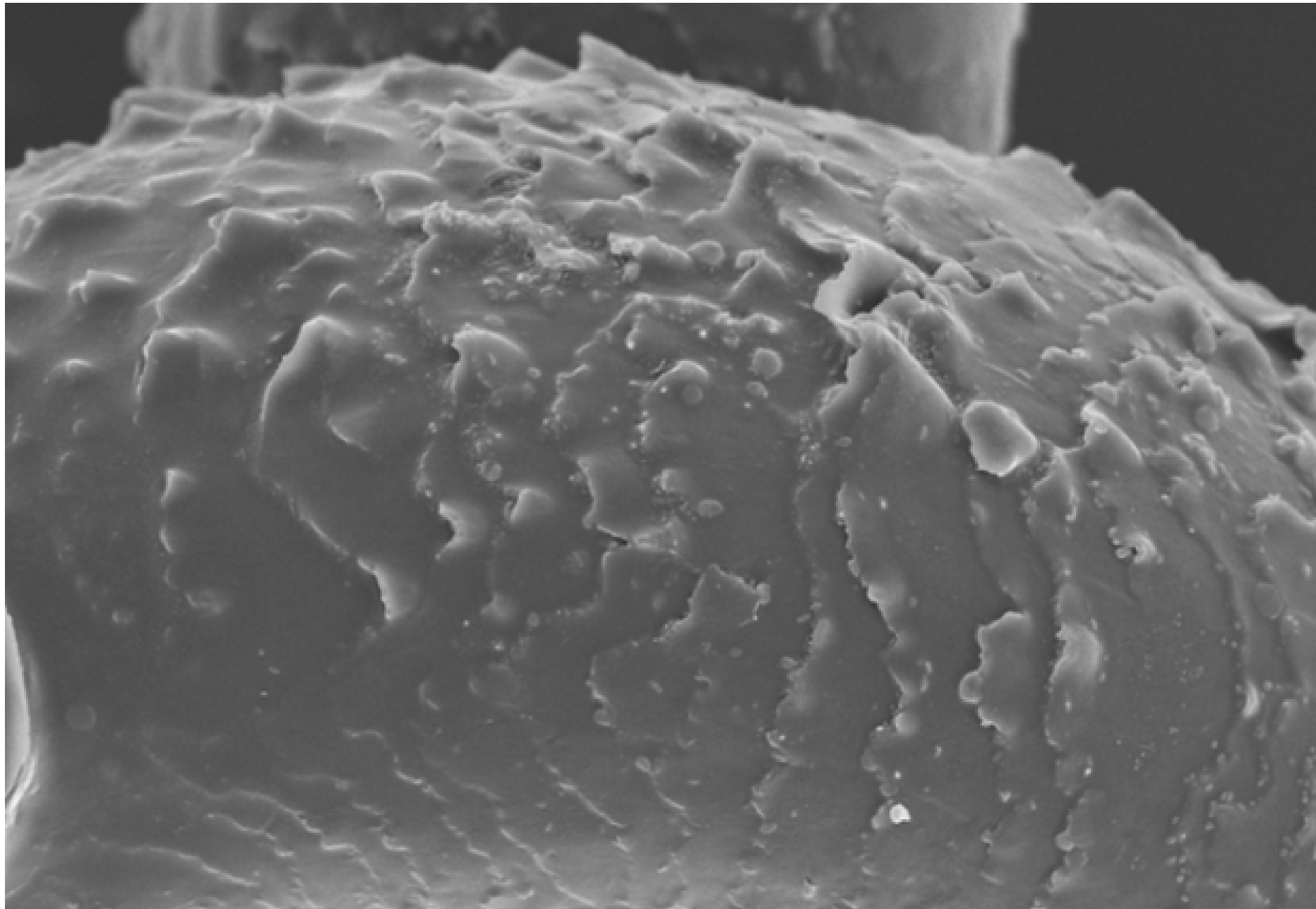
Crushed Pig Hair

2. Hair repair effect

Solubilised keratin was applied to damaged hair to investigate its effectiveness in repairing the cuticle. The hair immersed in the solubilised keratin solution had a smooth cuticle surface.



Damaged Hair



Treated with Keratin

3. The use of insoluble residues as fertiliser

The use of insoluble residues as fertilisers was investigated using Chinese cabbage. Cultivating Chinese cabbage by mixing insoluble residue and chemical fertiliser resulted in growth that was 1.5 times greater than when chemical fertiliser alone was used. On the other hand, the effect of insoluble residues alone as fertiliser was minimal. The effectiveness of mixing insoluble residues with chemical fertilisers in promoting the growth of certain crops has been demonstrated.



Residue

Mix

Chemical

No Fertiliser

Cultivated Chinese cabbage



Mixed Fertiliser



Chemical Fertiliser



Residue only



No Fertiliser

Same scale