Rationally designed skin moisturisers - *Professor Adrian Williams, University of Reading*

Human skin is a remarkably complex, multiply layered tissue that provides a self-repairing barrier to ingress of exogenous chemicals whilst regulating water loss from the body. Maintaining hydration of the skin, and in particular its outermost layer, the stratum corneum, is essential for the barrier function and is predominantly controlled by an endogenous hygroscopic mixture of amino acids, 2-pyrrolidone-5-carboxylic acid, urocanic acid and salts, collectively termed Natural Moisturising Factor (NMF). Reduced levels of NMF are associated with dry skin conditions with consequent adverse effects on skin's mechanical strength and elasticity.

We have designed and synthesised a library of un-natural amino acids that can replace Natural Moisturising Factor (NMF) to restore the skin's barrier and improve skin feel. Using un-natural hygroscopic amino acids that are capable of mimicking NMF should also prevent barrier disruption and potentially avoid further metabolism or recycling of amino acids within the skin.

The hydrotropes were designed to explore the influence of chemical structure and modification on the water-holding capacity of the un-natural amino acids, rooted in serine and glycine as two of the most abundant natural amino acids in NMF. From these, a series of "rules of thumb" were developed to inform the design of hygroscopic amino acids. The optimised materials were shown to be able to bind up to 12 water molecules per new hydrotrope molecule whereas a well-established humectant, urea can bind up to 6 molecules of water. Efficacy was demonstrated through their delivery into snake skin (a model for dry skin, lacking the NMF found in human tissue) and the subsequent increased uptake of water into the snake skin post treatment.