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TECHNOLOGY OFFER

PEPTIDE-IONIC LIQUID CONJUGATES FOR THE PREVENTION AND/OR TREATMENT OF SKIN DISORDERS

The invention herein disclosed relates to peptide-ionic liquid (PIL) conjugates for the prevention and/or treatment of skin disorders, a topical composition comprising the same and uses thereof.

INVENTORS

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RESEARCH GROUPS

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TECHNOLOGY DESCRIPTION

Addressing **complex skin and soft tissue infections** necessitates novel antimicrobial solutions and healing agents. **Ionic liquids** exhibit significant antimicrobial activity and enhance dermal permeation. **Cosmeceutical peptides** accelerate skin regeneration by stimulating extracellular matrix production. **Peptide-ionic liquid (PIL)** conjugates induce collagen biosynthesis (**Figure 1**), crucial for wound healing, and display *in vitro* antibacterial and antifungal activity, even against multidrug-resistant isolates (**Table 1** and **Table 2**, respectively). *In vivo* studies on a diabetic mouse model affirm wound-healing, pro-angiogenic, anti-inflammatory, and antioxidant properties of PIL (data available upon request). Integrating ionic liquid and peptide components in PIL promises efficient dermal and transdermal delivery with lower microbial resistance risk. **PIL chemical conjugation** follows a straightforward, potentially cost-effective industrial scale process. Novel PIL applications encompass the prevention and/or treatment of skin disorders, particularly those with heightened infection risks like diabetic foot ulcers or psoriasis.

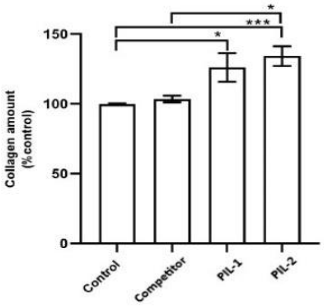

Figure 1. Relative collagen synthesis in human dermal fibroblasts after treatment with peptide-ionic liquid (PIL) conjugates. A commercial cosmeceutical peptide (competitor) is shown for reference. * $p < 0.05$, *** $p < 0.001$

Table 1. Comparative analysis of minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) of peptide-ionic liquid conjugates (PIL) against multidrug-resistant clinical isolates. The commercial antibiotic ciprofloxacin is shown for reference. Isolates: *K. pneumonia* (KP010), *P. aeruginosa* (PA004), *S. aureus* (SA007). MIC values in µM (in µg/mL).

Multidrug Resistant Bacteria	Peptide		Ciprofloxacin
	PIL-1	PIL-2	
KP010	21.7 (20.0)	37.9 (37.0)	48.0 (16.0)
PA004		18.9 (18.5)	96.0 (32.0)
SA007		18.9 (18.5) [a]	193.0 (64.0)

[a] The MBC was 2x the MIC; In all othar cases the MBC was equal to the MIC

Table 2. Minimum inhibitory concentration (MIC) of peptide-ionic liquid conjugates (PIL) against reference strains of pathogenic fungi.

Peptide	MIC in µM (in µg/mL)		
	C. albicans ATCC 90028	*C. glabrata* ATCC 90030	*C. parapsilosis* ATCC 22019
PIL-1	5.4 (5.0)	5.4 (5.0)	2.7 (2.5)
PIL-2	4.7 (4.6)	4.7 (4.6)	2.4 (2.3)

INNOVATIVE ASPECTS/ADVANTAGES

- Wound-healing, microbicidal, anti-inflammatory, antioxidant, and proangiogenic activity in one molecule;
- Novel approach to chemical conjugation of peptides and ionic liquids;
- Cost-effective production at an industrial scale;
- Low probability of inducing microbial resistance.

DEVELOPMENT STAGE

Technology Readiness Level 3: experimental proof of concept.

MARKET APPLICATION HIGHLIGHTS

Prospective Active Pharmaceutical Ingredient (API) suitable for topical compositions to prevent and/or treat skin disorders.

PATENT STATUS

Pending (PCT/IB2023/056516)

COOPERATION OPTIONS

Research partnership; Licensing agreement.

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