To explore the effect f N-acyl amino acid surfactants on Malassezia furfur

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Sanda Research and Innovation Center

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Introduction:

Amino acid surfactants are anionic surfactants which contain amino acid groups , wildly used in facial cleanser, shampoo and shower gels for its well-known low irritaiton and high degradability(1), but the bacteriostastic benefits are seldom reported.

Knowing that amino acid surfactants always come along with hydroxyl groups or unsaturated alkyl chain attached to acyl chains, the bacteriostastic benefits could be shown in some kinds of aspect(2). Rongjun Qu(3) and his colleagues reported N-acyl amino acid surfactants had good bacteriostastic properties against Staphylococcus aureus, Pseudomonas aeruginosa and Escherichia coli. And bacteriostastic activity are influenced by N-acyl amino acid surfactants concentration and pH of vehicle. Meanwhile, study on scalp bacteria had not been reported.

In order to bring a holistic overview on amino acid bacteriostastic properties, a in-depth study was done in Sanda research center, we have pleasantly found that N-acyl amino acid surfactants showed good bacteriostastic properties against Malassezia furfur, and bacteriostastic activity is influenced by pH as well.

Materials & Methods:

2.1 Materials

Materials	CAS No.	Materials	CAS No.
Sodium lauroyl sarcosinate	137-16-6	Cocamidopropyl betaine	61789-40-0
Sodium cocoyl alaninate	29923-31-7	Citric acid	77-92-9
Sodium lauroyl glutamate	90170-45-9	Phenoxyethanol	122-99-6
Sodium cocoyl glycinate	90387-74-9	Sodium benzoat	532-32-1
Cocamide methyl MEA	866889-75-0	Malassezia furfu	ATCC 4434

2.2.1 Preparation and detection of four shampoo formulas with and without N-acyl amino acid surfactants.

Exp1: Four shampoo formulas were designed hereby to demonstrate the bacteriostatstic effects.Bacteriostastic tests against Malassezia furfur in these four formulas were done under method of GB 15979-2002.

Ratio / Materials	Formula A	Formula B	Formula C	Formula D
Water	To 100	To 100	To 100	To 100
POLYQUATERNIUM-10	0.4	0.4	0.4	0.4
Sodium lauroyl sarcosinate 30%	37.3	37.3	/	/
Sodium laureth sulfate	/	/	16	16
Cocamidopropyl betaine	6.5	6.5	6.5	6.5
Cocamide methyl MEA	2	2	2	2
Citric acid	qs	qs	qs	qs
Phenoxyethanol	/	0.5	/	0.5
Sodium benzoate	/	0.3	/	0.3

2.2.2 Preparation and detection of N-acryl amino acid surfactant solution

Exp2: Bacteriostatic activity against Malassezia furfur impacted by pH of vehicle and different type of N-acyl amino acid surfactants, were also studied here. In order to confirm that N-acyl amino acid surfactant 's antibacterial effect, N-acyl amino acid surfactant solution is only cintain amino surfactan, water , with or without citric acid.Under the condition of the same effective substance content(11.2%), four different types of N-acyl amino acid surfactants cultured together with Malassezia furfur in the conditions of pHbelow 6 and pHabove 6 respectively.

2.2.3 Experimental method for antibacterial of malassezia furfur

According to appendix C4 of GB 15979-2002, the evaluation standard is: the antibacterial rate is> 50-90%, the product has antibacterial effect; the antibacterial rate is> 90%, the product has strong antibacterial effect.

Results & Discussion:

3.1 The results of Experiment 1:The shampoo formulas containing Sodium lauroyl sarcosinate, showed a certain bacteriostastic effect on Malasszia furfur. In comparison, the shampoo formula with SLES surfactant, showed no bacteriostastic effect against Malasszia furfur.

Contact time / Sample name	The reduction percentage at different contact time (Killing effect) (%)			
	2min	5min	10min	20min
Formula A	94.2	99.2	99.9	99.9
Formula B	99.9	99.9	99.9	99.9
Formula C	0	0	0	0
Formula D	0	0	0	0

3.2 The results of Experiment 2: Bactieriostastic benefit was impacted by pH of above solutions, and also by different type of N-acyl amino acid surfactants. When pH below 6, bacteriostastic effect of N-acyl amino acid surfactants on Malassezia furfur was more favorable.

Contact time / Sample name	The reduction percentage at different contact time (Killing effect) (%)			
	2min	5min	10min	20min
The Sodium lauroyl sarcosinate solution **(pH>6)**	0	0	0	74.7
The Sodium cocoyl glycinate solution **(pH>6)**	24.7	32.9	49.4	69.0
The Sodium lauroyl sarcosinate solution **(pH<6)**	97.2	98.9	99.9	>99.9
The Sodium lauroyl glutamate solution **(pH<6)**	0	53.8	99.6	99.6
The Sodium cocoyl alaninate solution **(pH<6)**	90.9	98.9	99.9	99.9

Conclusions:

The conclusion of these studies has a very practical application. An effective mild anti-dandruff shampoo formula could be designed base on these findings.Mildness of anti-dandruff could be not only well kept by using kinds of N-acyl amino acid surfactants, much more mildness could also be pursued by adjust pH of formula, and using less amount of anti-dandruff agents to reach same level of Malassezia furfur inhibition. Reduction using of anti-dandruff agents would further have positive significance for the health of scalp and the protection of the ecological environment.Per our above studies, we make a mild anti-dandruff amino acid shampoo with Sodium lauroyl sarcosinate(effective substance content is 10%) and only add 0.1% Piroctone olamine, at 2min, 5min, 10min and 20min, the results showed that Malasszia furfur was killed 82.5%, 98.9%, 99.8% and 99.9% respectively. To sum up , our research of N-acyl amino acid surfactants on Malassezia furfur inhibition was further verified in hair care product development.

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Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor. Financial and material support should also be mentioned.

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