Table S1: Skin microbial groups identified by culture-independent methods

	Dry sites				Moist sites				Sebaceous sites			
Microorganism		**Methods**	**Platform**	**References**		**Methods**	**Platform**	**References**		**Methods**	**Platform**	**References**
Arthrodermataceae	x	gene marker	454 Roche	[1]	x	gene marker	454 Roche	[1]	x	gene marker	454 Roche	[1]
Aspergillus	x	gene marker	455 Roche	[1]	x	gene marker	455 Roche	[1]	x	gene marker	455 Roche	[1]
Candida	x	gene marker	456 Roche	[1]	x	gene marker	456 Roche	[1]	x	gene marker	456 Roche	[1]
Chrysosporium	x	gene marker	457 Roche	[1]	x	gene marker	457 Roche	[1]	x	gene marker	457 Roche	[1]
Clavispora lusitaniae	x	WGS		[2]	x	gene marker	458 Roche	[1]	x	gene marker	458 Roche	[1]
Cryptococcus	x	gene marker	463 Roche	[1]	x	gene marker	461 Roche	[1]	x	gene marker	461 Roche	[1]
Debaryomyces hansenii	x	WGS		[2]	x	gene marker	462 Roche	[1]	x	gene marker	462 Roche	[1]
Epicoccum	x	gene marker	458 Roche	[1]	x	gene marker	463 Roche	[1]	x	gene marker	463 Roche	[1]
Eurotiomycetes sp	x	WGS		[2]	x	gene marker	464 Roche	[1]	x	gene marker	464 Roche	[1]
Eurotiomycetes sp					x	gene marker	465 Roche	[1]	x	gene marker	465 Roche	[1]
Leptosphaerulina	x	gene marker	459 Roche	[1]					x	WGS		[2]
Malassezia auris	x	WGS		[2]					x	WGS		[2]
Malassezia dermatis					x	Marker gene	Illumina	[3]	x	WGS		[2]
Malassezia furfur					x	Marker gene	Illumina	[3]	x	WGS		[2]

Malassezia japonica					x	Marker gene	Illumina	[3]				
Malassezia obtusa					x	Marker gene	Illumina	[3]				
Malassezia palma	x	WGS		[2]								
Malassezia rara	x	WGS		[2]								
Malassezia restricta	x	WGS		[2]	x	WGS		[2]				
Malassezia slooffiae	x	WGS		[2]	x	WGS		[2]				
Malassezia sympodialis	x	WGS		[2]	x	WGS		[2]				
Phoma	x	gene marker	461 Roche	[1]	x	Marker gene	Illumina	[3]				
Rhodotorula	x	gene marker	464 Roche	[1]	x	Marker gene	Illumina	[3]				
Rhodotorula sp					x	Marker gene	Illumina	[3]				
Rhodotorula sp	x	WGS		[2]	x	Marker gene	Illumina	[3]				
Rhodotorula sp					x	Marker gene	Illumina	[3]				
Saccharomyces	x	gene marker	462 Roche	[1]	x	Marker gene	Illumina	[3]				
Ustilago	x	gene marker	465 Roche	[1]	x	Marker gene	Illumina	[3]				

Table S2: Patent documents related to postbiotics for skin applications.

Patent number	Patent title	Inventor
WO2021165434-A1	Bacterial strain *Cutibacterium acnes* used as medicament in postbiotic product and topical composition for topical treatment of inflammatory or allergic disease, is deposited in German Collection of Microorganisms and Cell Cultures GmbH	Vergalito, F.; Longo Sormani, S.; Magnifico, I.; Pietrangelo, L.; Di Marco, R. M. A.; Cutuli, M. A.; et al.
US2017304377-A1	Composition useful improving human health, comprises mixture comprising prebiotic, probiotic comprising mixture of Lactobacillus microorganisms, and postbiotic derived from liquid fermentation medium of Lactobacillus microorganism	Carpenter, R. S.; Huff, E. W.; Kapur, A.
US2015320809-A1	Composition for treating digestive disorder such as constipation and diarrhea dysbiosis, reducing comorbidities associated with metabolic X syndrome, and treating skin disorder such as rosacea, comprises prebiotic, probiotic and postbiotic	Carpenter, R. S.; Huff, W. E.; Kapur, A.; Carpenter, R.; Kapoor, A.; Huff, E. W.; Kappel, A.
CN113925884-A	Use of postbiotic extract prepared from components such as casein and sodium alginate having different isoelectric points for preparing composition for promoting skin regeneration	Chiu, Y.; Chiu, H.; Lin, M.
US2022096573-A1	Improving skin condition, where skin condition to be improved is selected from skin wrinkles, skin elasticity, involves administering postbiotic extract to subject, where postbiotic extract is prepared by providing first and second material	Chiu, Y.; Chiu, H.; Lin, M.
CN113925885-A	Use of a postbiotic extract for the preparation of a composition for preventing and/or treating arthritis	Chiu, Y.; Chiu, H.; Lin, M.
WO2021105638-A1	Use of hydroperoxyalcohol type compound or its 1,2,4-trioxane as preservative for improving antimicrobial properties and antimicrobial agent for treating disease of skin, mucous membrane and/or integuments, preferably acne, herpes	Caijo, F.; Darcel, C.; Martin, R.; Escande, V.

WO2020210553-A1	Pharmaceutical composition useful for treating, inhibiting or preventing disease, disorder, or condition associated with pathogenic microorganism, preferably Dermatophyte or bacterium, comprises human-derived Janthinobacterium lividum	Brucker, R. M.; Zhang, X.; Lister, I.; Jain, S.
KR2421144-B1	New Bifidobacterium bifidum EPS DA-LAIM having prebiotic activity, useful in e.g. food composition for producing exopolysaccharide through promoting growth of probiotics, and improving skin aging caused by excessive accumulation of oxygen	Hansangduck; Youngsun, H.; Parkminju; Cho, H. I.; Lee, E.
KR2374480-B1	Postbiotics for use in health functional food or pharmaceutical composition for improving or treating inflammatory diseases, comprises exopolysaccharide and Exopolysaccharide in form of ropy and Lactobacillus paracasei	Hansangduck; Youngsun, H.; Parkminju; Cho, H. I.; Lee, E.
EP3915537-A1	Use of bacterium of Bifidobacterium animalis or its mixture for preventing, reducing or treating skin aging in subject by maintaining metabolic activity or cell viability, increasing metabolic activity or cell viability, and slowing down reduction of metabolic activity and/or cell viability	Anglenius, H.; Huuskonen, L. T. M.; Tiihonen, K.
WO2022119533-A2	Alcohol-based product used to disinfect the skin by preserving the skin flora, comprises at least one type of alcohol and at least one type of prebiotic	Bilir, N. D.
WO2022060334-A1	Sexual health product useful as sexual health product, such as lubricant gel, composition comprises agent with lubricating property, prebiotic and postbiotic	Bilir, N. D.; Boduroglu, M. S.; Acar, C.
WO2022195118-A1	Use of postbiotic composition comprises postbiotic and bacteriocin and/or endolysin for treating of cutaneous T-cell lymphoma	Decrulle, A.; Duportet, X.
WO2022195112-A1	Use of postbiotic composition comprising postbiotic, and bacteriocin and/or endolysin, in formulation for treating acneiform rash in subject by stimulating growth of commensal bacterial species and targeting unfavorable bacterial species	Decrulle, A.; Duportet, X.

WO2022195115-A1	Use of postbiotic composition comprising postbiotic, and bacteriocin and/or endolysin, in formulation for treating subacute cutaneous lupus erythematosus and inducing antiinflammatory response in subject	Decrulle, A.; Duportet, X.
WO2022195109-A1	Use of postbiotic composition comprises postbiotic and bacteriocin and/or endolysin for treating inflammatory disorder, folliculitis, acne, and atopic dermatitis	Decrulle, A.; Duportet, X.
WO2022195108-A2	Cosmetic caring of skin and/or mucosa of subject involves applying postbiotic composition comprising postbiotic and bacteriocin or endolysin, where postbiotic and bacteriocin or endolysin have synergistic effect in cosmetic caring method	Decrulle, A.; Duportet, X.
WO2022053770-A1	Performing non-therapeutic cosmetic treatment useful for improving hydration state of skin or scalp, and treating inflammatory skin disorder e.g. dermatitis, by applying cosmetic composition containing alkyl glycoside, polysaccharide, triglyceride, phytosterol and amino acid	Ormancey, X.; Bidan, C.; Rattier, S.; Duplan, H.; Jacques-Jamin, C.; Jacques, J. C.; et al.
FR3073142-A1	Solid cosmetic formulation useful for washing integument (skin, superficial body growths), mucous membranes, genital mucosa and intimate hygiene comprises basic formulation comprising syndet, prebiotic, and postbiotic	Drago, M.
FR3086170-A1	Cosmetic formulation used to cosmetic care of skin and integuments for skin application comprises prebiotic and postbiotic comprising acetic acid	Drago, M.
WO2021176387-A1	Composition used for treating or preventing pathological condition of the female reproductive system caused by an imbalance in the microbiota, comprises paraprobiotic bacteria belonging to the genus Lactobacillus	La Marca, A.
WO2021000046-A1	Synergistic combination used in tablet or capsule for e.g. resensitizing antibiotic-resistant infection and decreasing resistance of bacterial infection comprises quorum-sensing inhibitor and/or postbiotic metabolite and antibiotic	Cella, M. A.

CN113637606-A	Microbial composition useful in e.g. preparing medicine, food or animal food, nutrition, health products or supplements, daily chemicals, cosmetics, washing and protecting product comprises postbiotic and bacteriophage, where postbiotic comprises inactivated probiotics	Lu, Q.; Li, J.; Sun, W.
CN114099408-A	Composition containing prebiotics, probiotics and postbiotics, comprises preparation raw materials containing first phase e.g. moisturizer, second phase e.g. glyceride and third phase e.g. biological polysaccharide gum powder composition	Yang, Y.; Chen, Y.; Pu, S.
CN112980892-A	Probiotic fermentation liquid useful in cosmetics and beauty products for e.g. removing wrinkles comprises e.g. Lactobacillus plantarum, Lactobacillus casei, Bifidobacterium lactis, Bifidobacterium animalis, sucrose and seaweed powder	Peng, C.; Wang, X.
WO2021111372-A1	Stable eye topical composition used to prevent or treat microbial eye infections, and vernal keratoconjunctivitis, comprises postbiotic, liquid carrier i.e. water, buffer system comprising sodium hydrogen phosphate, and isotonising agent	Solfato, E.; Sudano Roccaro, A.; Zappulla, C. M. C.; Spoto, C. G.; Spina, D.; Pepe, V.; et al.
KR2149102-B1	Manufacture of dermobiotics block composition used for e.g. face mask, involves preparing restriction mediums, inoculating and fermenting lactic acid bacteria in medium, heating fermented product, and mixing obtained paraprobiotics	Choi, D.; In, J.; Lee, C. W.; Choi, J. W.; Cha, S. Y.; Lee, S. Y.; Lee, S. H.; et al.
WO2022219133-A1	Aqueous sulfate-free cleansing composition useful for female intimate hygiene for balancing microbiome, comprises sulfate-free surfactants comprising glycinates, betaines, alkyl polyglucosides and amphoacetates, prebiotic and lactic acid	Bharadwaj, S.; Gupta, S.; Kapoor, R.; Mitra, R.; Nair, R. S.; Yang, L.; Yekhe, A. S.
WO2022112609-A1	New isolated bacterial strain of Limosilactobacillus reuteri species, useful for treating/preventing diseases associated with reduced levels of riboflavin e.g. nervous system, skin diseases, respiratory diseases	Lebeer, S.; Ahannach, S.; Spacova, I.; Wittouck, S.

WO2020056359-A1	Probiotic composition useful for diagnosing skin disease or disorder, comprises microorganism including Staphylococcus capitis N030E12, and Staphylococcus epidermidis AMT5C5	Gallo, R. L.; Nakatsuji, T.; Oneill, A. O.; O'neill, A. O.; Oneill, A.
KR2020028627-A	Composition used as health functional food and food for improving skin aging and skin by increasing oil and water content of skin, reducing transdermal water loss, skin roughness, skin depression and wrinkles comprises Lactobacillus reuteri	Mo, K. S.; Suk, J. H.
KR2021137739-A	Producing post biotic fermentation product used in food composition and pharmaceutical composition for enhancing immunity involves leaving fermented lactic acid bacteria culture medium and heat-treating to obtain fermentation product	Kang, J. H.; Yang, K. C.
WO2021110768-A1	Combination used in cosmetic composition and device for caring for hair or skin, comprises powder adhesion agent, mannitol, alpha-glucan oligosaccharide, oil and surfactant	Azancot, H.; Helene, A.

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