

Fig. S1 - Study design

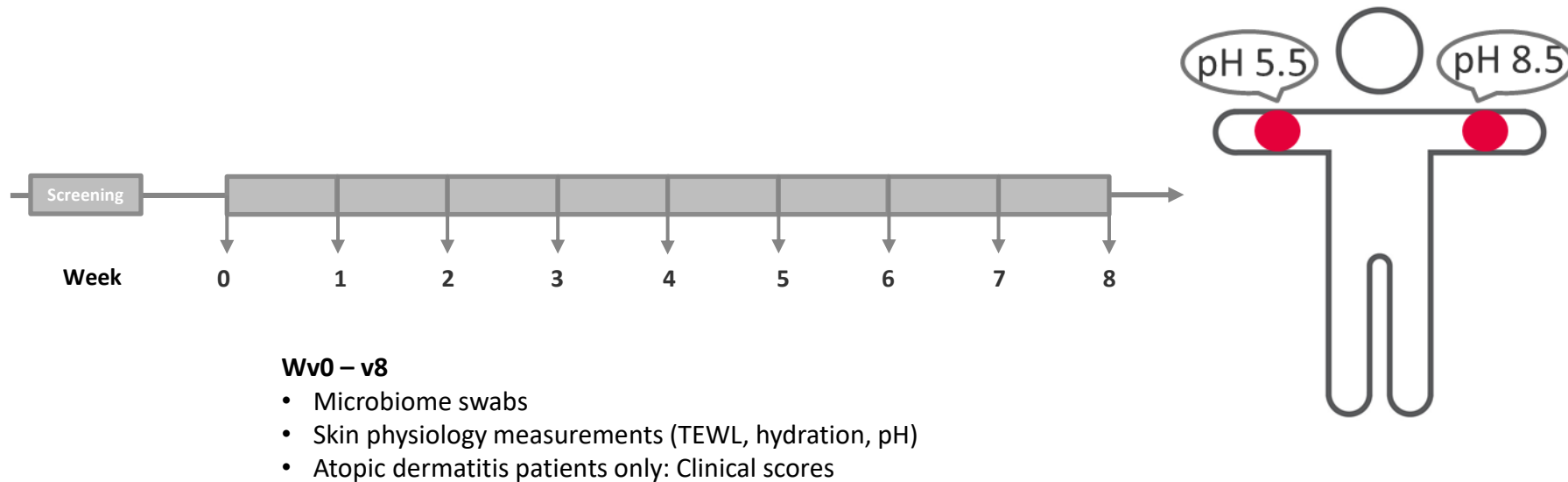


Fig. S1: Study design. For this double blinded control study, 6 healthy individuals and 6 atopic dermatitis patients put the same emollient with either pH 5.5 or pH 8.5 twice daily on opposite bodysides for 8 weeks. Each week, swabs were taken for microbiome analysis. Also, skin physiology parameters were investigated (hydration, transepidermal waterloss (TEWL), pH). Furthermore, in AD patients, clinical scores were investigated (EASI, objective SCORAD, local SCORAD).

Tab. S1 – Demographic data

Tab. S1: Demographic data. The table shows the distribution of gender, ethnicity and age of healthy and atopic dermatitis individuals

Safety Set	atopic dermatitis	healthy volunteer
	No. of Patients	No. of Participants
Gender		
	male	2
	female	4
Ethnicity		
	caucasian	6
Age [Years]		
	Mean (STD)	43.50 (15.91)
	Min - Max	22.20 - 66.40

Tab. S2 – statistical tests physiology

Tab. S2: Statistical analysis of physiological parameters. The tables show the p-value of an unpaired (A) or paired (B, C) Wilcoxon test. Significant values are marked in red.

A

Comparing	pH	Hydration	TEWL
AD vs HE week 0	0.478	0.052	0.004
AD vs HE week 1	0.862	0.004	<0.001
AD vs HE week 2	0.713	<0.001	<0.001
AD vs HE week 3	0.885	<0.001	<0.001
AD vs HE week 4	0.378	0.046	<0.001
AD vs HE week 5	0.436	0.198	<0.001
AD vs HE week 6	0.564	0.011	<0.001
AD vs HE week 7	0.931	0.069	<0.001
AD vs HE week 8	0.795	<0.001	<0.001

B

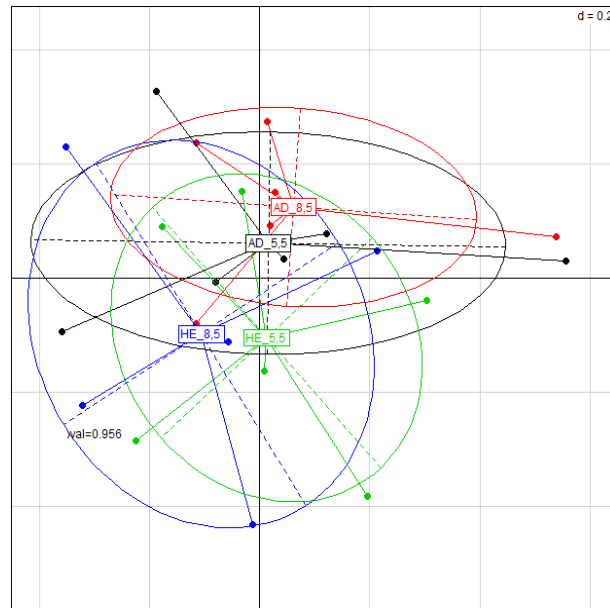
Comparing	local SCORAD	pH	Hydration	TEWL
AD - Baseline vs week 1	0.159	0.577	0.569	0.176
AD - Baseline vs week 2	0.093	0.413	0.784	0.970
AD - Baseline vs week 3	0.943	0.966	0.906	0.424
AD - Baseline vs week 4	0.280	0.465	0.733	0.784
AD - Baseline vs week 5	0.756	0.577	0.027	0.622
AD - Baseline vs week 6	0.382	0.365	0.266	0.424
AD - Baseline vs week 7	0.526	0.700	0.470	0.052
AD - Baseline vs week 8	0.369	0.278	0.380	0.077
HE - Baseline vs week 1	NA	0.147	0.052	0.850
HE - Baseline vs week 2	NA	0.147	0.110	0.733
HE - Baseline vs week 3	NA	0.067	0.204	0.042
HE - Baseline vs week 4	NA	0.206	0.910	0.042
HE - Baseline vs week 5	NA	0.054	0.470	0.266
HE - Baseline vs week 6	NA	0.278	0.042	0.970
HE - Baseline vs week 7	NA	0.147	0.240	0.733
HE - Baseline vs week 8	NA	0.206	0.129	0.850

C

Comparing	loc Scrad	pH	Hydration	TEWL
AD week 0	0.174	0.813	1.000	0.844
AD week 1	0.586	0.313	0.563	1.000
AD week 2	0.773	0.031	1.000	0.844
AD week 3	0.783	0.219	1.000	0.438
AD week 4	1.000	0.156	0.418	0.844
AD week 5	1.000	0.031	0.563	0.844
AD week 6	0.345	0.063	0.219	0.688
AD week 7	0.181	0.031	0.688	0.563
AD week 8	0.586	0.115	0.219	0.688
HE week 0	NA	1.000	0.688	0.563
HE week 1	NA	0.438	0.438	0.563
HE week 2	NA	0.688	0.563	0.313
HE week 3	NA	0.219	0.156	0.313
HE week 4	NA	0.313	0.563	0.313
HE week 5	NA	0.063	0.313	0.563
HE week 6	NA	0.031	0.625	1.000
HE week 7	NA	0.063	0.813	0.438
HE week 8	NA	0.094	0.031	1.000

Fig. S2 – Beta-diversity plot at Baseline and Endpoint

A



B

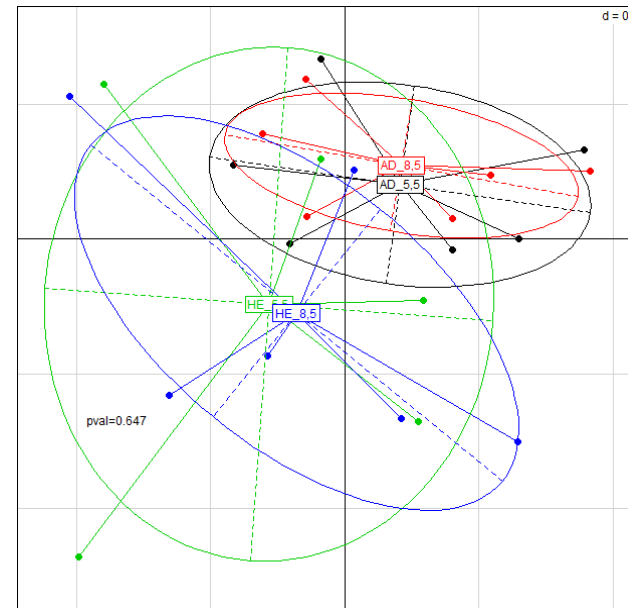


Fig. S2: The β -diversity of the skin microbiome. The β -diversity of AD and HE participants separated for treatment at baseline (A) and at endpoint are shown (B).

Tab. S3 – statistical tests skin microbiome

Tab. S3: Statistical analysis of microbiome parameters. The tables show the p-value of an unpaired (A) or paired (B, C) Wilcoxon test. Significant values are marked in red.

A

Comparing	richness	evenness	<i>P. acnes</i>	<i>S. epidermidis</i>	<i>S. caprae</i>	<i>S. aureus</i>	<i>C. tuberculo</i>	<i>S. hominis</i>	<i>M. osloensis</i>	<i>S. saccharolyticus</i>	<i>F. magna</i>	<i>S. warneri</i>	<i>Staphylococcaceae</i>	<i>Propionibacteriaceae</i>	<i>Corynebacteriaceae</i>	<i>Moraxellaceae</i>	<i>Streptococcaceae</i>	<i>Micrococcaceae</i>	<i>Clostridiales</i>	<i>Lactobacillaceae</i>	<i>Rhodobacteraceae</i>	<i>Pseudoalteromonadaceae</i>
AD vs HE week 0	0.094	0.319	0.713	0.219	0.478	0.035	0.410	0.078	0.977	0.977	0.069	0.101	0.671	0.713	0.347	0.755	0.114	0.020	0.078	0.040	0.224	0.894
AD vs HE week 1	0.190	0.059	0.786	0.413	0.786	0.019	0.023	0.069	0.651	0.928	0.928	0.169	0.169	0.786	0.169	0.566	0.976	0.002	0.740	0.644	0.118	0.403
AD vs HE week 2	0.003	0.020	0.347	0.143	0.713	0.012	0.977	0.045	0.799	0.507	0.624	0.143	0.242	0.378	0.713	0.932	0.443	0.024	0.507	0.840	0.410	0.286
AD vs HE week 3	0.312	0.160	0.443	0.590	0.977	0.017	0.514	0.319	0.030	0.544	0.087	0.603	0.198	0.443	0.266	0.024	0.713	0.319	0.236	0.236	0.563	0.542
AD vs HE week 4	0.101	0.160	0.178	0.887	0.443	0.006	0.671	0.078	0.443	0.319	0.514	0.795	0.843	0.178	0.514	0.932	0.478	0.014	0.378	0.341	0.101	0.069
AD vs HE week 5	0.033	0.443	0.101	0.887	1.000	0.005	0.755	0.371	0.932	0.843	0.088	0.506	0.219	0.101	0.932	0.755	0.507	0.751	0.126	0.370	0.840	0.068
AD vs HE week 6	0.051	0.288	0.833	0.379	0.413	0.037	0.525	0.413	0.134	0.347	0.525	0.356	0.134	0.880	0.740	0.059	0.449	0.023	0.449	0.559	0.389	0.630
AD vs HE week 7	0.079	0.134	0.525	0.347	0.928	<0.001	0.926	0.566	0.566	0.782	0.372	0.880	0.169	0.449	0.976	0.347	0.695	0.255	0.340	0.309	0.479	0.205
AD vs HE week 8	0.204	0.024	0.178	0.378	0.977	0.001	0.799	0.068	0.630	0.932	0.012	0.624	0.514	0.178	0.078	0.590	0.843	0.128	0.010	0.112	0.052	0.113

B

Comparing	richness	evenness	<i>P. acnes</i>	<i>S. epidermidis</i>	<i>S. caprae</i>	<i>S. aureus</i>	<i>C. tuberculo</i>	<i>S. hominis</i>	<i>M. osloensis</i>	<i>S. saccharolyticus</i>	<i>F. magna</i>	<i>S. warneri</i>	<i>Staphylococcaceae</i>	<i>Propionibacteriaceae</i>	<i>Corynebacteriaceae</i>	<i>Moraxellaceae</i>	<i>Streptococcaceae</i>	<i>Micrococcaceae</i>	<i>Clostridiales</i>	<i>Lactobacillaceae</i>	<i>Rhodobacteraceae</i>	<i>Pseudoalteromonadaceae</i>
AD - Baseline vs week 1	0.034	0.910	0.910	0.424	0.380	0.009	0.519	0.791	0.424	0.791	0.052	0.677	0.266	0.910	0.470	0.569	0.622	0.910	0.052	0.077	0.204	0.584
AD - Baseline vs week 2	0.021	0.677	0.970	0.519	0.622	0.012	0.791	0.970	0.677	0.519	0.052	0.970	0.850	0.910	0.970	0.850	0.519	0.266	0.052	0.042	0.204	0.181
AD - Baseline vs week 3	0.424	0.677	0.622	0.129	0.424	0.064	0.424	0.910	0.424	0.519	0.129	0.569	0.519	0.622	0.519	0.034	0.910	0.233	0.092	0.042	0.230	0.181
AD - Baseline vs week 4	0.034	0.970	0.519	0.266	0.009	0.034	0.470	0.910	0.733	0.151	0.424	0.266	0.339	0.470	0.380	0.791	0.569	0.733	0.424	0.034	0.380	0.787
AD - Baseline vs week 5	<0.001	0.380	0.424	0.007	0.042	0.009	0.791	0.677	0.042	0.176	0.064	0.791	0.677	0.424	1.000	0.064	0.176	0.519	0.110	0.016	0.622	1.000
AD - Baseline vs week 6	0.001	0.380	0.470	0.151	0.424	0.012	0.791	0.677	0.677	0.733	0.077	0.380	0.301	0.470	0.733	0.622	1.000	0.677	0.092	0.052	0.266	0.295
AD - Baseline vs week 7	0.003	0.176	0.850	0.910	0.077	0.001	0.850	0.677	0.569	1.000	0.129	0.470	0.204	0.850	0.910	0.339	0.301	1.000	0.092	0.021	0.677	1.000
AD - Baseline vs week 8	0.003	0.021	0.733	0.176	0.077	<0.001	0.204	0.970	0.380	0.850	0.064	0.424	0.151	0.733	0.380	0.110	0.424	0.910	0.077	0.021	0.733	0.584
HE - Baseline vs week 1	0.760	0.365	0.765	0.206	0.413	0.175	0.240	0.365	0.831	0.898	0.365	0.520	0.123	0.831	0.700	0.898	0.001	0.147	0.147	0.185	0.465	0.855
HE - Baseline vs week 2	0.470	0.064	0.791	0.027	0.470	0.470	0.569	0.569	0.519	0.129	0.919	0.380	0.012	0.791	0.233	0.519	0.519	0.016	0.919	0.756	0.677	1.000
HE - Baseline vs week 3	0.970	0.569	0.733	0.380	0.910	0.850	0.339	0.176	0.034	0.519	0.120	0.092	0.233	0.424	0.424	0.052	0.052	0.077	0.197	0.505	0.789	1.000
HE - Baseline vs week 4	0.677	0.519	0.470	1.000	0.266	0.733	0.301	0.380	1.000	0.233	0.850	0.110	0.569	0.569	0.470	0.850	0.301	0.301	0.519	0.068	0.027	1.000
HE - Baseline vs week 5	0.970	0.424	0.266	0.470	0.380	0.733	0.204	0.204	0.569	0.470	0.415	0.970	0.301	0.266	0.470	0.569	0.233	0.733	0.756	0.838	0.919	0.789
HE - Baseline vs week 6	0.700	0.520	0.577	0.365	0.206	0.765	0.413	0.240	0.032	1.000	0.520	0.465	0.175	0.638	0.577	0.019	0.206	0.765	0.638	0.359	0.610	0.022
HE - Baseline vs week 7	0.477	0.413	0.320	0.465	0.831	0.898	0.175	0.042	0.465	0.966	0.906	0.520	0.831	0.278	0.083	0.365	0.413	0.520	0.813	0.476	0.610	0.855
HE - Baseline vs week 8	0.380	0.129	0.266	0.970	0.519	0.677	0.380	0.470	0.003	0.519	0.103	0.339	0.733	0.266	0.970	0.110	0.677	0.519	0.103	0.756	0.910	0.789

C

Comparing	richness	evenness	<i>P. acnes</i>	<i>S. epidermidis</i>	<i>S. caprae</i>	<i>S. aureus</i>	<i>C. tuberculo</i>	<i>S. hominis</i>	<i>M. osloensis</i>	<i>S. saccharolyticus</i>	<i>F. magna</i>	<i>S. warneri</i>	<i>Staphylococcaceae</i>	<i>Propionibacteriaceae</i>	<i>Corynebacteriaceae</i>	<i>Moraxellaceae</i>	<i>Streptococcaceae</i>	<i>Micrococcaceae</i>	<i>Clostridiales</i>	<i>Lactobacillaceae</i>	<i>Rhodobacteraceae</i>	<i>Pseudoalteromonadaceae</i>
AD week 0	0.844	0.563	0.688	1.000	0.563	0.563	0.156	0.688	1.000	1.000	0.563	1.000	0.688	0.688	0.156	0.438	0.844	0.688	0.563	0.156	0.688	1.000
AD week 1	0.063	0.313	0.563	0.688	0.563	0.438	1.000	0.063	0.844	0.688	0.688	0.313	1.000	0.563	0.563	0.313	0.063	0.844	1.000	0.563	0.423	0.423
AD week 2	0.844	0.438	0.563	0.844	1.000	1.000	0.313	1.000	0.156	0.219	0.563	0.844	0.844	0.563	0.563	0.063	0.156	0.563	0.844	0.563	0.219	0.371
AD week 3	0.438	0.563	1.000	0.313	0.844	0.313	0.844	0.688	1.000	0.156	0.313	0.438	1.000	1.000	0.844	0.688	0.844	0.438	0.438	0.313	1.000	1.000
AD week 4	0.563	1.000	1.000	0.156	0.844	0.844	0.844	0.438	0.313	0.844	0.688	0.563	0.438	1.000	0.313	0.094	0.844	0.563	0.563	1.000	0.844	0.361
AD week 5	0.438	0.844	0.094	1.000	0.156	0.313	0.844	0.844	0.844	1.000	0.844	0.688	0.031	0.094	0.688	1.000	0.313	0.563	0.844	0.313	0.844	0.789
AD week 6	0.844	1.000	1.000	0.063	1.000	1.000	0.563	0.563	0.313	0.688	0.688	0.563	0.844	1.000	0.094	0.219	0.688	0.563	0.844	1.000	0.563	0.855
AD week 7	0.313	0.313	0.313	0.688	1.000	0.063	0.219	1.000	0.844	0.438	0.031	0.563	0.844	0.219	0.313	0.313	0.563	0.438	0.031	0.094	0.844	0.584
AD week 8	0.688	0.844	0.844	0.563	0.438	0.844	0.688	0.844	1.000	0.563	0.438	1.000	0.688	0.844	0.563	0.844	0.438	0.313	0.438	0.688	1.000	0.371
HE week 0	0.844	0.438	0.438	0.438	0.844	0.063	0.844	0.438	0.438	0.438	0.178	0.313	0.031	0.438	0.438	0.219	0.563	0.313	0.281	0.438	0.063	1.000
HE week 1	0.438	0.188	1.000	1.000	0.438	1.000	0.813	0.188	0.313	0.625	0.125	1.000	0.813	1.000	0.813	0.125	1.000	0.313	0.125	0.584	1.000	1.000
HE week 2	0.094	0.438	0.563	0.438	0.844	1.000	1.000	0.563	0.688	0.219	0.590	0.156	1.000	0.563	0.844	1.000	0.563	0.844	0.418	0.844	1.000	1.000
HE week 3	0.438	0.688	0.094	0.438	0.688	0.156	0.563	0.844	1.000	0.844	0.787	0.178	0.156	0.094	0.313	0.563	0.094	0.031	0.313	0.418	0.844	1.000
HE week 4	0.688	0.844	0.063	0.156	1.000	0.438	1.000	0.688	0.313	0.688	0.563	0.281	0.156	0.063	0.438	1.000	0.844	0.438	1.000	0.844	1.000	1.000
HE week 5	0.844	0.563	0.844	0.438	0.438	0.106	0.438	0.787	0.313	0.156	0.418	0.787	0.844	0.844	0.844	0.438	0.178	0.281	0.281	1.000	0.584	0.371
HE week 6	0.438	0.125	1.000	1.000	1.000	0.313	0.438	0.188	0.063	0.188	1.000	0.438	1.000	1.000	0.625	0.313	0.813	0.813	1.000	0.855	0.313	0.361
HE week 7	0.438	0.438	0.625	1.000	0.313	1.000	0.063	0.813	0.063	0.584	0.361	0.063	1.000	0.625	0.063	0.125	0.625	0.313	0.584	0.855	0.361	1.000
HE week 8	0.563	0.844	0.563	0.219	0.688	0.313	1.000	0.219	0.844	0.094	0.688	0.219	0.031	0.563	0.688	0.844	0.563	0.688	0.844	1.000	0.844	1.000

Fig. S3 - Skin physiological parameters correlate among each other

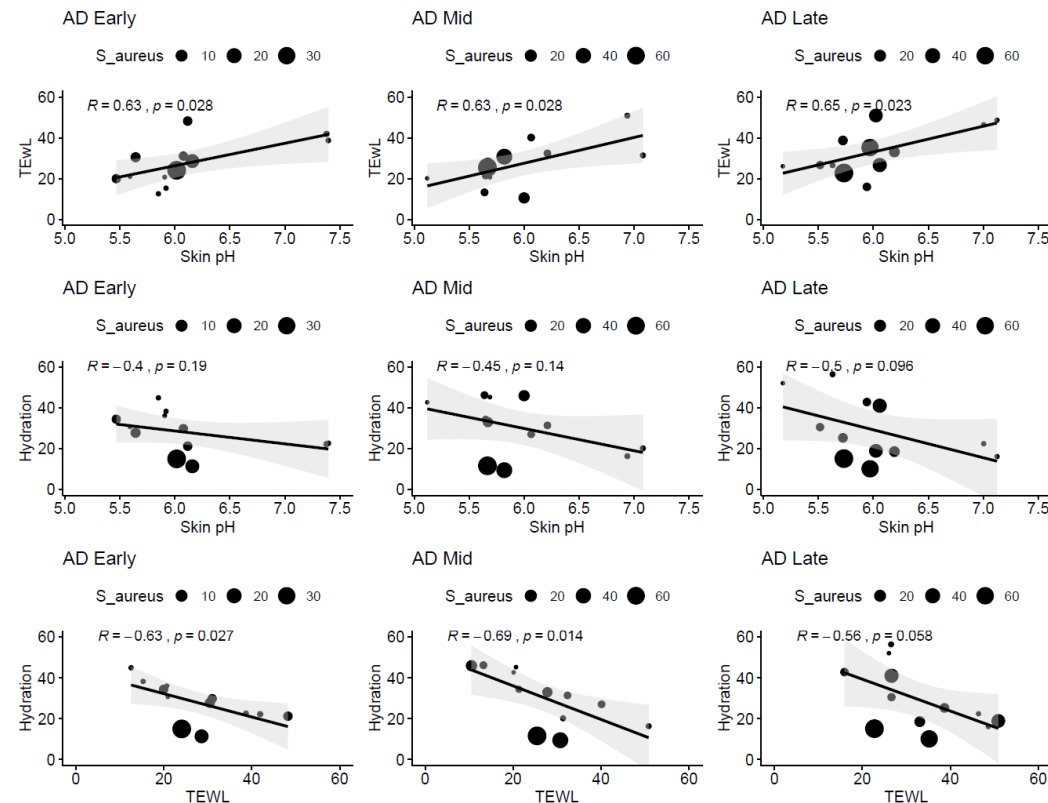


Fig. S3: Correlation of skin physiology parameters. Shown are the correlations of the physiological data among each other (Spearman correlation of y- and x-axis). On top, the bubble size shows the *S. aureus* abundance in percent.

Fig. S4 – Prediction Baseline *S. aureus* – Endpoint severity

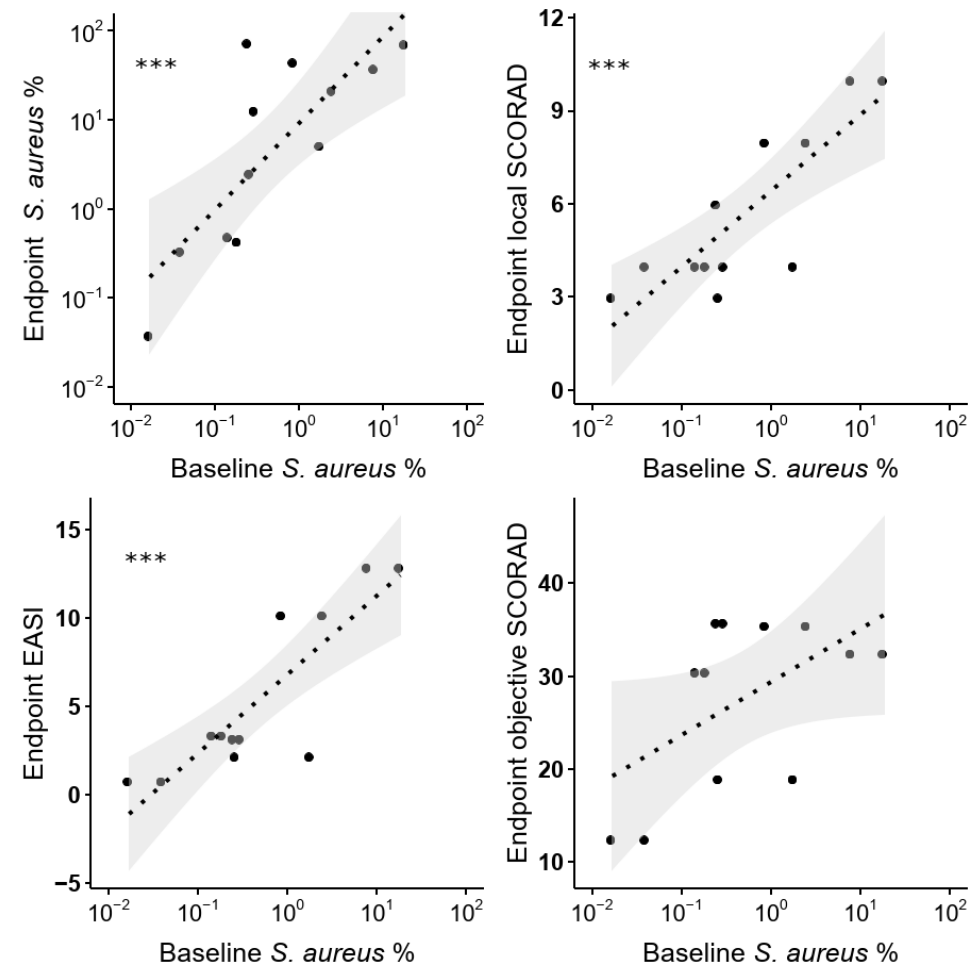


Fig. S4: Prediction of endpoint severity. The correlation between baseline *S. aureus* abundance in % and endpoint (A) *S. aureus* abundance in %, (B) local SCORAD, (C) EASI or (D) objective SCORAD are shown. Significant correlations were marked with * (p value < 0.05), ** (p value < 0.01) or *** (p value < 0.001).

Fig. S5 – Short term effect of emollient pH

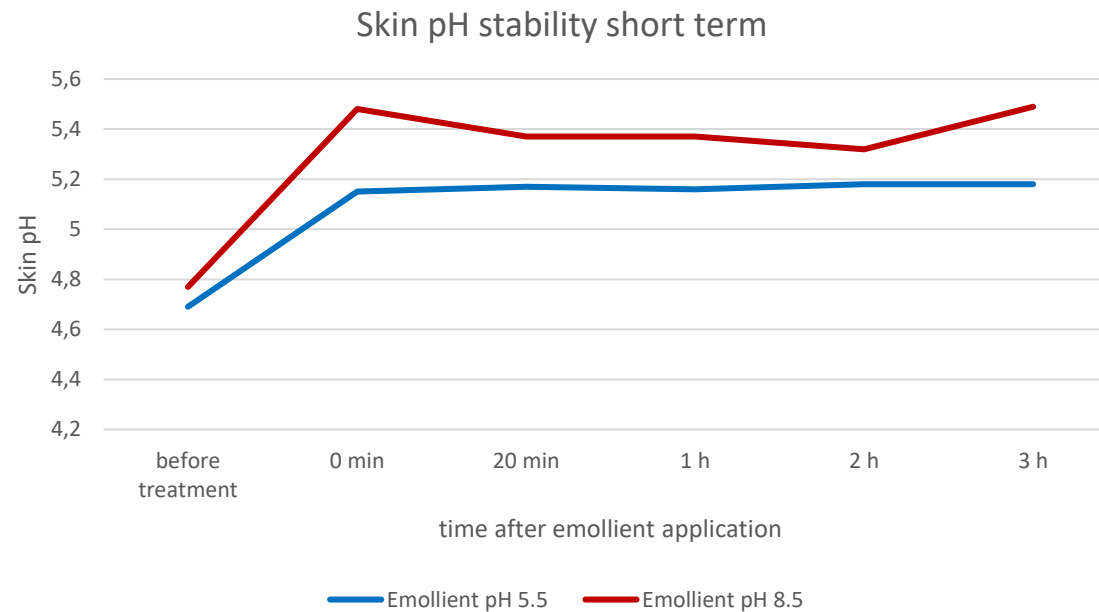


Fig. S5: Short term effect of emollient pH on skin pH. The figure shows a short term change in skin surface pH after application of the emollient with pH 5.5 (blue) or emollient pH 8.5 (red) on healthy individuals. Shown is the mean, n= 5.