Thermal therapy modulation of the psoriasis-associated skin and gut microbiome

Serena Manara, PhD*[,1]; Francesco Beghini, PhD*[,1,2]; Giulia Masetti, PhD*[,1]; Federica Armanini, MS[1]; Davide Geat, MD[3]; Giulia Galligioni, MD[4]; Nicola Segata, PhD^[,1]; Stefania Farina, MD^[,5]; Mario Cristofolini, MD^[,5]

1. Department of Cellular Computational and Integrative Biology-CIBIO, Trento, Italy

2. Yale Institute for Network Science, Yale University, New Haven, CT, USA

3. Department of Dermatology, ASST Spedali Civili di Brescia, Brescia, Italy

4. Clinical Unit of Occupational Medicine, Health Agency Trento, Trento, Italy

5. Istituto G.B. Mattei, Stenico (TN), Italy

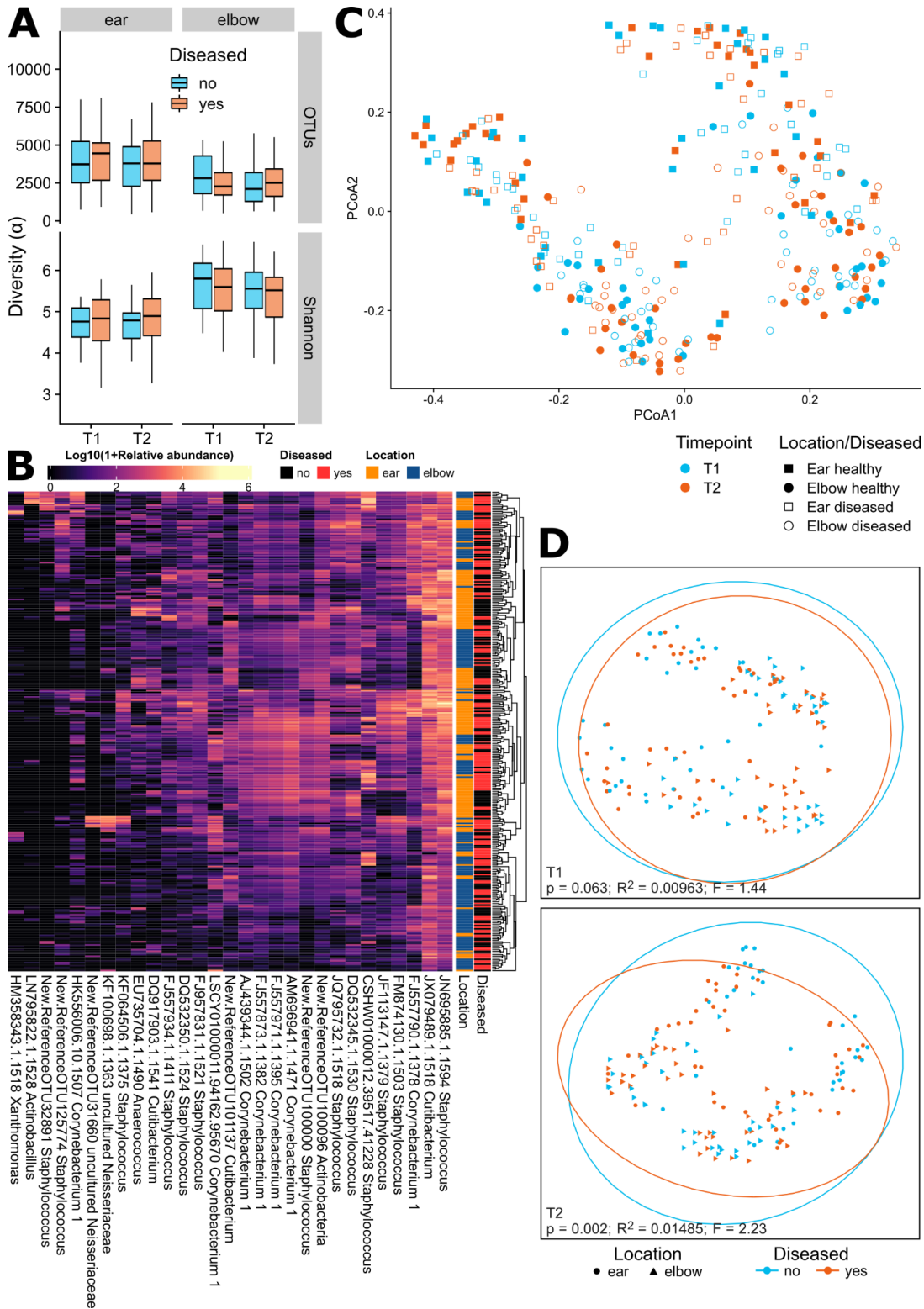* These authors contributed equally

^ Co-last authors

Corresponding author: Prof. Nicola Segata

Postal address: Laboratory of Computational Metagenomics, Department CIBIO, University of Trento, Via Sommarive 9, 38123 Povo (Trento), Italy

Phone number: (+39) 0461 285218

email: nicola.segata@unitn.it,

SUPPLEMENTARY FIGURES

Supplementary Figure S1. A) Alpha diversity of affected and unaffected areas behind the ear and on the elbow before (T1) and after (T2) balneotherapy. Alpha diversity is reported both as number of observed OTUs (i.e. species richness) as well as Shannon diversity index (i.e. species diversity). **B)** The 30 most abundant OTUs on the affected and unaffected skin of psoriatic patients before balneotherapy. **C)** Principal Component Analysis (PCoA) of pairwise Bray-Curtis dissimilarities on taxonomic composition shows no clear separation between affected and unaffected areas at the same location or between timepoints. **D)** PCoA of pairwise Bray-Curtis dissimilarities on taxonomic composition shows no clear separation between affected and unaffected areas before thermal treatment and a slight separation afterwards.
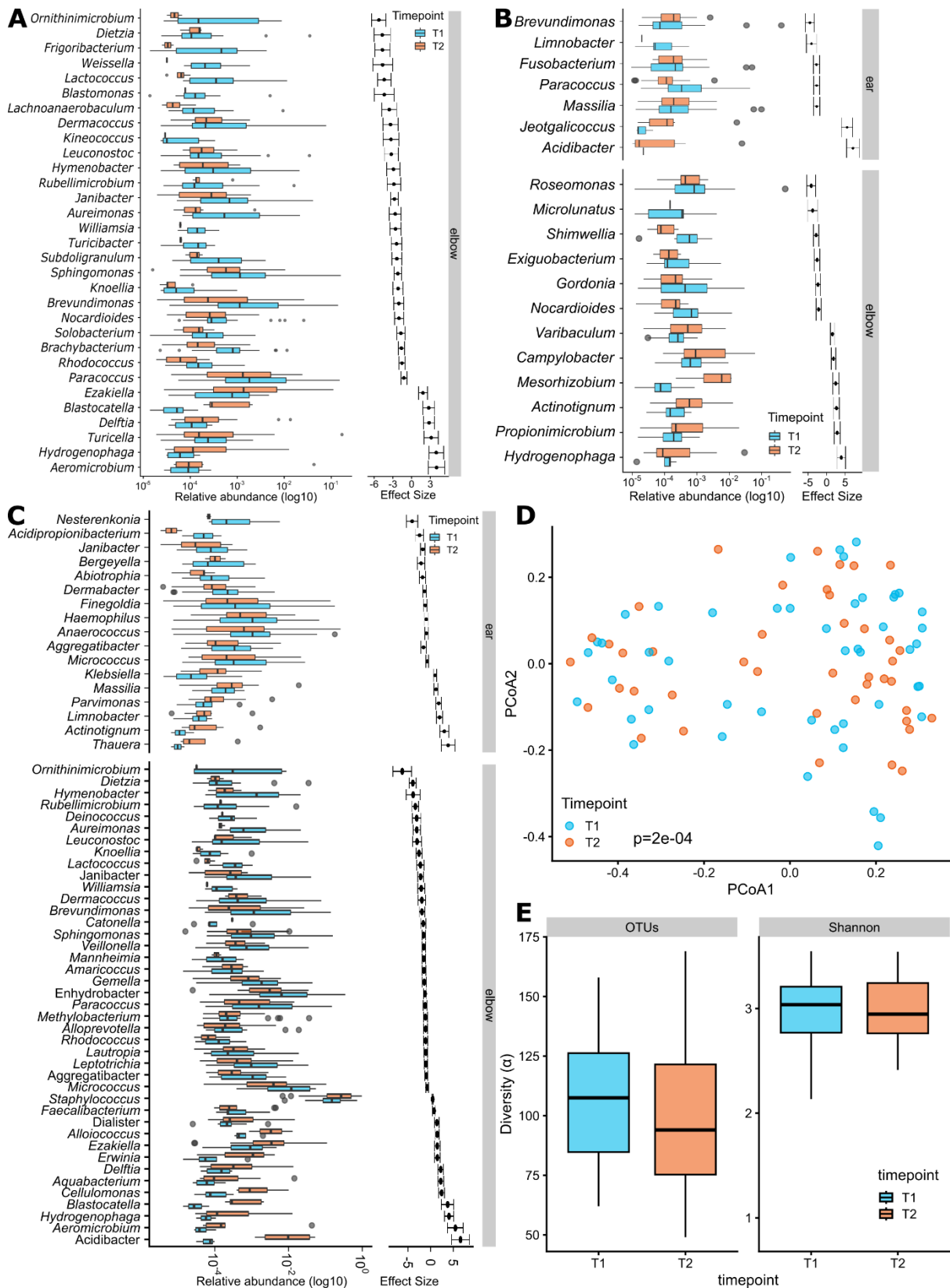
Supplementary Figure S2. A) Differentially abundant genera on the elbow skin affected by psoriasis before (T1) and after (T2) balneotherapy. No genera were significantly differentially abundant before and after balneotherapy on the psoriatic skin behind the ear. **B)** Differentially

abundant genera on the unaffected skin before (T1) and after (T2) balneotherapy. **C)** Differentially abundant genera on the skin not affected by psoriasis before (T1) and after (T2) thermal treatment in patients that reported an improvement after balneotherapy. **D)** PCoA of fecal samples Beta-diversity before (T1) and after (T2) thermal treatments. **E)** Alpha diversity of fecal samples before (T1) and after (T2) thermal treatments. Alpha diversity is reported both as number of observed OTUs (i.e. species richness) as well as Shannon diversity index (i.e. species diversity).

SUPPLEMENTARY MATERIALS LEGENDS

Supplementary Material S1. Clinical and anthropometric characteristics of the selected patient cohort (N=43). Missing data (N=2).

Supplementary Material S2. Tab1. OTU table of skin samples; Tab2. genus level taxonomic composition of skin samples.

Supplementary Material S3. Tab1. Differential genera between elbow and ear skin samples at baseline. Tab2. Differential genera before and after balneotherapy on diseased elbows. Tab3. Differential genera before and after balneotherapy on diseased ears of patients who reported an improvement. Tab4. Differential genera before and after balneotherapy on diseased elbows of patients who reported an improvement. Tab5. Differential bacterial species before and after balneotherapy on diseased elbows of patients who reported an improvement. Tab6. Comparison of significantly differential genera after balneotherapy between responders vs non-responders.

Supplementary Material S4. Tab1. Species-level taxonomic composition of fecal samples. Tab2. Functional differences between the microbiome of responders and non-responders.