Microbiome research in P&G: An Industry Perspective

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Procter & Gamble

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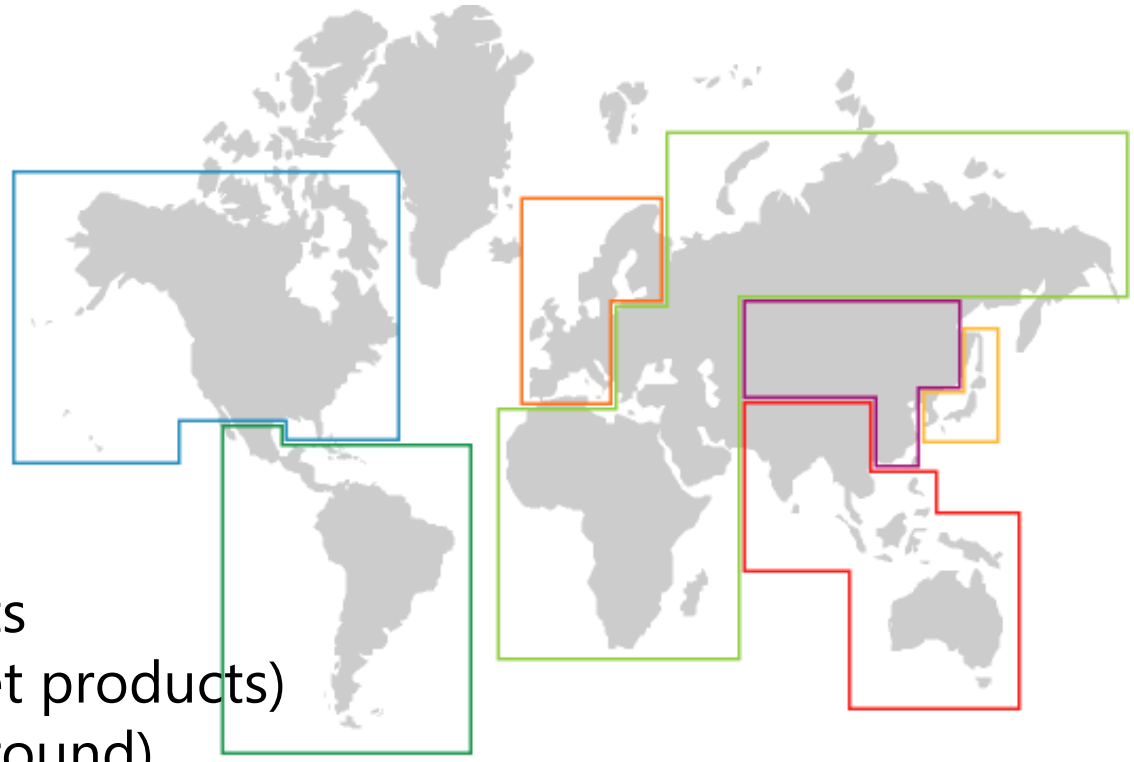
P&G…Who are we?


Gillette
Fusion
ProGlide
Sensitive
Shave Gel
Gel à raser
Gel de afeitado
Tide
PODS
Pampers
baby dry
Pantene
Expert
AgeDefy
Keratin

We are a Global Company

- North America
- Latin America
- Western Europe
- Central and Eastern Europe, Middle East and Africa
- Greater China
- North East Asia
- Australasia, ASEAN, India



- 10 Major Business Units
- 180+ Countries (market products)
- 80 countries (on the ground)

Touching and improving the lives of nearly 5 billion consumers

Our Focus is on Holistic Human Experiences

We provide branded products and services of superior quality and value that improve the lives of the world's consumers

23 Billion-Dollar Brands

We seek innovations that exceed expectations to create delight

Nearly 5 billion consumers served today

Hot Topic in Science

ANNALS OF SCIENCE

GERMS ARE US

Bacteria make us sick. Do they also keep us alive?

BY MICHAEL SPECTER

THE NEW YORKER, OCTOBER 22, 2012

The skin microbiome

Elizabeth A. Grice and Julia A. Segre

Forensic identification using skin bacterial communities

Noah Fierer[a,b,1], Christian L. Lauber[b], Nick Zhou[b], Daniel McDonald[c], Elizabeth K. Costello[c], and Rob Knight[c,d]

LETTER

doi:10.1038/nature14052

Commensal–dendritic-cell interaction specifies a unique protective skin immune signature

Shruti Naik[1,2]†*, Nicolas Bouladoux[1,2]*, Jonathan L. Linehan[1,2], Seong-Ji Han[1,2], Oliver J. Harrison[1,2], Christoph Wilhelm[1,2], Sean Conlan[3], Sarah Himmelfarb[1,2], Allyson L. Byrd[1,2,3], Clayton Deming[3], Mariam Quinones[4], Jason M. Brenchley[1,5], Heidi H. Kong[6], Roxanne Tussiwand[7], Kenneth M. Murphy[7], Miriam Merad[8], Julia A. Segre[3] & Yasmine Belkaid[1,2]

HMP

NIH HUMAN MICROBIOME PROJECT

The microbiome extends to subepidermal compartments of normal skin

Teruaki Nakatsuji, Hsin-I. Chiang, Shangi B. Jiang, Harish Nagarajan, Karsten Zengler & Richard L. Gallo

REVIEW

Probiotics and prebiotics in dermatology

Katherine L. Baquerizo Nole, MD,[a] Elizabeth Yim, MPH,[a] and Jonette E. Keri, MD, PhD[a,b]
Miami, Florida

The rapid increase in the medical use of probiotics and prebiotics in recent years has confirmed their excellent safety profile. As immune modulators, they have been used in inflammatory skin conditions, such as atopic dermatitis. We review the literature regarding the use of probiotics and prebiotics in dermatology. Probiotics and prebiotics appear to be effective in reducing the incidence of atopic dermatitis in infants, but their role in atopic dermatitis treatment is controversial. Their role in acne, wound healing, and photoprotection is promising, but larger trials are needed before a final recommendation can be made. (J Am Acad Dermatol http://dx.doi.org/10.1016/j.jaad.2014.04.050.)

Key words: acne; atopic dermatitis; dermatology; prebiotics; probiotics; wound healing.

ORIGINAL ARTICLE

Molecular analysis of the prevalent microbiota of human male and female forehead skin compared to forearm skin and the influence of make-up

T. Staudinger, A. Pipal and B. Redl

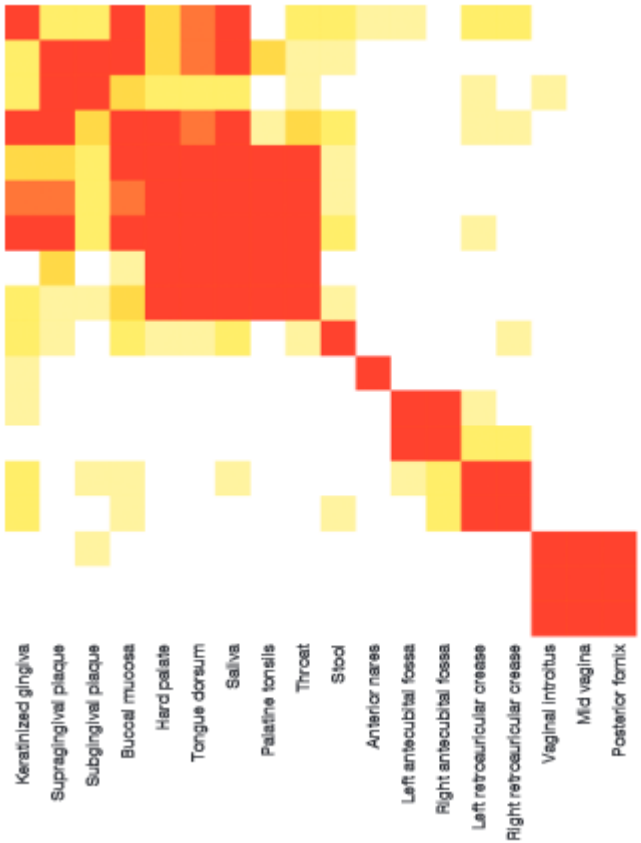
Division of Molecular Biology, Biocenter, Medical University Innsbruck, Innsbruck, Austria

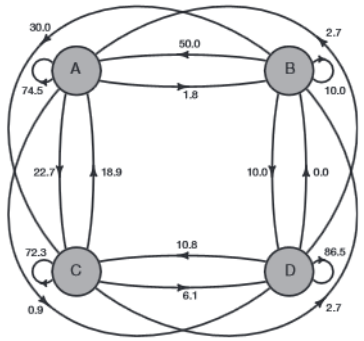
LETTER

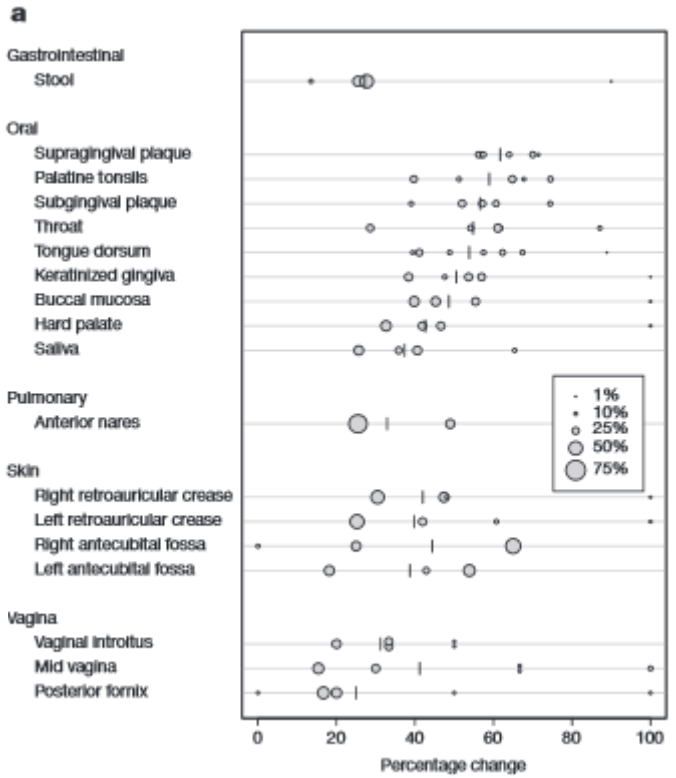
doi:10.1038/nature13178

Dynamics and associations of microbial community types across the human body

Tao Ding[1] & Patrick D. Schloss[1]



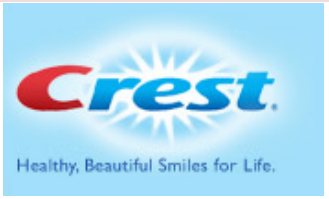


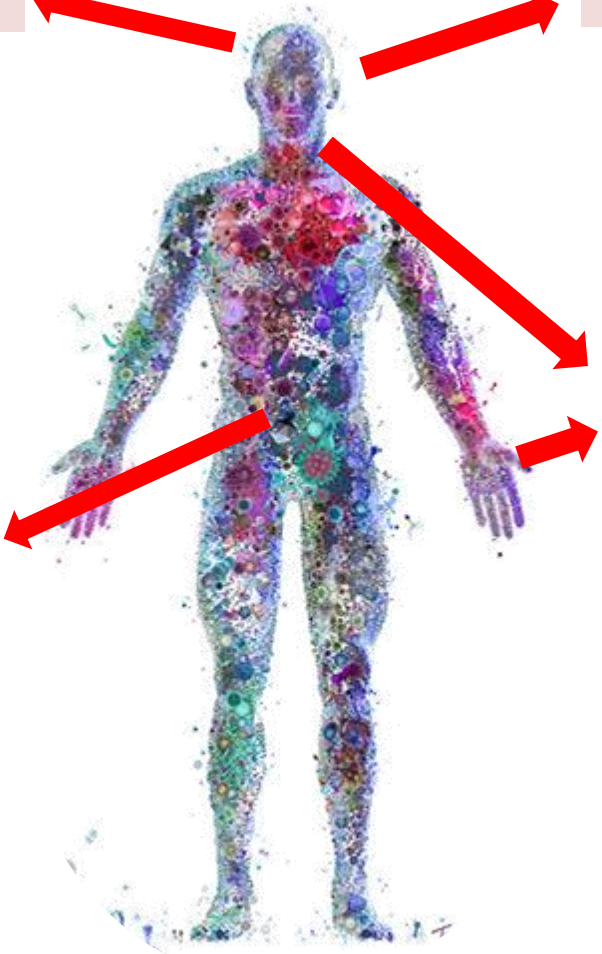


Areas of P&G Interest

Scalp Microbiome

Oral Microbiome

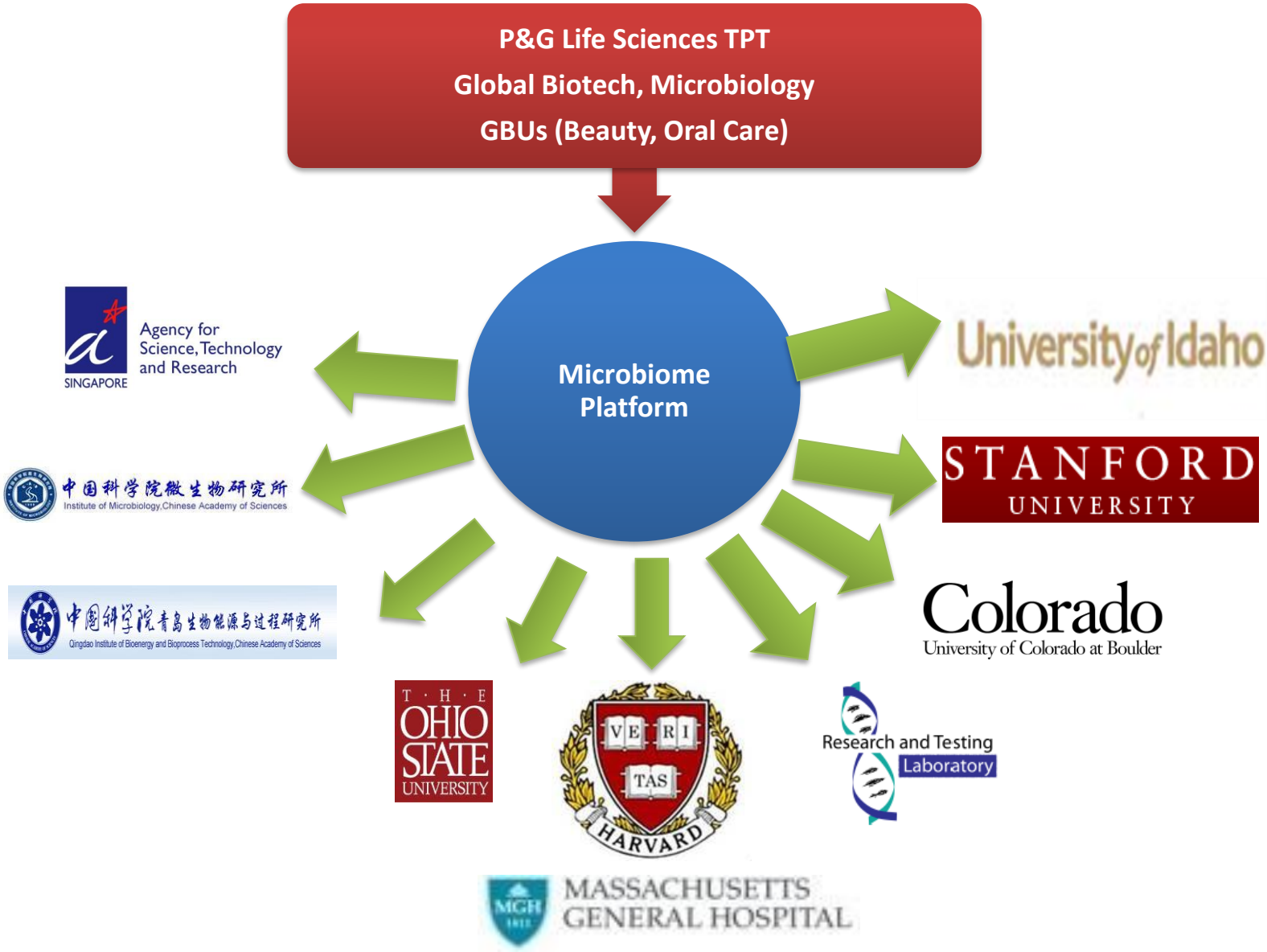




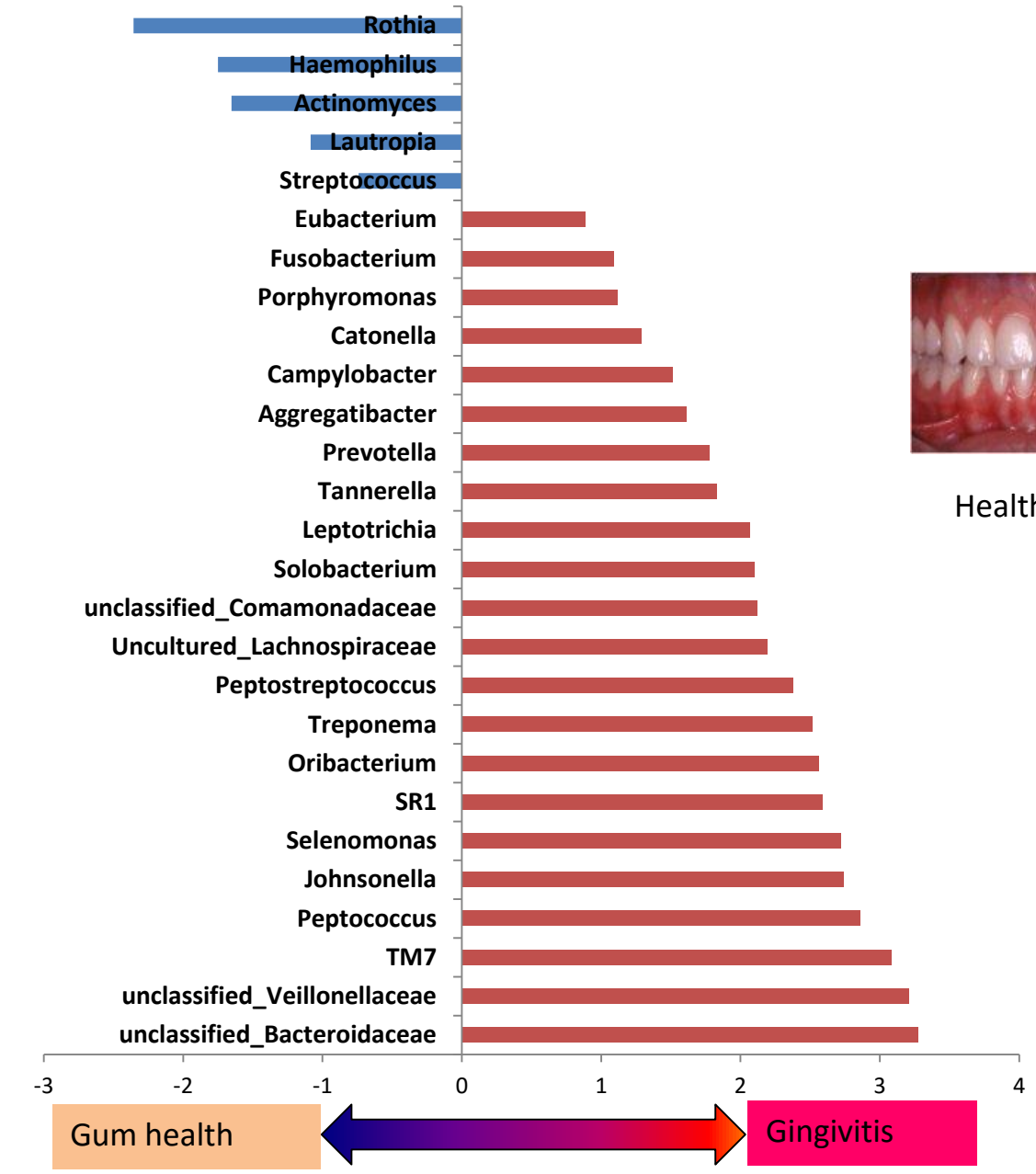
Skin Microbiome

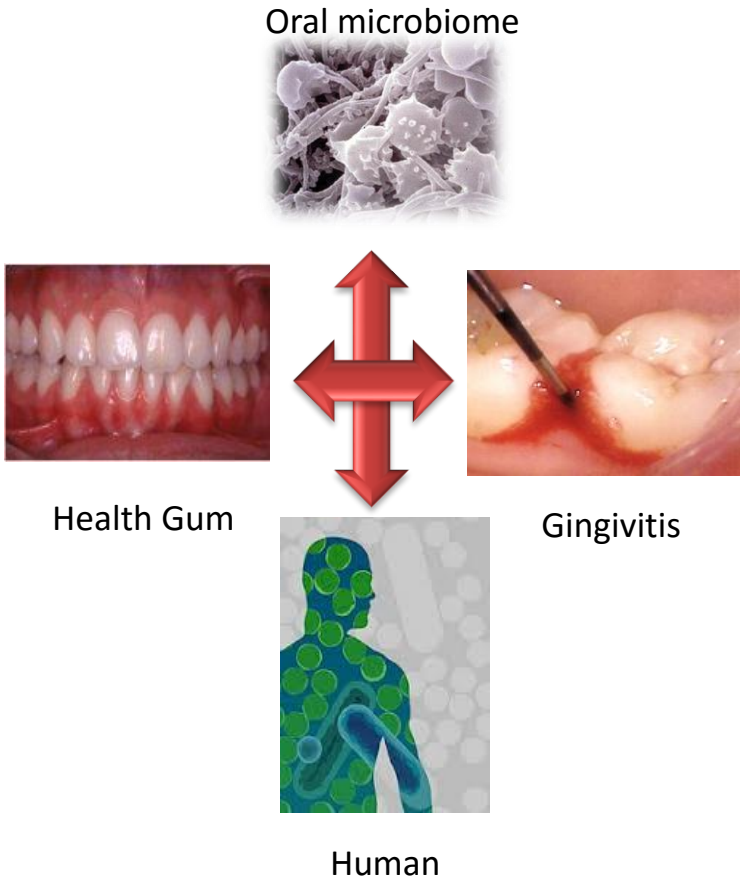
Gut Microbiome

Wide external collaboration



A novel gingivitis biomarker created to measure the balance of gum health vs gingivitis





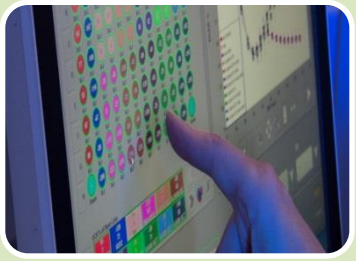
Huang and Li et al, The ISME J. 1-13, 2014
Huang et al. BMC Oral Health 11:33, 2011

Potential

- Biomarkers for more sensitive and appropriate technology identification.
- Technologies that work to reduce harmful bacteria and improve healthy bacteria for a balanced oral ecosystem.
- Holistic mechanisms on healthy gum.

Multi-decade and Ethnicity (MDE) Study

Objective: To develop a fundamental understanding of the molecular mechanisms which contribute to skin aging, both intrinsic and extrinsic, across different ages, body sites and ethnicities



Multiple Decades

20s, 30s, 40s, 50s, 60s, 70s

(N=231)

Multiple Body Sites

Face, arm, buttocks

Multiple Ethnicities

Caucasian & AA (Phase 1), Asian & Hispanic (P 2)

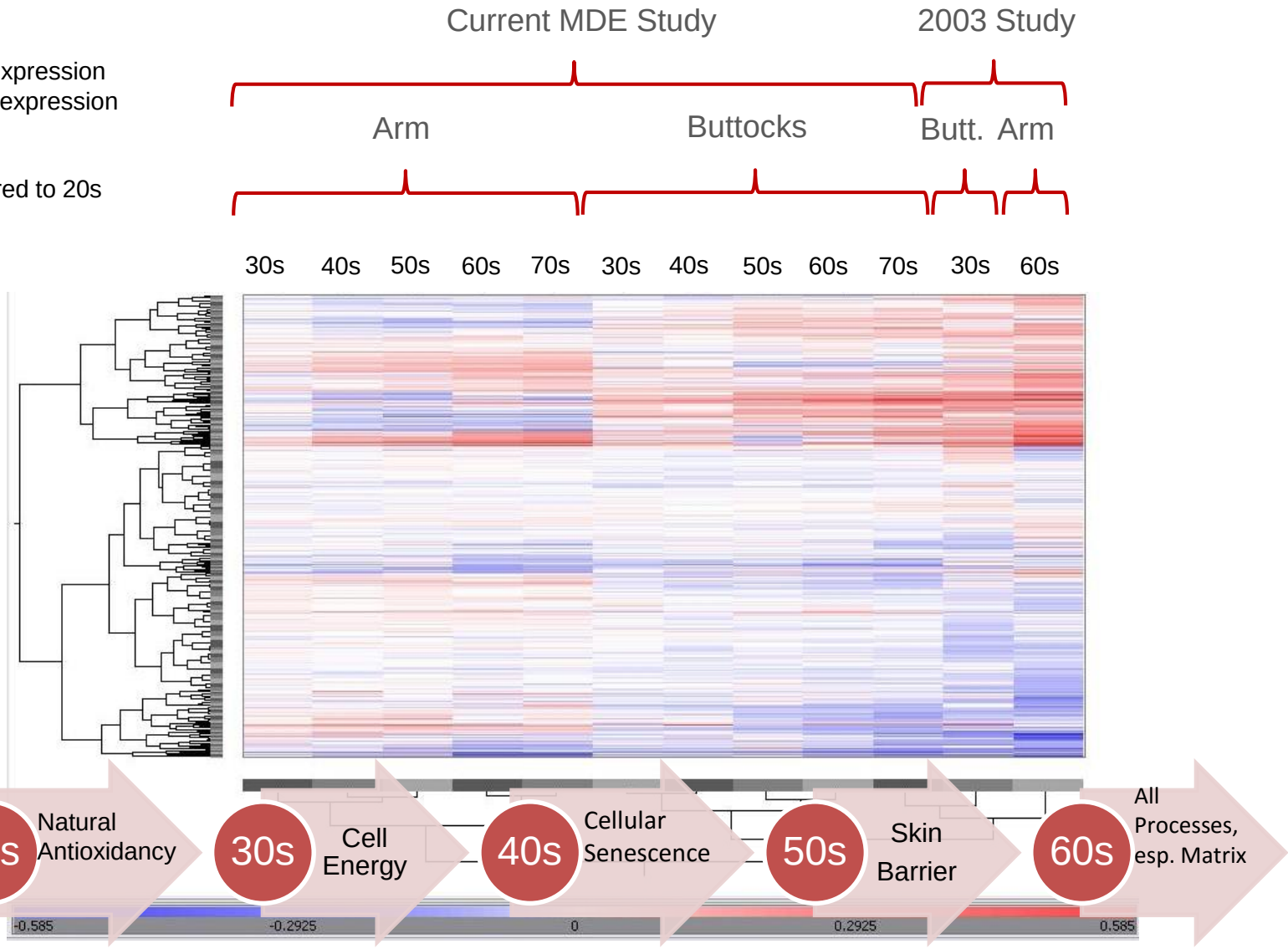
Multiple Measures

Appearance, skin structure & biology, DNA, genomics, proteomics, hormones, microbiome…

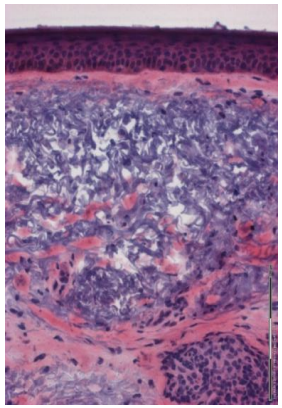
Transcriptomic Profiles: Tipping Points

'Heat Map'
Red = increased gene expression
Blue = decreased gene expression

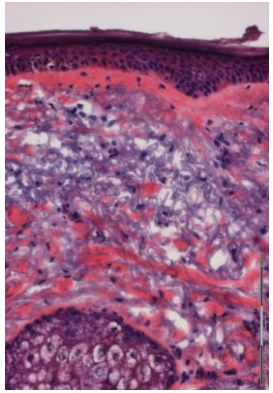
Caucasian data
Each age group compared to 20s



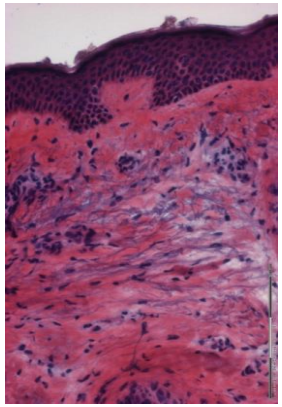
Link of Appearance to Underlying Elastosis



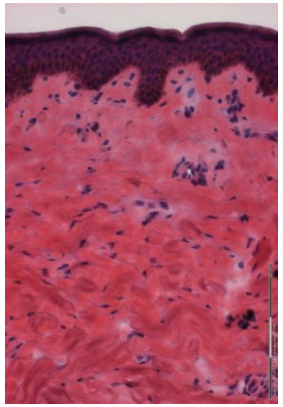
54 year old



70 year old

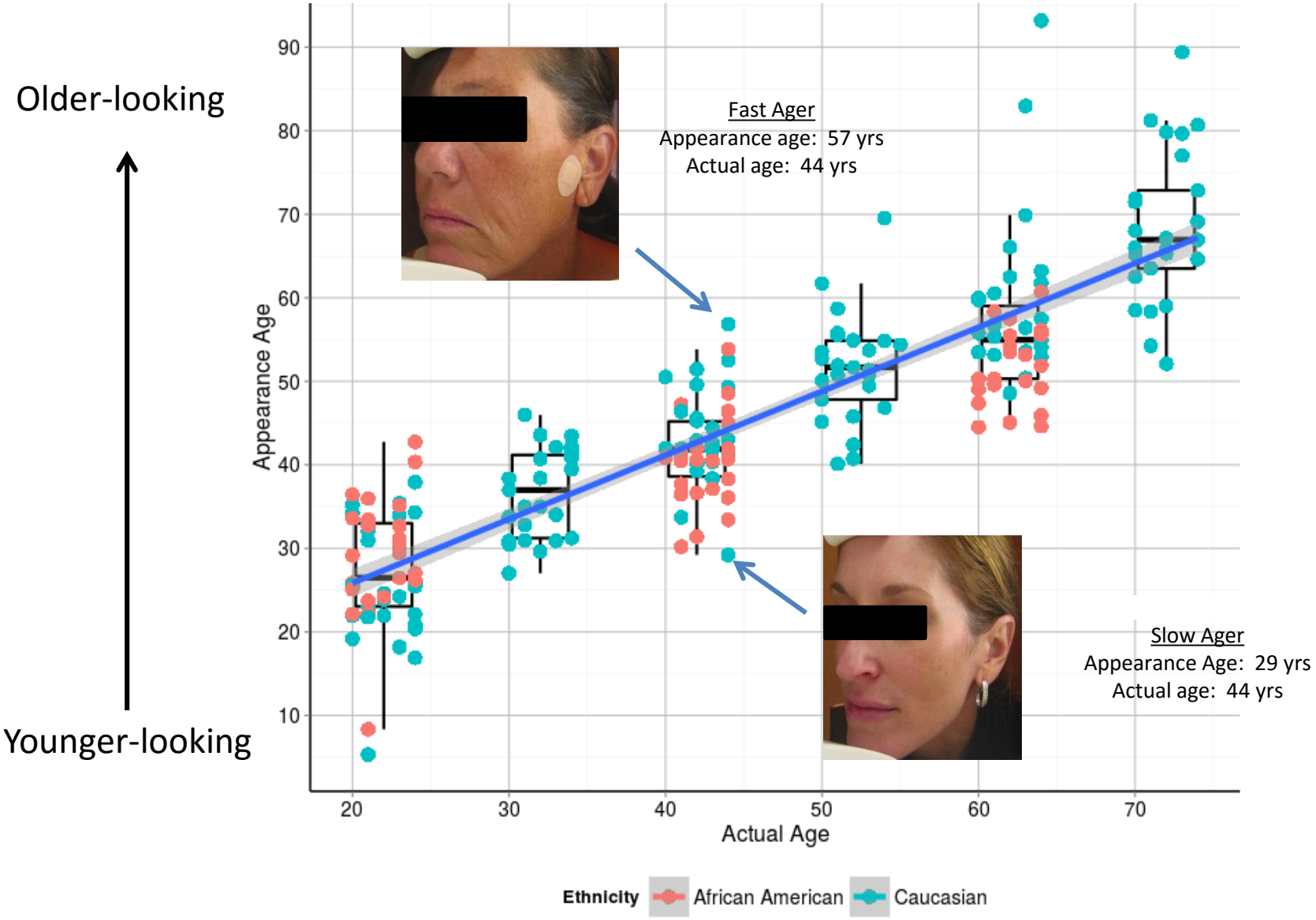


44 year old



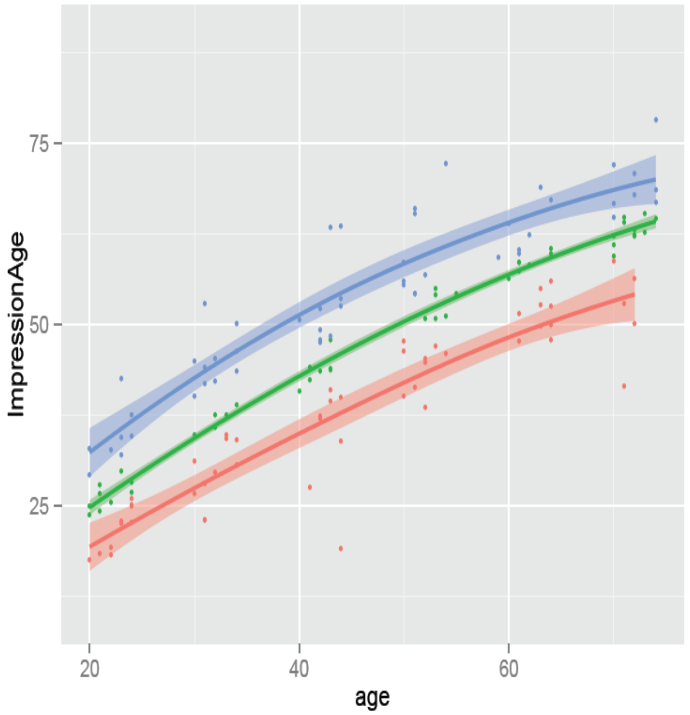
42 year old

Facial Skin Appearance vs Actual Age

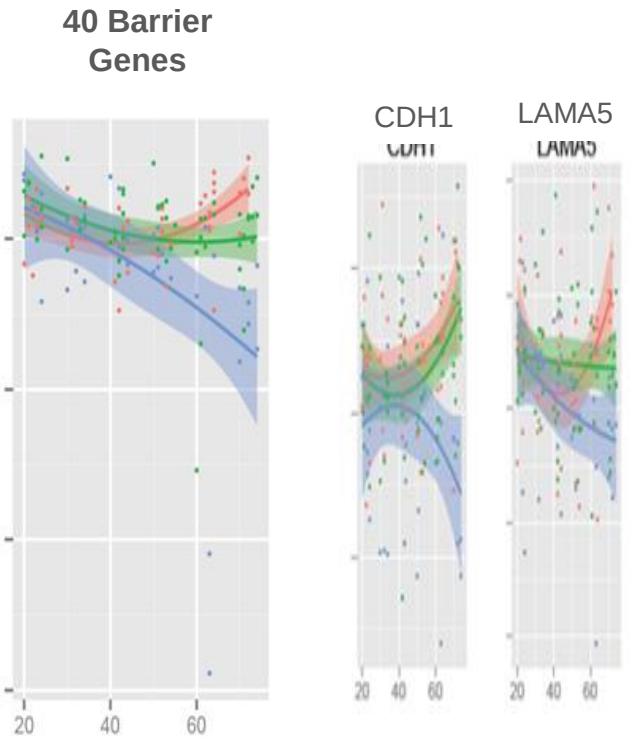


Exceptional Skin Agers

Global Gene Expression associated with “Exceptional Aging”

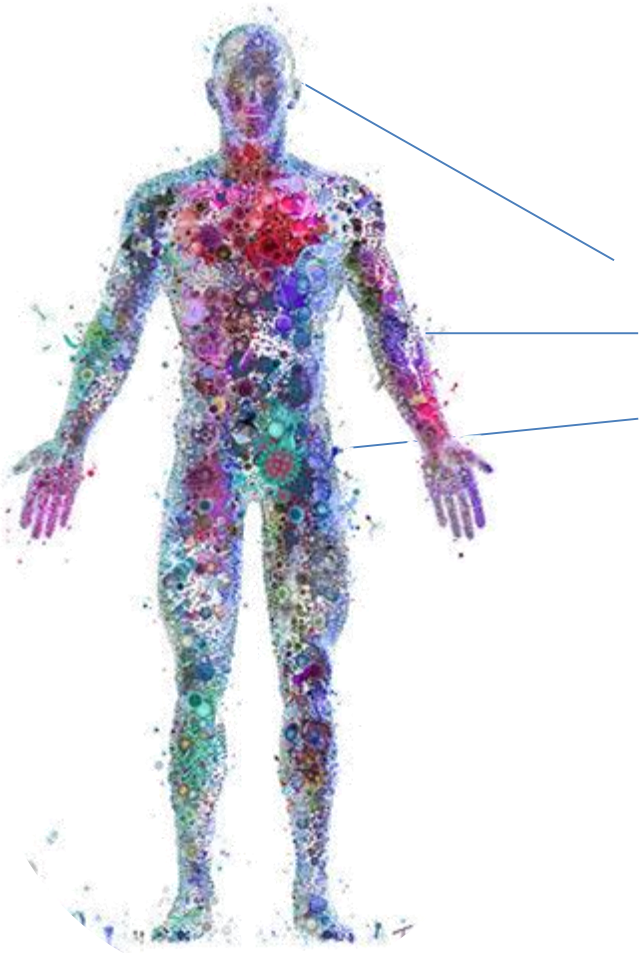


Epidermal Gene Expression Associated with ‘Exceptional Aging’



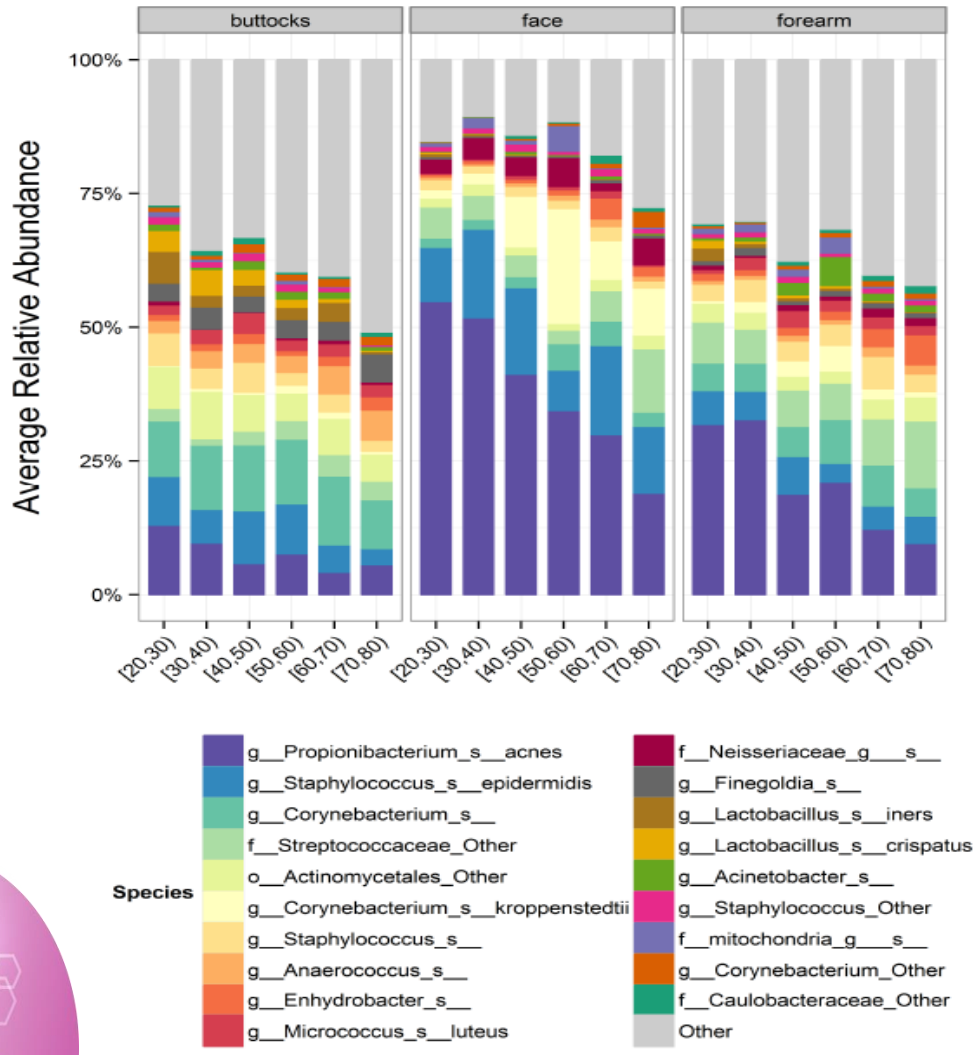
younger average Older looking

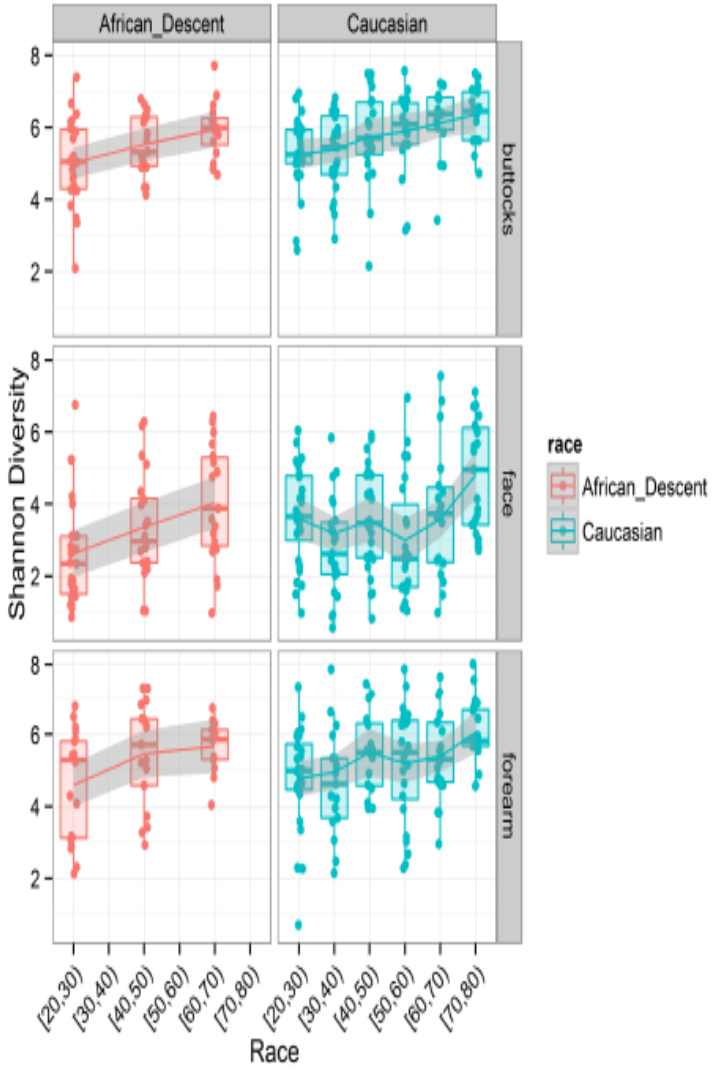
Microbiome Analysis from MDE



- Micro swabs taken from face, forearm, buttocks
- Metagenomics analysis performed using 16S rRNA gene sequencing

Microbiome Diversity Increases with Age





MDE Summary

- Clear differences between intrinsic and extrinsic aging that can be readily identified.
- Skin microbiome undergoes ageing associated changes that reflect changes in the host, such as a decrease in Propionibacteriaceae with reduced host sebum production.
- An overall increase in bacterial diversity on the skin with age was observed.

Potential

- Holistic mechanisms on health and aging for skin.
- Better understanding of skin biology with both host and microbiome data.
- Technologies that work to improve healthy skin from balanced ecosystem point of view.

Acknowledgments

Gum health vs gingivitis study:

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- Rob Knight (Howard Hughes Medical Institute and University of Colorado)

Multiple Decades and Ethnicities Study

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