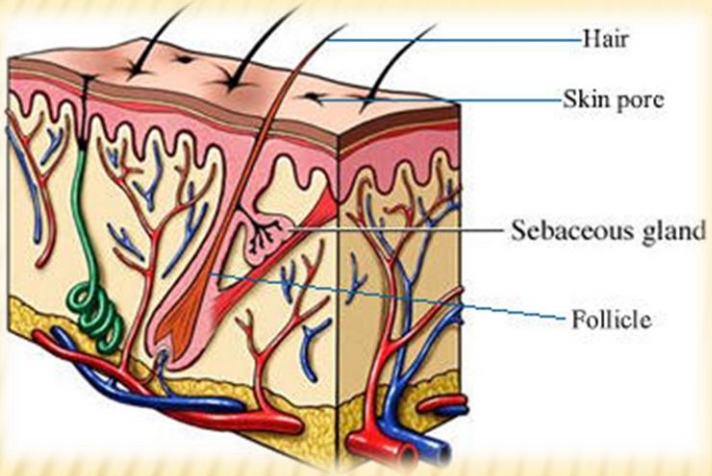
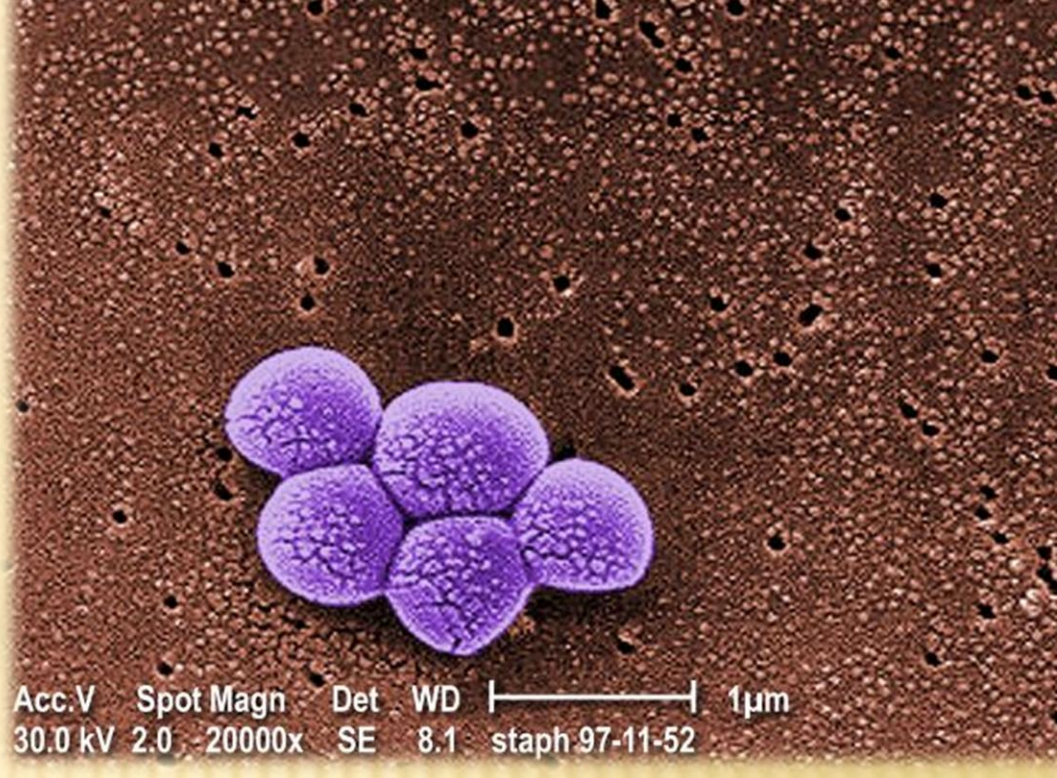




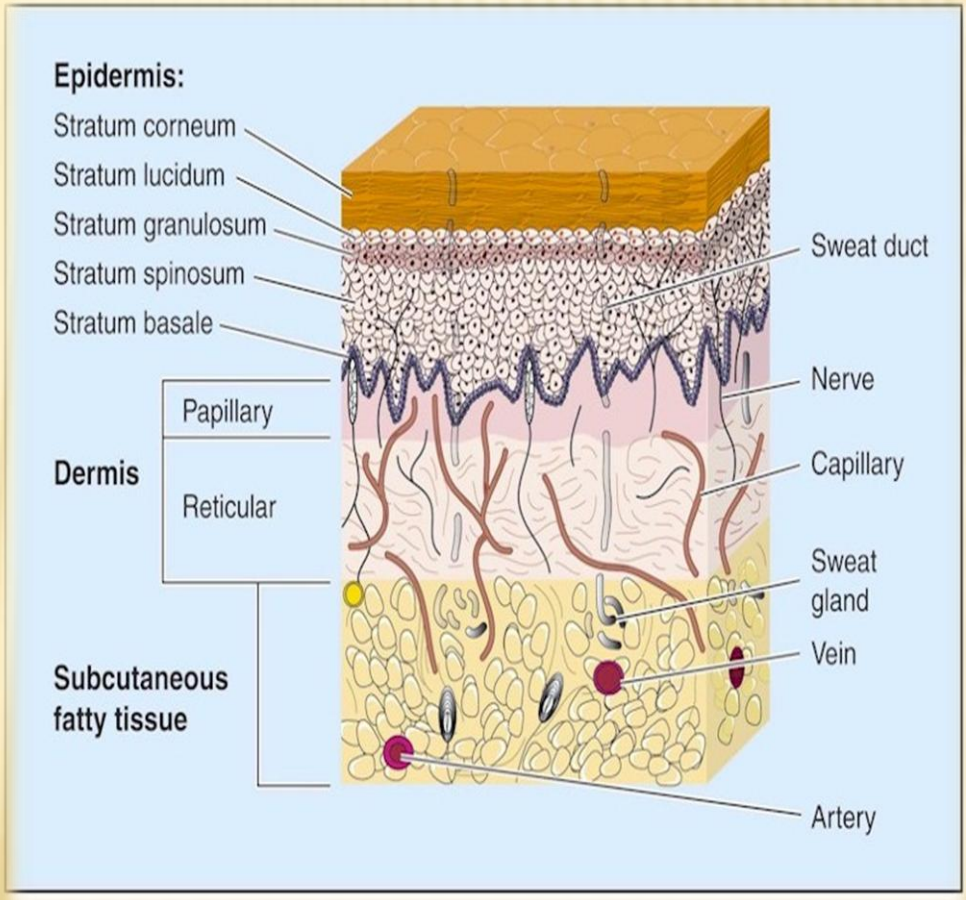
Robert Barthen and Igor Felschau presenting the review:

THE SKIN MICROBIOME

BY E. A. GRICE AND J. A. SEGRE

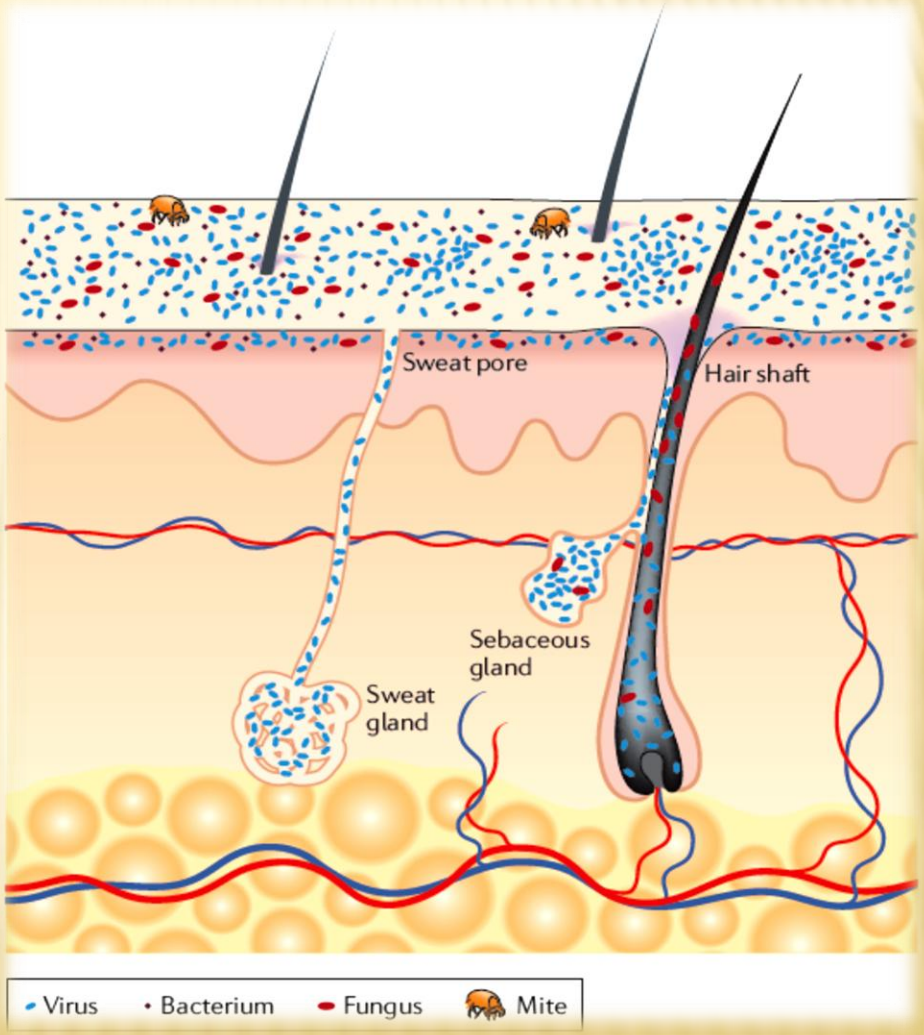
SKIN

- Physical barrier of 1.8 m^2
- Interface with outside environment
- It is cool, acidic and desiccated
- Selects for specific microorganisms
- Composed of different layers
- Provides various invaginations and appendages



INVAGINATIONS AND APPENDAGES

- E.g. sweat or sebaceous glands
- Create special habitats



DIFFERENT HABITATS ON SKIN

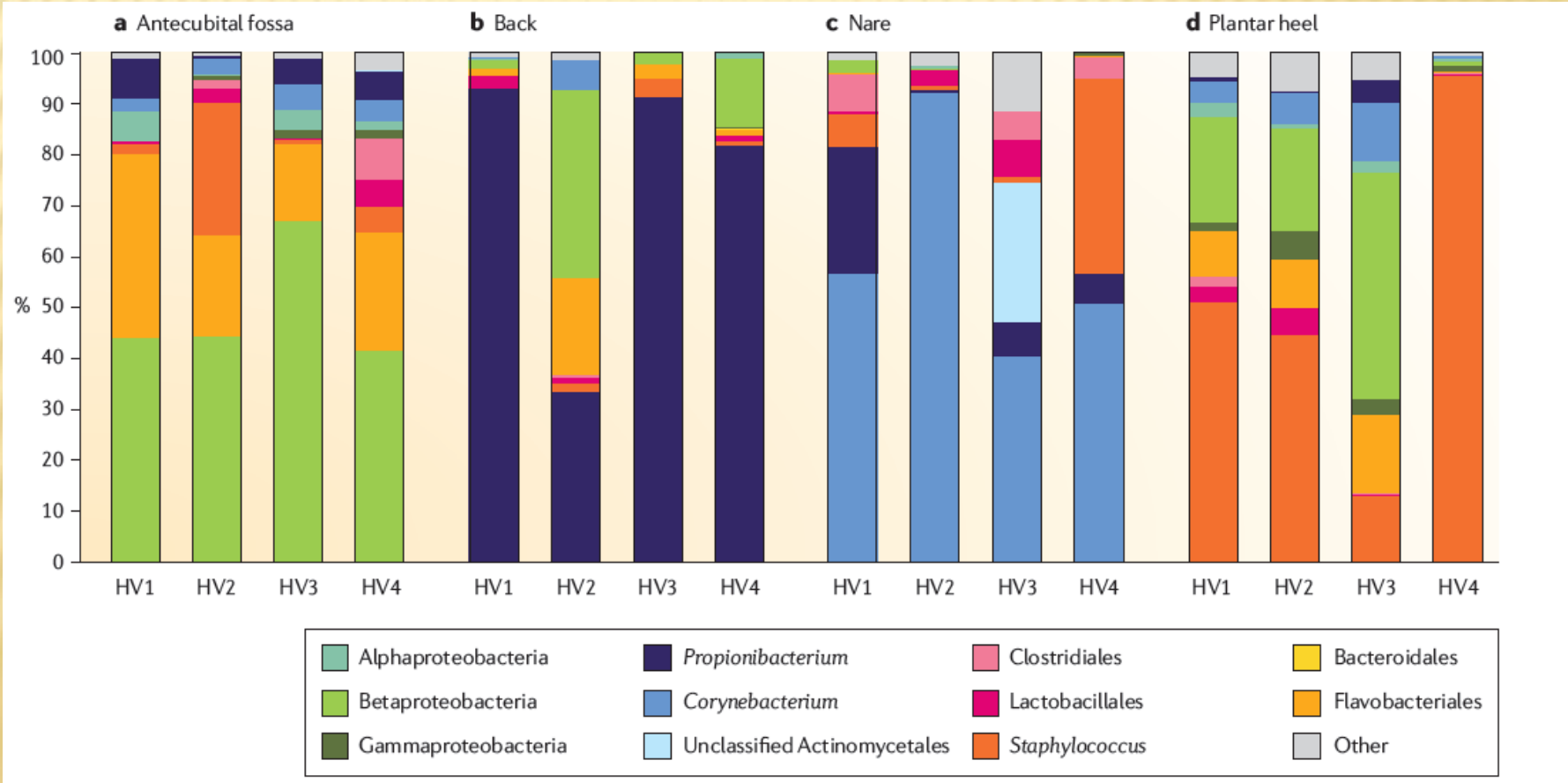
- Host factors (age, sex and location)
- Environmental factors (occupation, clothing, antibiotic use and hygienic products)
- Habitat defines microbial community

INHABITANTS OF HUMAN SKIN

- Bacteria
- Fungi
- Viruses
- Mites

INTER- VS. INTRAPERSONAL VARIATION

- Composition of skin microbiota is more dependent on body site than on the individual



ANALYSIS OF SKIN MICROBIOTA

- Culture based methods
- 16s rRNA analysis
- Whole-genome shotgun metagenomic sequencing

BEYOND THE BACTERIAL MICROBIOME

Fungi

- *Malassezia spp*. make up 53 – 80% of total skin fungal population
- Remainder remains unclear
  - *Candida spp*. rarely found, can cause infections
  - Species of *Debaryomyces* and *Cryptococcus* found by culture based analysis, but has not been conformed by molecular analysis

BEYOND THE BACTERIAL MICROBIOME

Mites

- *Demodex spp*. are considered part of the skin microflora
- Associated to skin disorders like facial itching and chronic blephartitis
- Molecular methods to specify *Demodex* mites do not exist

BEYOND THE BACTERIAL MICROBIOME

Viruses and Archaea

- Methods for isolation and identifying viruses from skin are just being developed

- Archaea have not been identified on the skin, either by culture or by molecular methods

IMMUNE ANSWER OF THE SKIN

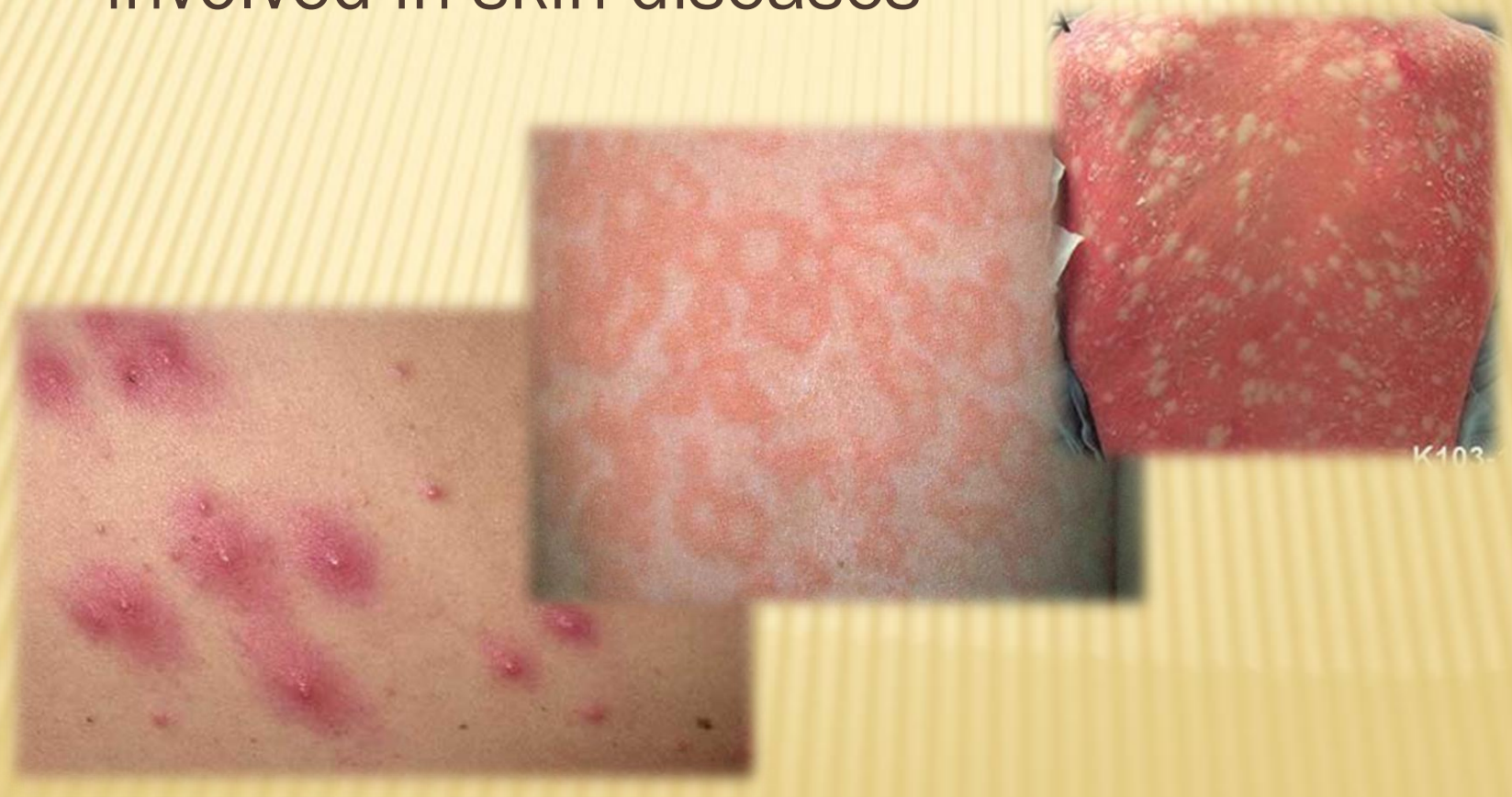
- Skin is also an immunological barrier
  - Keratinocytes sample the MOs on the skin by **pattern recognition receptors** (PRRs)
  - PRRs recognize **pathogen-associated molecular patterns** (PAMPs)
    - PAMPs can be flagellin, nucleic acids, lipo-polysaccharides and other attributes of bacterial or fungal cell walls

IMMUNE ANSWER OF THE SKIN

- By activation of PRRs the keratinocytes initiate the immune response
- Antimicrobial peptides, cytokines and chemokines can be released
- Skin can distinguish between harmless and harmful MOs
- Commensal MOs can be involved in the immune answer by triggering receptors

SKIN DISEASES

- Three ways how specific organisms can be involved in skin diseases



SKIN DISEASES

Skin disorders with a correlation to microbiota

e.g. acne

- Commensal skin bacterium *Propionibacterium acnes* destroys tissue of the pilasebaceous unit by lipases and proteases

SKIN DISEASES

Disorder with an unidentified microbial component.

- Commensal skin organisms invade and become pathogenic upon breach of the skin barrier.
- E.g. burn wounds commonly become infected with *S. pyogenes, Enterococcus spp* or *Pseudomonas aeruginosa*

SKIN DISEASES

Invasive skin commensal that causes infection

- Normaly commensal organisms can become virulent when the invade other sites
- E.g. *S. epidermis* forms biofilms on catheters or other medical devices, which protect them from the host immune system and antibiotics

CONCLUSIONS AND PERSPECTIVES

- Several dominant organisms of the skin microbiota are known, but little is understood about the rare or transient organisms

- Also it is not completely clear if the indigenous organisms provide some benefit to the host and whether they are truly symbiotic or commensal