Observations of a practicing dermatologist

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I have no conflicts of interest
On how bacteria can be our friends and help us fight inflammation
Structure and functions of the skin

- Barrier against the environment
- Thermal regulation of the body
- Sensory organ (touch)
- Part of the immune system
Histology of the skin

- Epidermis
- Dermis
- Hypodermis (superficial fascia)
- Hair root
- Hair follicle
- Eccrine sweat gland
- Hair follicle receptor (root hair plexus)
- Adipose tissue
- Arteries
- Veins
- Dermal papillae (papillary layer or derm)
- Meissner’s corpuscle
- Free nerve ending
- Reticular layer of derm
- Sebaceous (oil) gland
- Arrector pili muscle
- Sensory nerve fibre
- Eccrine sweat gland
- Pacinian corpuscle
Skin Barrier function and dysfunction
Eczema

- Occurs at any age
- the itch that rashes (itch precedes eruption)
- Poorly defined erythematous papules and plaques with epithelial disruption
- usually flexural but can be coin sized and scattered all over
- less than 5% is IgE mediated
- mostly a skin barrier function issue
Eczema
Moisturizer types and function

- **Emollients**: add a layer of oil to the top layer of the skin to trap the moisture in it (eg: petroleum jelly)
- **Humectants**: allow the skin to retain more water (eg: hyaluronic acid)
- **Coating agents**: coat the skin to prevent further damage (eg: dimethicone)
- **Exfoliants**: help eliminate the loose corneocytes (top layer of the skin)
Natural Moisturizing Factor

- **Ceramides**: Ceramide 1, Ceramide 3 and Ceramide 6-II
- **Cholesterol**
- **Fatty acids**
- 3 part Ceramides: 1 part cholesterol : 1 part fatty acids is the ideal ratio
Designing the perfect moisturizer

- Start with water
- Add emollient (higher amount in cream than lotion): petroleum jelly
- Add humectant: glycerin, hyaluronic acid
- Add coating agent: dimethicone
- Add exfoliating agent: propylene glycol, salicylic acid
- Add Natural Moisturizing factor
Impact of "perfect moisturizer" on Eczema

- repair the skin barrier function
- less itching
- and since the eczema is the itch that rashes: fewer outbreaks (50% less if patient is compliant)
- decreased colonization of the skin with pathogenic strains of Staph.
The Skin Microbiome

- remarks based on presentation by Dr. Richard Gallo at the Carta Symposium on the Unique Features of Human Skin at the Salk Institute in La Jolla October 16th, 2015

- Titled: Skin, a Window into the Evolution of the Human Super-Organism

- Richard Gallo, M.D., PhD is interim Chair and Professor of the Dermatology Department at UC San Diego.

- He is a pioneer in studying how antimicrobial peptides and the microbiome are fundamental to human health
The Skin Microbiome

Immune system sits just below the surface
The Skin Microbiome and Antimicrobial peptides

The skin makes its own antibiotics (AMPs)

Gallo RL, et al. PNAS. 1994
The Skin Microbiome

AMPs protect our skin surface

The Skin Microbiome

Our AMPs are designed to permit some bacteria to thrive on the skin

The Human Microbiome Project says the human body has 100 trillion microscopic life forms living in it.

You call this living?
The Skin Microbiome

Bacteria are present throughout the skin

The Skin Microbiome

Has human skin and microbes co-evolved to serve each other?

Diagram of skin layers with characters interacting.
The Skin Microbiome

The microbiome is part of our immune surface protection

Group A Streptococcus (GAS)

S. epidermidis

GAS is hemolytic

S. epidermidis
Not hemolytic

Cogen AL. (2009) J. Invest Derm
The Skin Microbiome

Microbiome controls excess inflammation

The Skin Microbiome

Microbial imbalance on the skin is associated with disease

Healthy

- AMP producing

Eczema

- AMP
- Other CoNS Staph

American College of Physicians
Internal Medicine - Rights of ACP
The Skin Microbiome

Skin microbiome transplant is helping patients

Staph aureus

% of starting infection

140

> 100X reduction

Cream only
Strain 1
Strain 2

Bacterial strain from eczema
Bacterial strain from healthy skin

Before
24hr after
Clinical Case #1

- Patient is in his 60's, s/p stem cell transplant for Multiple Myeloma.
- Has many recurrent MRSA folliculitis on the axillae, responds to antibiotics but relapses
Clinical Case #1

- started on moisturizer to repair the skin barrier function
- No further relapses in the past 3 years
- Infectious disease was consulted and had no further recommendations
Clinical Case #1 thoughts

- Did the repair of the skin barrier function lead to a healthier microbiome that protected the patient from a more aggressive strain of Staph?

- Should we be treating recurrent folliculitis with antibiotics and increasing antibiotic resistant strains in the community or should we be repairing the skin barrier?
Clinical Case #1 thoughts

- Should we be scrubbing our hands with abrasive soaps or should we be washing with a milder soap and improving our skin barrier with moisturizers?

- Should the surgical patients be taught how to improve their skin barrier function for a couple of weeks before surgery to decrease their skin's bacterial load and their risk of a post operative infection?
Clinical Case #2
Dissecting Folliculitis of the scalp similar to cystic acne
Clinical Case #2

14 year old boy with dissecting folliculitis of the scalp.

Pathophysiology of disease felt to be auto-sensitization to Staph Aureus
Clinical Case #2

- Improves on a diabetic and dairy free diet
- Clears with antibiotics but keeps relapsing even with continuing antibiotic treatment
- Needs prednisone to control inflammation
- Finally clears when started on Isotretinoin.
Clinical Case #2 thoughts

- Would skin microbiome transplant have been helpful in this case?
- Patient would have needed the transplant deep into the hair follicle
- How do we help? We change the way the immune system reacts to the Staph. Isotretinoin modifies the Toll-like receptors in dendritic cells which leads to a down regulation of the inflammatory response to the bacteria.
Clinical Case #2 thoughts

- Consider Acne and its subtypes (including dissecting folliculitis of the scalp and Hidradenitis suppurativa) as inflammation rather than infection.
- All treatments should target immune dysregulation rather than infection.
- Diet can impact acne: diabetic diet and avoidance of dairy products.
- Can we use the GI tract to immunomodulate disease?
Clinical Case # 3
Inflammatory causes of skin cancer?

Maybe next time you'll try a little sunscreen...
Clinical Case #3

- 80 year old woman with Muir-Torres syndrome, Hereditary nonpolyposis Colorectal Cancer (Lynch syndrome) with multiple Keratoacanthomas
- Gets multiple Keratoacanthomas on the lower legs
Clinical Case #3

- Why are the skin cancers coming preferentially on the legs?
- Patient has venous stasis. She starts wearing compression hose and the number of skin cancers decreases by three quarters.
- She is borderline diabetic, watches her diet very carefully. Later, a stroke causes her to stop watching her diet, the number of skin cancers increase.
- As soon as her diet improves, the number of skin cancers drops again.
Clinical Case #3 thoughts

- Even in patients with hereditary skin cancer, reducing inflammation leads to decrease incidence of cancer.
- Should we be incorporating dietary suggestions in the treatment of our patients with inflammatory conditions?
Clinical Case #3 thoughts

How can the bowel microbiome help us?
Thank you for including dermatologists in your difficult cases