Little Known Physiological Facts

THAT MAY CHANGE YOUR PRACTICE OF HERBALISM

PAUL BERGNER

TRADITIONAL ROOTS CONFERENCE

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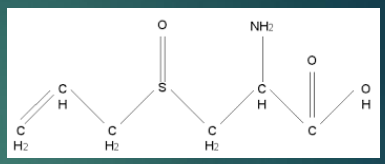
http://naimh.com

Notes and slides: http://naimh.com/nunm

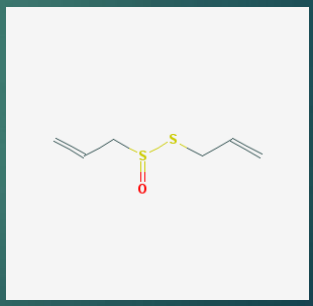
Cutaneous absorption of plant constituents

Molecular size

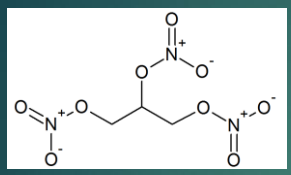
- Aromatic/volatile constituents are readily absorbed in the skin resulting in systemic circulation and pharmacological effects
- An average of 8% of a concentrated essential oil applied to the skin is absorbed.
- This may be greatly increased by the application of heat.
- Allicin and other sulfur compounds from garlic are rapidly absorbed across the skin and some metabolites are excreted in the breath.
- Molecules of less than 500 molecular weight can pass the corneal outer layer of the skin.



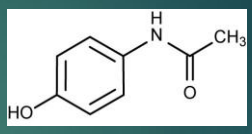
Aliin



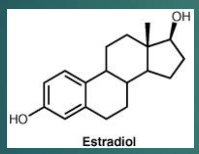
Allicin

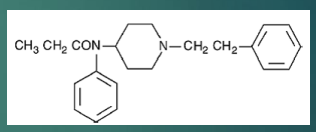


Nitroglycerine



Acetaminophen





Fentanyl

Most medicinal plant constituents will pass through the skin, enhanced by soaking the body part in warm water. Relevant to foot bath, sitz bath, hand bath, and compress.

Molecular weights of some Plant Constituents

- Azuline 128
- Achillene 136
- Pentose (Althaea) 150
- Methyl salicylate 152
- *Thujone* 152
- *Pulegone* 152
- Menthol 156
- Carvacrol 158
- Allantoin 158
- *Saffrole* 162
- *Nicotine* 162
- Harman (passiflora) 182
- Chamazuline 184
- Pectin 194
- Apigenin 270
- Baicalein 270
- Luteolin 286
- Capsaicin 305
- Tetrahydrocannibinol 314
- Berberine 336
- Canadine 338
- *Lobeline* 337
- *Symphytine* 381
- Verbenalin 338
- Hydrastine 389
- Scutellarin 462

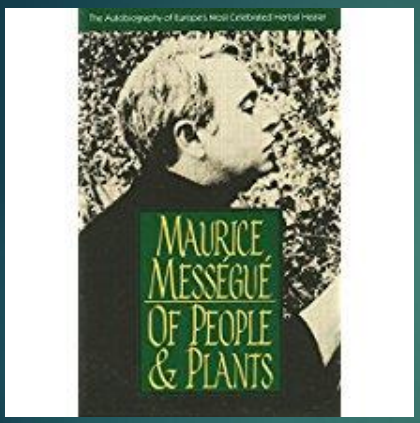
Factors affecting corneal/cutaneous absorption

- Skin integrity
- Skin thickness
- *Hydration*
- *Local blood flow*
- *Rubefacient agents*
- Age. > in children. (caution)
- Occlusive bandages (compress) increase hydration of corneal layer from 10-50%. Penetration of corticosteroids through the skin can increase >100-fold and cause significant systemic side effects. Cortisone = MW 360

Empirical observations with foot bath

- Garlic Foot Bath results in persistent garlic on the breath, delivers antimicrobial substances directly to alveoli in lungs.
- Long Garlic foot bath aggravated BPH to point of hour-long obstruction of urine.
- Vinegar foot bath (1:2 vinegar to water) results in cooling and relaxing effect of vinegar in the bronchial tract, within 8-10 minutes.
- *Mentha* foot bath results in persistent menthol effects in the upper respiratory tract for many hours, relaxation, diffusion and mild diaphoresis.
- Yarrow foot bath, with vinegar, results in pelvic astringency
- *Symphytum* foot bath results in expectorant effect
- Emetic effects of *Anthemis nobilis*, cited by Messegue
- *Excessive tonic/astringency on gut and hypertonic headache with long (> 20 min.) foot bath of Agrimonia*

Implication: The plant constituents are circulating systemically with potential effects throughout the system.



One of the most famous mid-20th Century European herbalists

Trained in a family tradition, with mixed French, Spanish, and Moorish influences

Delivered herbs by foot bath, hand bath, sitz bath, douche, poultice, compress. Does not record internal use.

Also a nutritionist and wrote on herbs and cooking

Messegue: Common bath herbs

- Garlic
- Onion
- Sage
- Thyme
- Linden
- Plantain
- Mallow
- Violet
- Lavender
- Horsetail
- Nettle
- Mentha
- Anthemis
- Meadowsweet

Note: Mineral nutrients pass readily through the skin into the system

Many other herbs, used generally as they would be for oral use

Methods

- Basic preparation, per quart
  - Heat the water to boiling.
  - Allow to stand 5 minutes.
  - Add chopped, grated, or crushed herbs. ¼ to ½ cup per quart.
  - Macerate 4-5 hours.
- Basic preparation is used for all forms of bath, poultice, or douche.
- Dilute one liqueur glass in pint of water for gargle.

- For foot/hand bath, make 2 quarts. Strain into a bottle. Warm without boiling.
- Eight minutes foot bath duration, before breakfast in AM
- Eight minutes hand-bath duration, before dinner in PM
- One liqueur-glass delivered to skin via compress or poultice.

Refrigerate between uses, may be re-used for 8 days.

Mentha experiment

Warm foot bath, Mentha piperita N=1, self

- 2 minutes. Relaxation and drowsiness
- 4 minutes. Pelvic relaxation, stiff back relaxed. Nose formerly stuffy, now relaxed, runny, sneezes/
- 10 minutes, feel menthol in lungs
- 12 minutes, distinct antispasmodic effect in back
- 20. Minutes, lungs feel heavy, relaxation, coolness and dryness in lungs and sinuses.
- 30 general feeling of coolness, surface relaxed and open, flatus, \ alertness and mental clarity, mood lifted from flu-like melancholy. Vital stimulation motivation.
- Pulse unchanged

Agrimonia experiment

Foot bath N=1, Self

- 6:00 Distinct tonic astringency in gut and respiratory tract
- 12:00 Distinct tonic astringency in pelvic area. Tightening of anal sphincter
- 15:00 Contractive headache, slight stimulation of mucous.
- 17:00 Deepening of respiration. Headache worse, leading to cessation of experiment.
- 20:00 Floaters (drying) deeper breathing, pulse unchanged. Smell of Agrimonia in lungs and sinuses, distinct systemic astringent/tonification
- Later in day. Unpleasant astringency of digestive tract.
- Pulse unchanged

Cautions

- Note the low dose and duration that Messegue and his lineage found to be effective, and his ***cautions on adverse effects***.
- Such caution is reinforced by the ready absorption of potentially harmful constituents across the skin.
- Consider all the safety indications for essential oils if using volatile plants.
- Story anecdote of Thuja branches in hot tub

Gastric absorption of alcohol-soluble constituents

Gastric absorption of alcohol-soluble constituents

- Water soluble constituents not absorbed in the stomach.
- Lipid soluble constituents absorbed to some extent
- Alcohol and alcohol soluble constituents may be absorbed to a high degree.
- About 20% of a dose of alcohol is absorbed in the stomach
- The rest is absorbed in the upper intestine
- Some sulfur containing garlic molecules (alcohol soluble) from garlic are absorbed in the stomach, bio-transformed in the liver, and the bio-transformed substances detected on the breath within 4 minutes.

Implication for forms

- Tinctures may have more rapid (nearly instantaneous) effect of some constituents on the system.
- Taking tincture drops alone may deliver the dose to the stomach and system, without topical effects further down the tract.
- Taking drops diluted in water may provide sufficient volume for it to pass to the upper intestine.
- Taking drops away from food, with a little warm water, may optimize rapid absorption of constituents.

Provings

- Observation of many thousands of regular provings of the effect of small tincture doses on the pulse, over a twenty-year period.
- It is common for a nearly instantaneous effect on the pulse due to reflex/energetic actions. This is non-pharmacological, but a vital/neuro-endocrine reflex.
- A secondary effect is commonly experienced at the 10-20 minute point, and may be very different from the initial vital response This is due to the absorbed constituents.
- Example: *Viburnum prunifolium* has an initial relaxing effect on the pulse, and by about ten minutes, the effect switches to tonification, strengthening.

Teas and powders

- Constituents in teas are not absorbed in the stomach, and pass more slowly to the intestine
- Taking with food may promote delivery further down the digestive tract as the plant material is carried with the food. This may be desirable for topical effects on the intestinal wall.
- Optimal delivery for effects on the intestinal wall may be obtained by taking herbs as powders with food media.

- Calendula
- Plantain
- Althaea

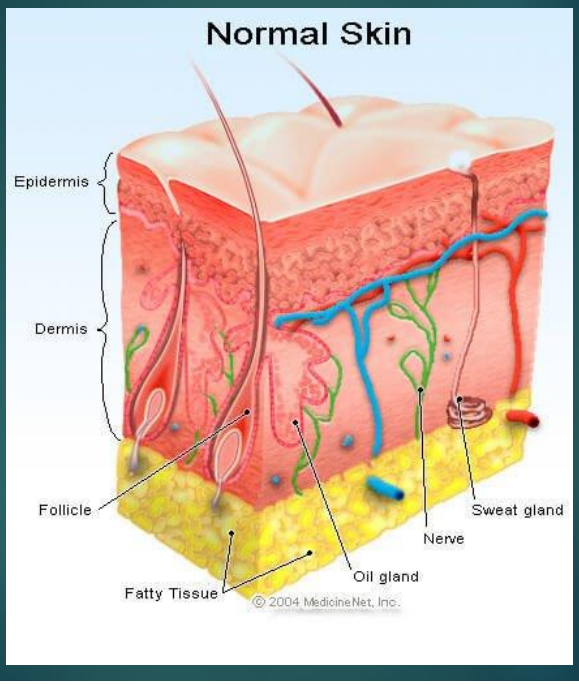
2-4 TBLS (to ¼ cup)

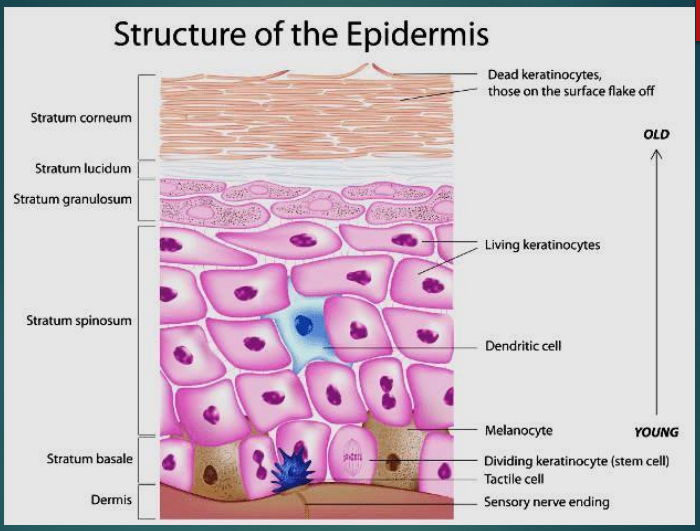
As powder delivered in warm applesauce

The Skin as immunological organ

THE SKIN POSSESSES A SEMI-AUTONOMOUS IMMUNE SYSTEM

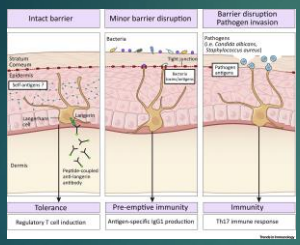
THIS CAN BE DYNAMICALLY ACTIVATED BY HERBAL MEDICINES.

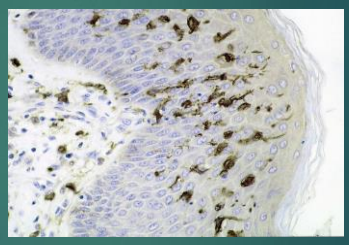

Normal Skin
Epidermis
Dermis
Follicle
Fatty Tissue
Oil gland
Nerve
Sweat gland
© 2004 MedicineNet, Inc.


Structure of the Epidermis
Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Dermis
Dead keratinocytes, those on the surface flake off
OLD
Living keratinocytes
Dendritic cell
Melanocyte
YOUNG
Dividing keratinocyte (stem cell)
Tactile cell
Sensory nerve ending

Epidermal immunity

Langerhans cells. The major epidermal phagocyte. Dendritic antigen-presenting cells. About ½ the phagocytic capacity of tissue macrophages. Activate epidermal and dermal T-Cells





Salmon JK, Armstrong CA, Ansel JC. The skin as an immune organ. West J Med. 1994 Feb;160(2):146-52. Review.

The major skin cells all possess immunological properties

- **Keratinocytes.** Immune competent epithelial cells. Make up 90% of epidermal cells. Phagocytes which secrete T-cell activating cytokines.
- http://www.jidonline.org/article/S0022-202X(15)47825-X/pdf)
- https://www.ncbi.nlm.nih.gov/pubmed/11549105

- **Melanocytes.** Pigmented cells. 3-5% of epidermal cells. Like keratinocytes, can secrete cytokines.

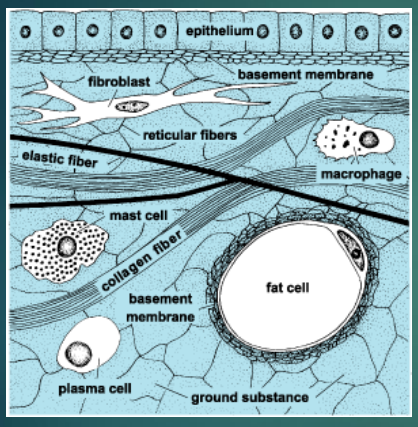
Lymphocytes in the skin

The skin is the largest reservoir of T-Lymphocytes in the body.

- **Resident CD8+ T cells.** Most of the CD8 (cytotoxic) cells in the skin reside in the epidermis
- **Epidermotropic T-Lymphocytes**. Skin-homing lymphocytes from the dermis or system.
- **Dermal T4-lymphotyces** (most abundant in dermis)
- **B-Lymphocytes** present in low numbers but home to the dermis from cutaneous lymphatic material in response to infection or inflammation

Egbuniwe IU, Karagiannis SN, Nestle FO, Lacy KE. Revisiting the role of B cells in skin immune surveillance. Trends Immunol. 2015 Feb;36(2):102-11.

The dynamic dermis



- Circulation can increase or decrease from external or internal (or herbal) stimuli
- The immune-cell-rich dermis is semi-independent of the larger immune system, and can be regulated or stimulated by local factors. Including herbal applications.
- Collagen and elastin forming fibrocytes circulate in the system in the same manner as white blood cells, and can migrate into an injured or inflamed dermis to produce healing and **scarring.**
- More than 90% of T-lymphocytes in the dermis may be "mature" cells already alert for their designated antigen.

- The skin contains all the essential elements of the immune system
- The skin cells themselves are immune cells and form both a mechanical and a biological layer against invaders.
- Most of our "immune herbs" which we know affect systemic immunity, have an exponentially more potent effect on local immunity when applied topically because of the greater concentration at the site of infection that can be achieved with internal use.

Potential synergistic actions against the biofilm complex

	Anti-inflammatory	Vulnerary	Antiseptic	Anti-biofilm	MRDi	Local Immunity
Calendula	x	x	x		x	x
Plantago	x	x	x	x	x	x
Hypericum	x	x	x	x	x	x
Echinacea	x	x	x		x	x
Althaea	x	x	x	x	x	x

Infused oils: Olive oil also has wound healing and anti-inflammatory effects
Echinacea wash from decoction of 1 ounce per liter for 40 minutes.
Echinacea wash from tincture 1 part Echinacea to 3-6 parts water.

	Anti septic	Immune	Anti Biofilm	MDRi
Larrea	x	x	trad	
Thuja	x	x	trad	
Anemopsis	x		trad	
Baptisia	x	x	trad	x
Hypericum	x	x	science	x
Althaea	x	x	science	x

	Antiseptic	Immune	Biofilm	MRDi
Aloe	x		science	(-)
Commiphora	x	x	science	x
Boswellia	x	x	science	x
Allium	x	x	science	x
Hydrastis	x		science	x
Achillea	x		science	x

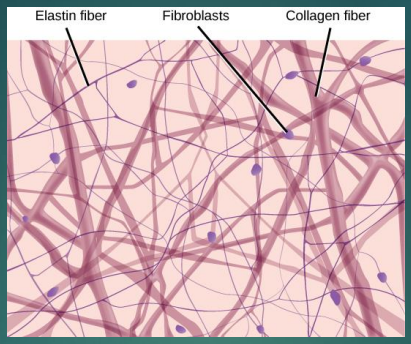
Stimulate local circulation (rubefacient effect)

	Stimulant	Antiseptic	Immunity	Biofilm	MDRi
Thuja	x	x	x	trad	
Anemopsis	x	x		trad	
Myrica	x	x	x	trad	
Baptisia	x	x	x	trad	x
Commiphora	x	x	x	yes	x
Achillea	x	x		yes	x
Capsicum	x	x			
Arnica	x	x	x	yes	

Delivering herbs to site of immune challenge

- Apply tinctures. Dilute between 1:3 and 1:6. Compress or medicated clay.
- Apply teas. Foot Bath, Hand/arm bath, Sitz bath, Compress, medicated clay.
- Exponentially larger volumes of immune-stimulating constituents reach the local autonomous immunity with dermal application rather than systemic.
- Consider enemas in ulcerative colonic conditions

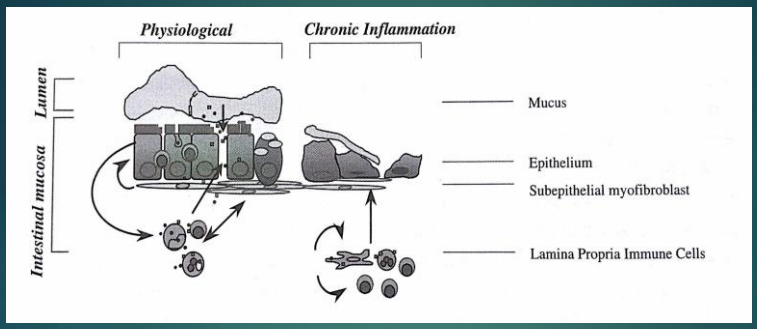
Gut wall as systemic immune organ



- Collagen-producing fibroblasts are antigen-presenting and cytokine-secreting cells, midway in phagocytic potential between monocytes and tissue macrophages
- ***The entire connective tissue is an immune organ***

Chesney J, Bacher M, Bender A, Bucala R. The peripheral blood fibrocyte is a potent antigen-presenting cell capable of priming naive T cells in situ. Proc Natl Acad Sci U S A. 1997 Jun 10;94(12):6307-12.

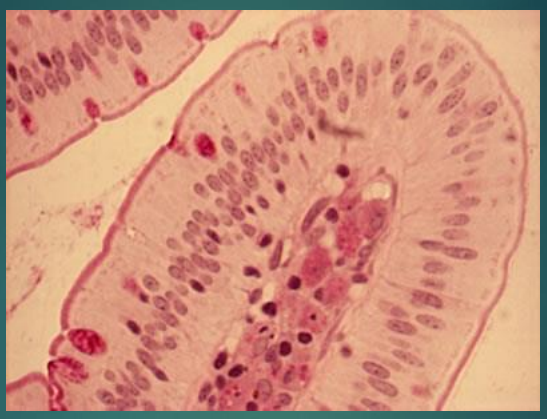
The villus as a lymphatic organ



Myofibroblasts at the base of the enterocytes control gut lining regeneration and tight junctions through chemical triggers.

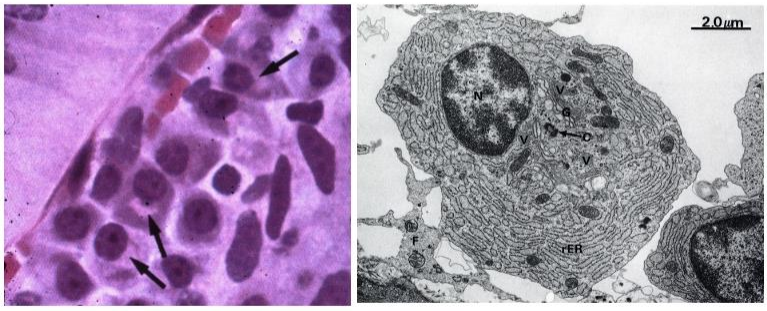
The initiating trigger of control is the presence of short-chain fatty acids from the microbiome, mediated by prostaglandins.

Lymphocytes in villus tip are stained in black



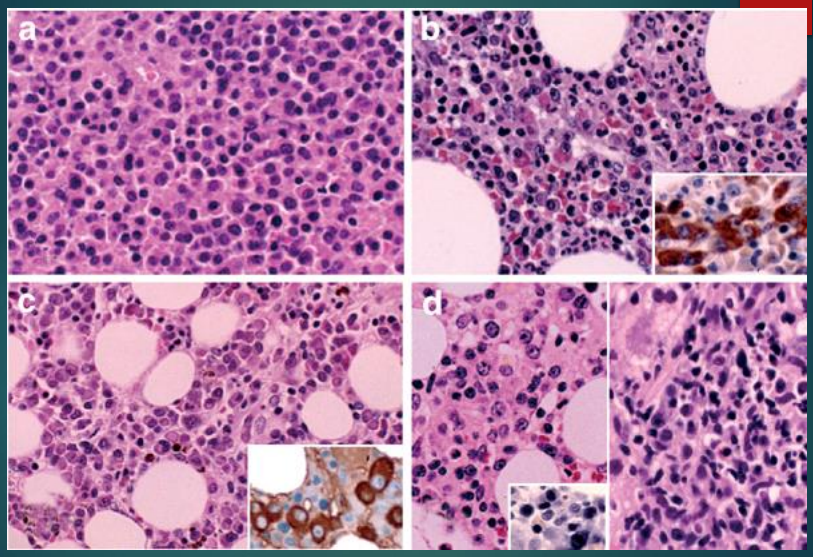
Macrophages in villus are stained pink

Plasma cells are immigrant, antibody-producing cells

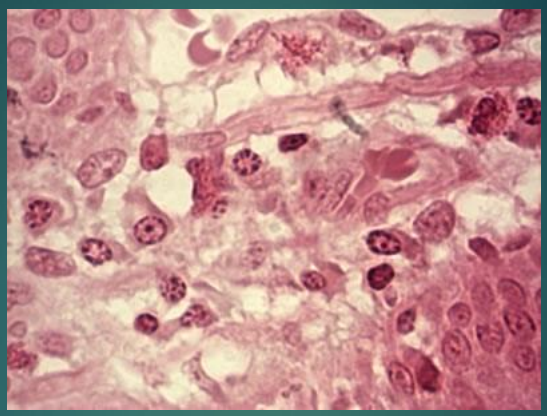


plasma cells are identified by the low-staining region next to the nucleus (LM), which is occupied by the Golgi apparatus

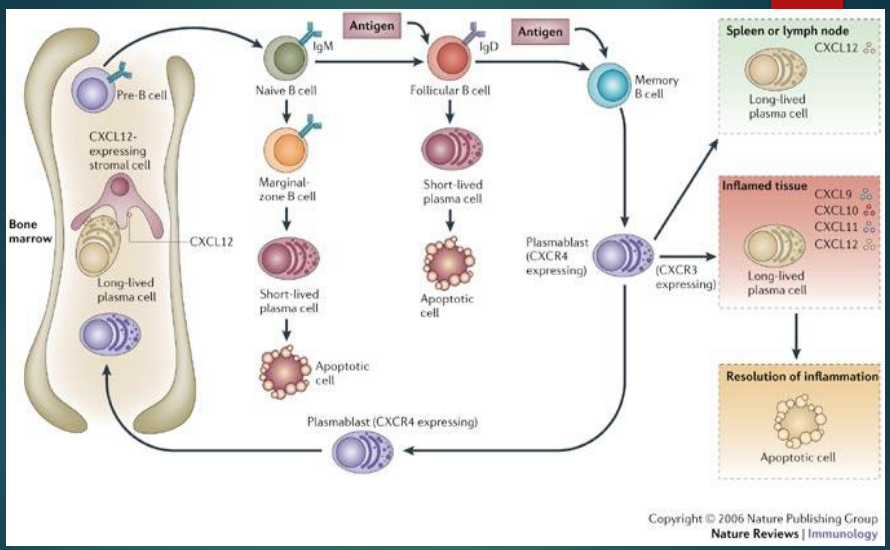
Stained plasma cells in bone marrow tissue



The bone-marrow plasma cells secrete antibodies to circulate throughout the system



Plasma cells in villus stained dark pink

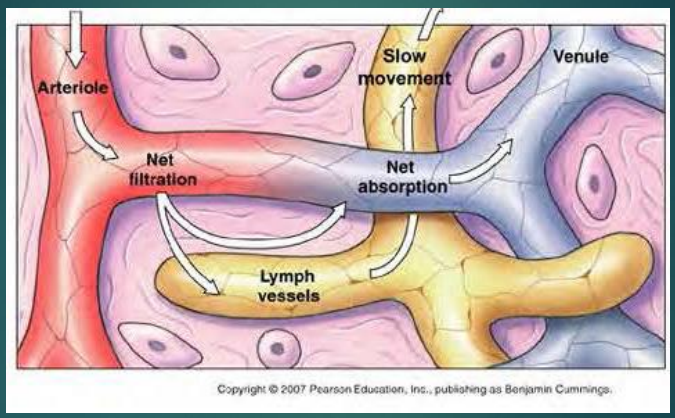


Plasma cells migrate to bone marrow, spleen or nodes.
They may be attracted to and sequestered in any area of inflammation

Significance

- One root of systemic inflammation and autoimmune reactions are inflammatory reactions in the outer layer of the gut barrier producing autoantibodies.
- When treating systemic inflammation, the front line of the battle is the gut wall.
- Strictly remove autoantigen producing food intolerances.
- Apply topical anti-inflammatories in a form which will reach the intestinal wall.
- Herbal triad: *Calendula, Plantago, Althaea* with modifying companions per the case
- And the standard combination of bitters and carminatives

Autophagy in the gut and extracellular space



Detoxification of the extracellular spaces

- The extracellular spaces can be the sites of significant inflammation from auto-toxification. The condition is a form of "damp heat."
- The ECS contains cellular wastes, debris from dead cells
- ***Little Known Fact:*** The entire volume of circulating plasma proteins moved into the ECS and recycles through the lymph in 24-48 hours.
- Inflammation in the ECS can be triggered by inefficient cell death, excess cell death, and poor intracellular detoxification, ***excessive accumulation of plasma proteins***, and inefficient drainage via the lymphatic system.
- Normal cell death is through *autophagy,* and leaves no debris that needs to be removed.

Autophagy

- Programmed non-inflammatory removal of cells and subcellular particles.
- Makes amino acids available locally in abundance.
- Promoted by exercise
- Promoted by fasting
- ***May be promoted by traditional alterative and lymphatic herbs.***
- The alternative is destructive inflammatory removal of debris. May be correlated with "damp heat" in traditional systems

Fasting, ghrelin, and autophagy

- Ghrelin is secreted by the gut wall of the stomach, small intestine, and large intestine when empty
- Stimulates hunger centers in hypothalamus
- Promotes growth hormone
- Has systemic anti-inflammatory effects
- Acts as selective Cox-2 inhibitor
- Has febrifuge effects
- Promotes ***autophagy*** in the system and ***locally*** in the gut
- **Promotes gut remodeling.**

The effects of ***alterative*** herbs and ***gut-healing formulas*** are greatly enhanced during the fasting/ghrelin state.

Total or intermittent fasting. The cue is the growling stomach.

Consider implications for traditional emetic and laxative therapy in acute febrile illness.

The Healing Power of Snot

- Mucin binds to pathogens
- Lysozyme in an antiseptic enzyme that break down bacterial cell walls. Component of mothers' milk.
- Lactoferrin. Antimicrobial and antifungal glycoprotein also found in mothers' milk
- Antibodies. Secretory IgA, and also large amounts of IgG, IgM, and IgE are present.
- ***Mucus contains most of the immunological components of mothers' milk, which confer immunity to the infant.***

https://www.nature.com/articles/mi201015

"Keep the membranes moist"

- Avoid drying astringents.
- ***No Hydrastis*** for acute mucous membrane issues.
- From Edwin Hale: "Not until the fever has passed."
- Hydrastis if for sub acute and chronic mucous membrane conditions.
- Hydration
- ***All demulcents and expectorants are immune herbs*** via their action to moisten the membranes.
- Deliver ***expectorants*** in dilute *Althea* water.
- Consider implications for traditional emetic therapy (Emesis is followed by the flow of copious clean mucous.)

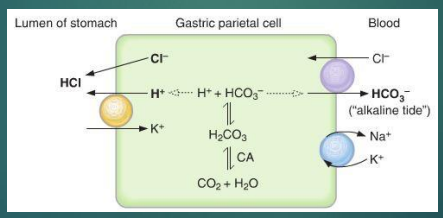
The Urinary Alkaline Tide

Alkaline tide

- Serum pH is strictly regulated.
- With increased acid load, more acid is secreted in the urine.
- The lung can also adjust the serum pH by exhalation of more or less CO2. An involuntary process.
- Normal urine pH is acid, at about 6.0, the result of the acid-producing nature of the Krebs cycle.
- This acid barrier forms a defense against most bacteria.
- Alkalinity in the urine also has antimicrobial effects, through promoting an iron-sequestering protein.
- Urine pH, though typically acidic, demonstrates periodic "alkaline tides" which can raise the pH to the alkaline state.

Alkaline tide

- With a high protein meal, requiring larger amounts of stomach acid to digest, bicarbonate ions are excreted into the system to maintain balanced pH within the cell. The result is a flood of alkalinity in the serum which is nearly instantaneously compensated for by excretion of bicarbonate ions into the urine, and respiratory compensations.



- The tide is a beneficial phenomenon, contributing to host defenses and immunity in the bladder and urethra.
- The higher the dose of protein, the stronger the tide, and the higher the alkaline peak.
- Significance for the value of a high protein meal.
- Also consider recent research in protein nutrition, showing that a minimum per-meal dose is necessary for the muscle building and metabolic effects. 25-30 grams for most people.
- Consider the beneficial effect of this minimal protein dose at 2-3 meals on successive alkaline tides through the urinary system.

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