Aging skin & Vitamin A (retinoids)
Major Functions of Skin

**Barrier**
(excludes infectious agents & some chemicals; retains moisture, prevents dessication)

**Temperature control**
(perspiration, insulation)

**Receptor of sensory stimuli**
(touch, pressure, pain, temperature)

**Biosynthesis**
(vitamin D, melanin, estrogen)

**Inflammatory/immune reactions**
(contact dermatitis)

**Excretion/secretion** (sweat, milk, pheromones?)
The composition of a collagen fibril and the distribution of tropocollagen molecules in connective tissue.
Changes in Aging Skin

Events

Epidermis: cell production, melanocytes, Langerhans cells
Dermis: density, #cells, blood vessels
Other: sweat, sebaceous glands, hair follicles

Functional consequences

wound healing, immunity, tanning, elasticity, clearance of foreign substances, thickness
blisters, infection, roughness, dryness, cancer, fragility, insensitivity
UV (ultraviolet) radiation affects gene expression in skin (collagenase up, collagen down) leading to acute collagen loss, imperfect repair, and microscars. Chronic collagen loss results in photoaging.
Treatments for photoaged skin

antioxidants

a-hydroxyacids

Retinoids (vitamin A metabolites and analogs)

“Of these three approaches only topical retinoids, particularly retinoin (all-trans-retinoic acid), have a well documented ability to repair photoaged skin at the clinical, histological and molecular level. Furthermore, the use of topical retinoids may actually prevent photoaging.”

Vitamin A (retinol) is the parent retinoid

- vision (nyctalopia)
- development, growth, reproduction
  epithelia (skin, trachea, digestive system)
  immune system, nervous system
fruits & vegetables

carotenoids (provitamin A)

liver

vitamin A (retinol)

intestine

(retinol esters)

liver

retinoic acid (RA)

storage

retinoid actions
Cells (keratinocytes) convert vitamin A (retinol) into all-trans-retinoic acid (atRA).

atRA regulates gene expression through nuclear hormone receptors and thereby controls cell differentiation/function.

atRA (tretinoin) = Retin-A®, Renova®, Accutane®
Effects of atRA (Renova®) on photoaged skin

18 months topical treatment once daily

before

after

Effects of retinoic acid on human skin

-RA

+RA

protective barrier

epidermis
dermis
Retinoids and cystic acne
Systemic dosing of RA and cystic acne

before                            after RA
Severe Darier’s disease

before

after
Retinoids and psoriasis vulgaris

before                          after RA
RA effects on a tadpole tail
Vitamin A toxicity

Single dose—100-fold > DRDA in adults,
20-fold > in children

Chronic intake—10-fold > DRDA

RA is teratogenic!
Retinoids and over-the-counter skin products