

Formulation Design

THE SKINCARE E-SUMMIT

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**What is formulation
design?**

Formulation Design

Process that blends science and creativity to create products that meet consumer standards and adhere to safety and quality standards

It's Interdisciplinary

Chemistry

Regulatory

Art

Biology

Marketing

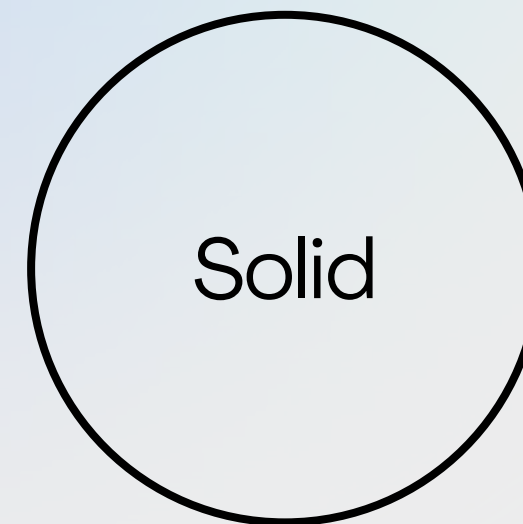
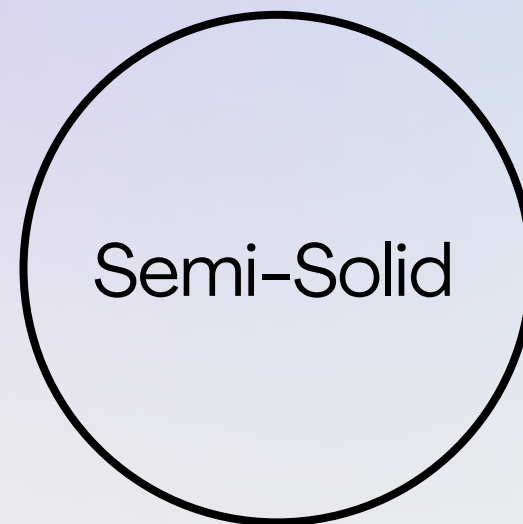
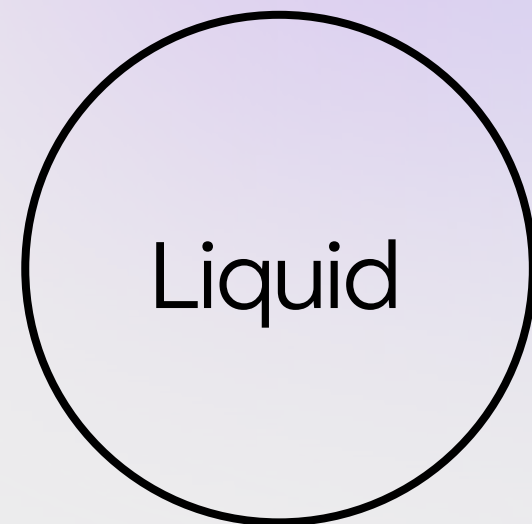
Product Types

Gives formulators
an idea of what
ingredients will need
to go into a product



Dosage form = final form of a product

There are a gazillion products out on the market, but all of them fall under 3 categories:



Liquids

Product Types

Liquids

Solution



Lotion



Suspension



Product Types-Liquids

Solution



contains one or more ingredients dissolved in a solvent or mixture of mutually miscible solvents

Water-based



Hydroalcoholic



Anhydrous

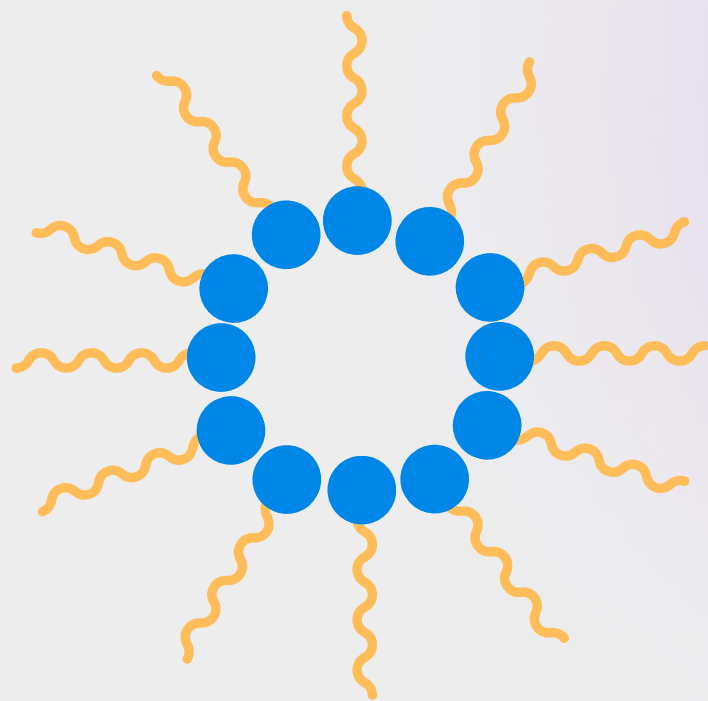
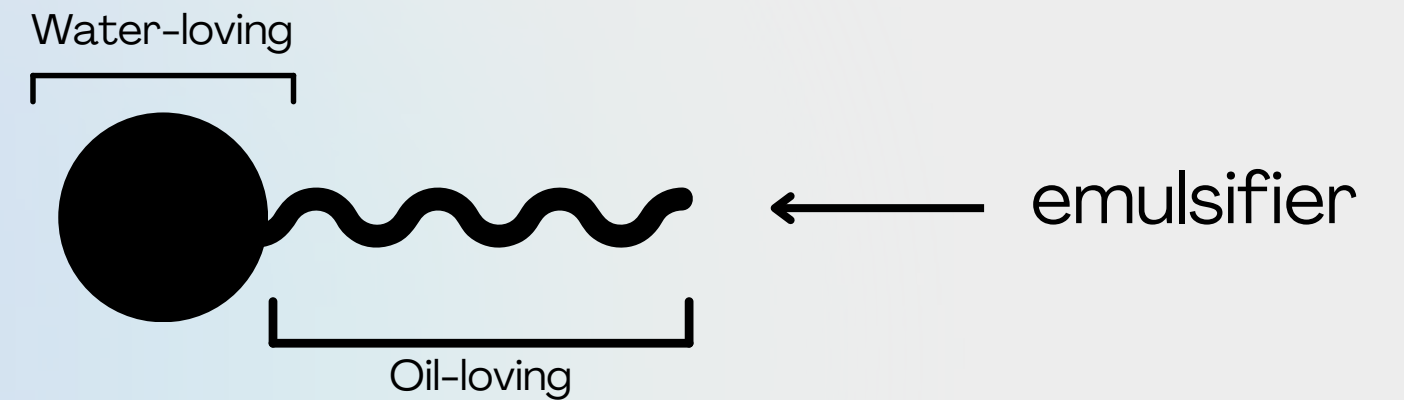


Product Types-Liquids

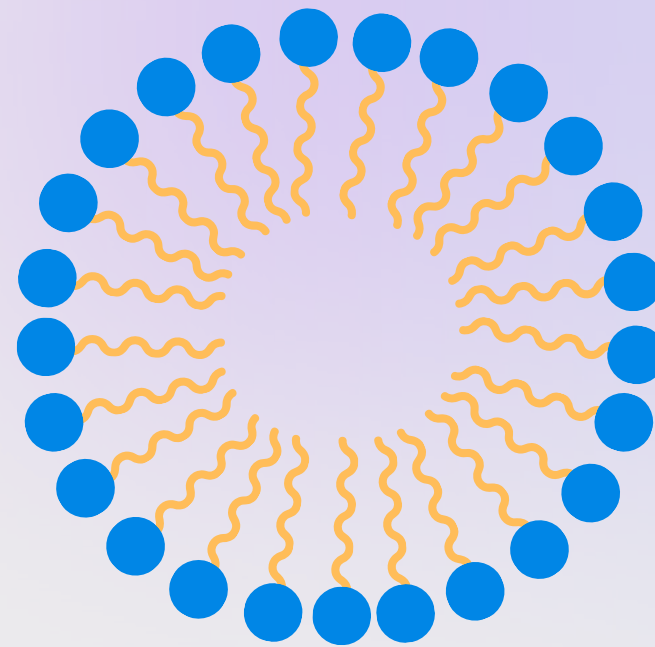
Lotion

→ a thin emulsion that is easily pourable, less greasy, and easily washable

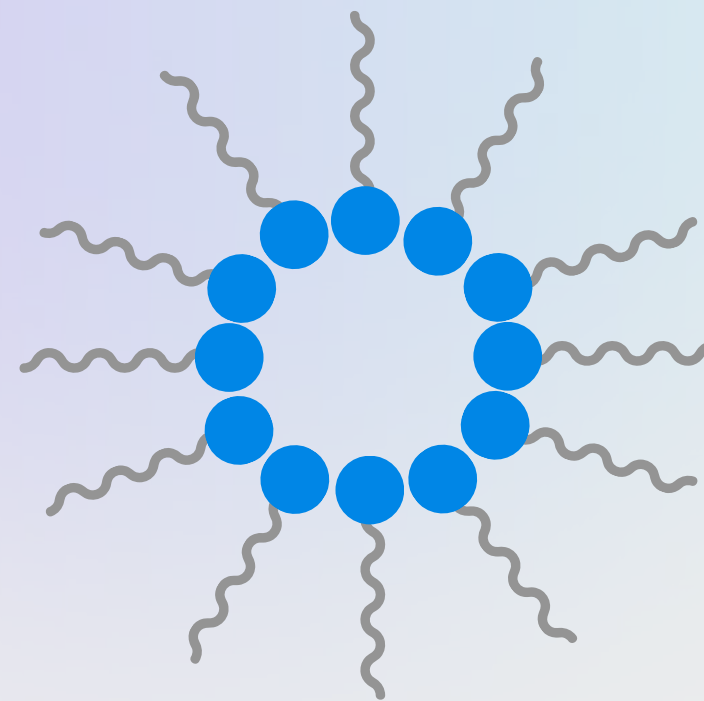
Emulsion=two immiscible phases brought together by an emulsifier



Water-in-oil



Oil-in-water



Water-in-silicone

Examples:



Product Types-Liquids



Suspension

→ contains immiscible solid particles dispersed in a liquid

Water-based



Hydroalcoholic



Anhydrous



Semi-solids

Product Types

Semisolids

Cream



Ointment



Paste



Gel



Product Types-Semisolids

Cream

→ a thicker emulsion that does not flow readily

Lotion

vs

Cream

Lighter texture

Contains higher amount of water

Absorbs quickly

Generally thicker consistency

Contains higher amount of oils/waxes

Greater moisturization

Examples:



Product Types-Semisolids

Ointment

→ contains <20% water and >50% waxes & oils

Lotion



Cream



Ointment



Examples:



Product Types-Semisolids

Paste

→ contains a large proportion of solids dispersed in a fatty vehicle

Examples:

Ointment

Very thick, greasy

Can contain small amount of water

Contains low amount or no solids

vs

Paste

Very thick, greasy

Anhydrous

Contains high amount of solids (20-50%)



DIY Sunscreen
(do NOT make this,
I beg you)



Product Types-Semisolids

Gel

→ contains a gelling agent to provide stiffness to a solution or colloidal dispersion

Water-based



Hydroalcoholic



Solids

Product Types

Solids

Loose Powder



Pressed Powder



Capsule



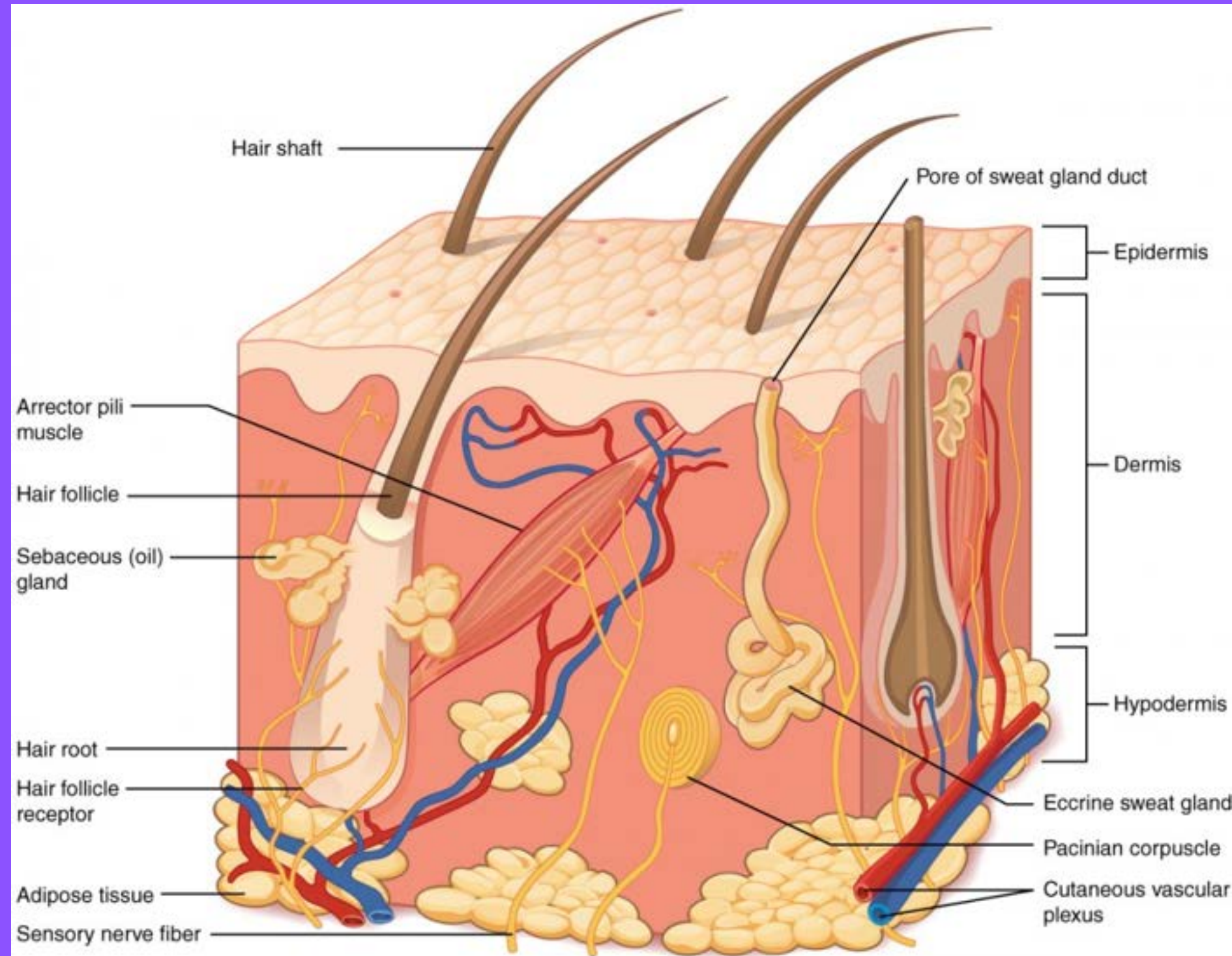
Stick



Let's Talk Skin

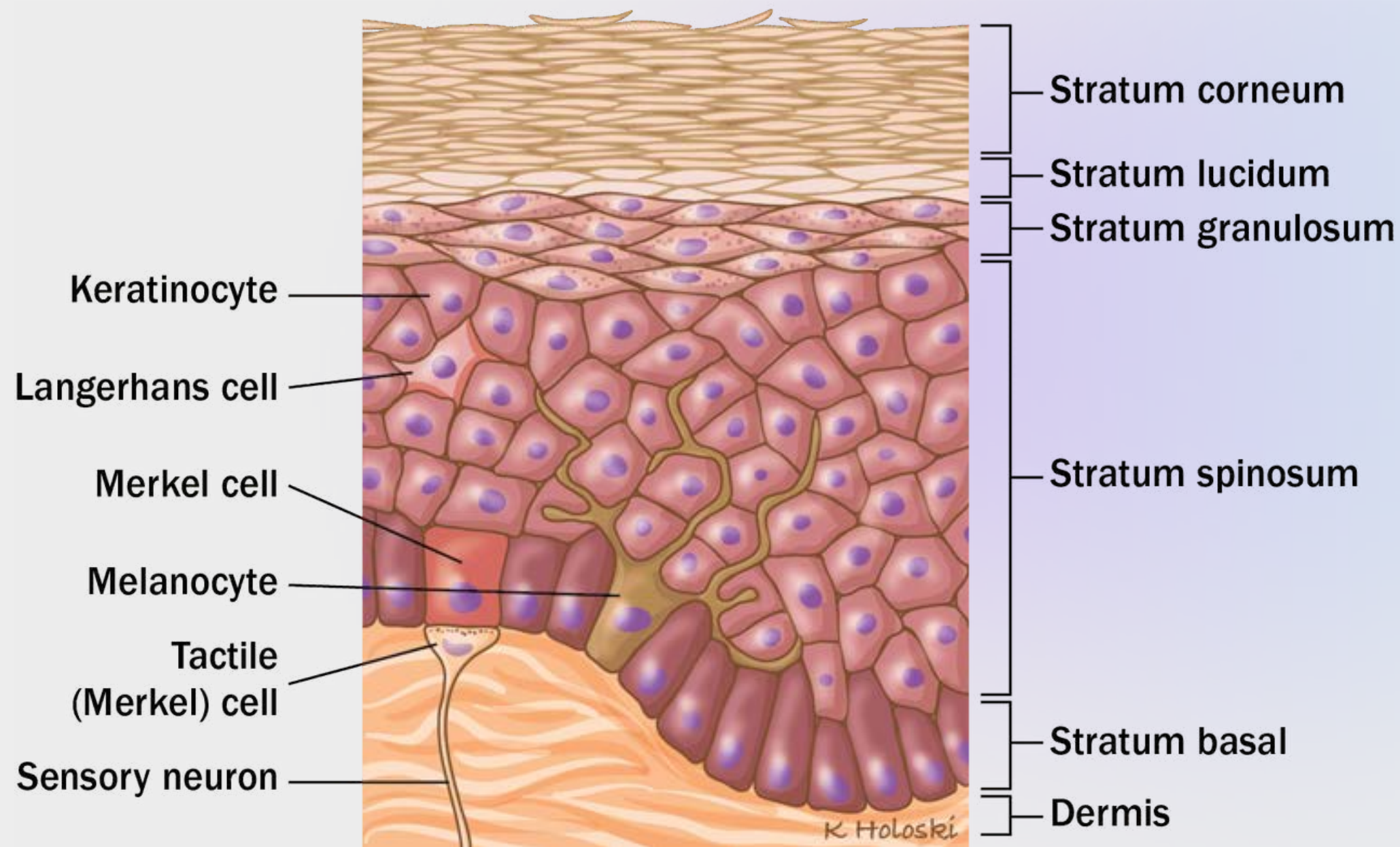
Skin Structure

<https://courses.lumenlearning.com/suny-ap1/chapter/layers-of-the-skin/>



The skin is a complex organ
(which is good, right?)

Skin Structure-Epidermis



<https://thanguide.org/cancer-types/skin/anatomy/>

Keratinocytes

make up the majority of the epidermis

Merkel Cells

play a role in sensing touch

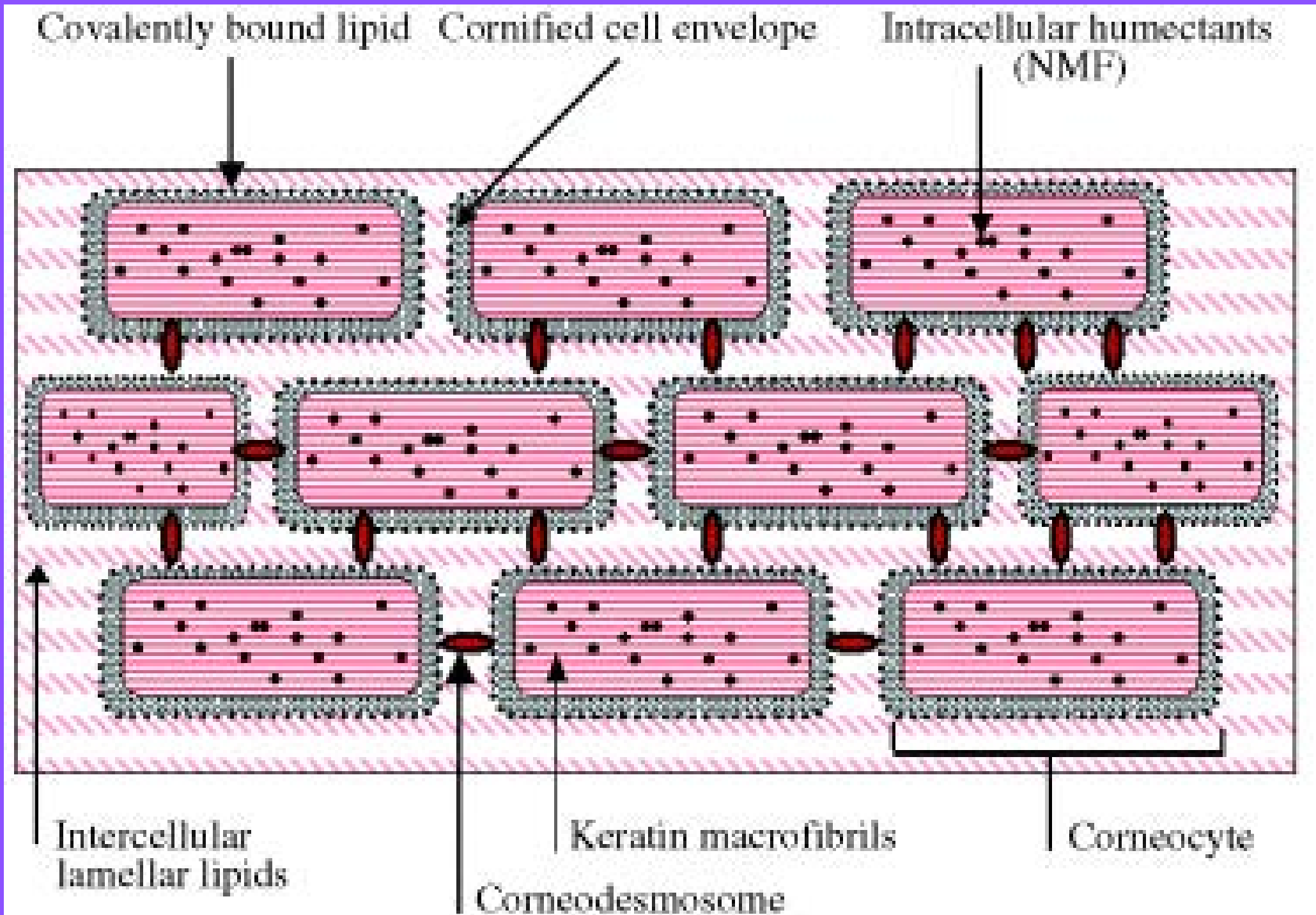
Melanocytes

produce melanin, is responsible for skin color

Langerhans Cells

participate in immune response

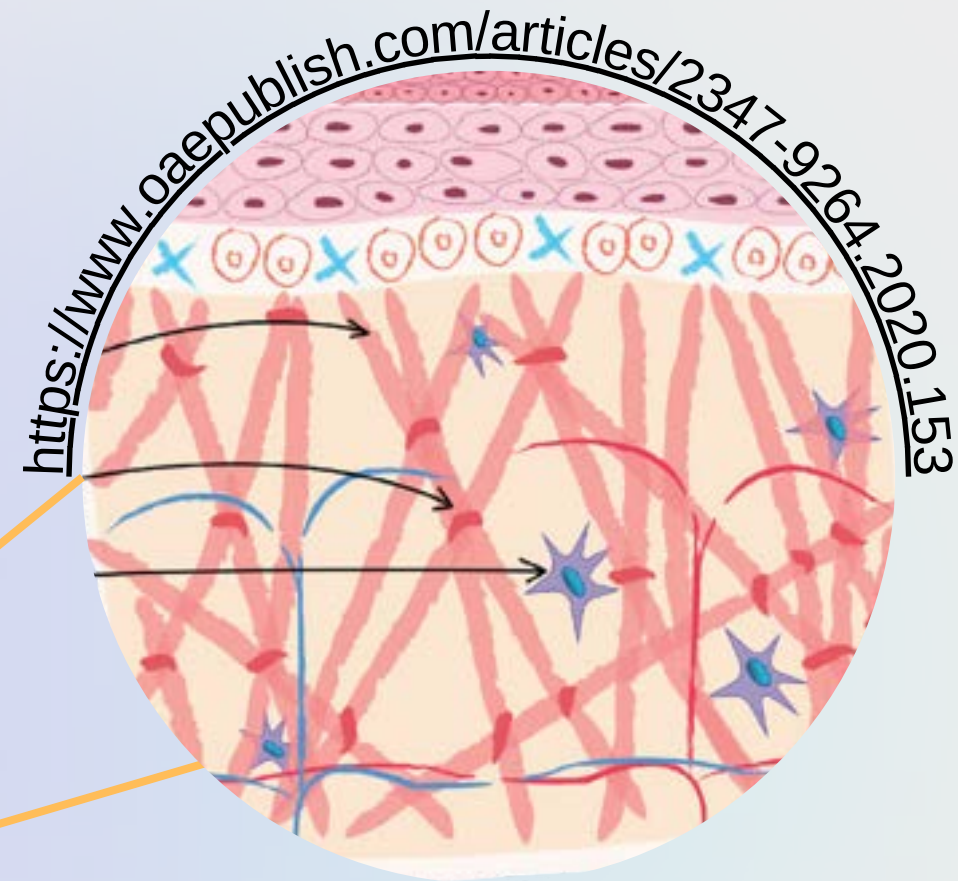
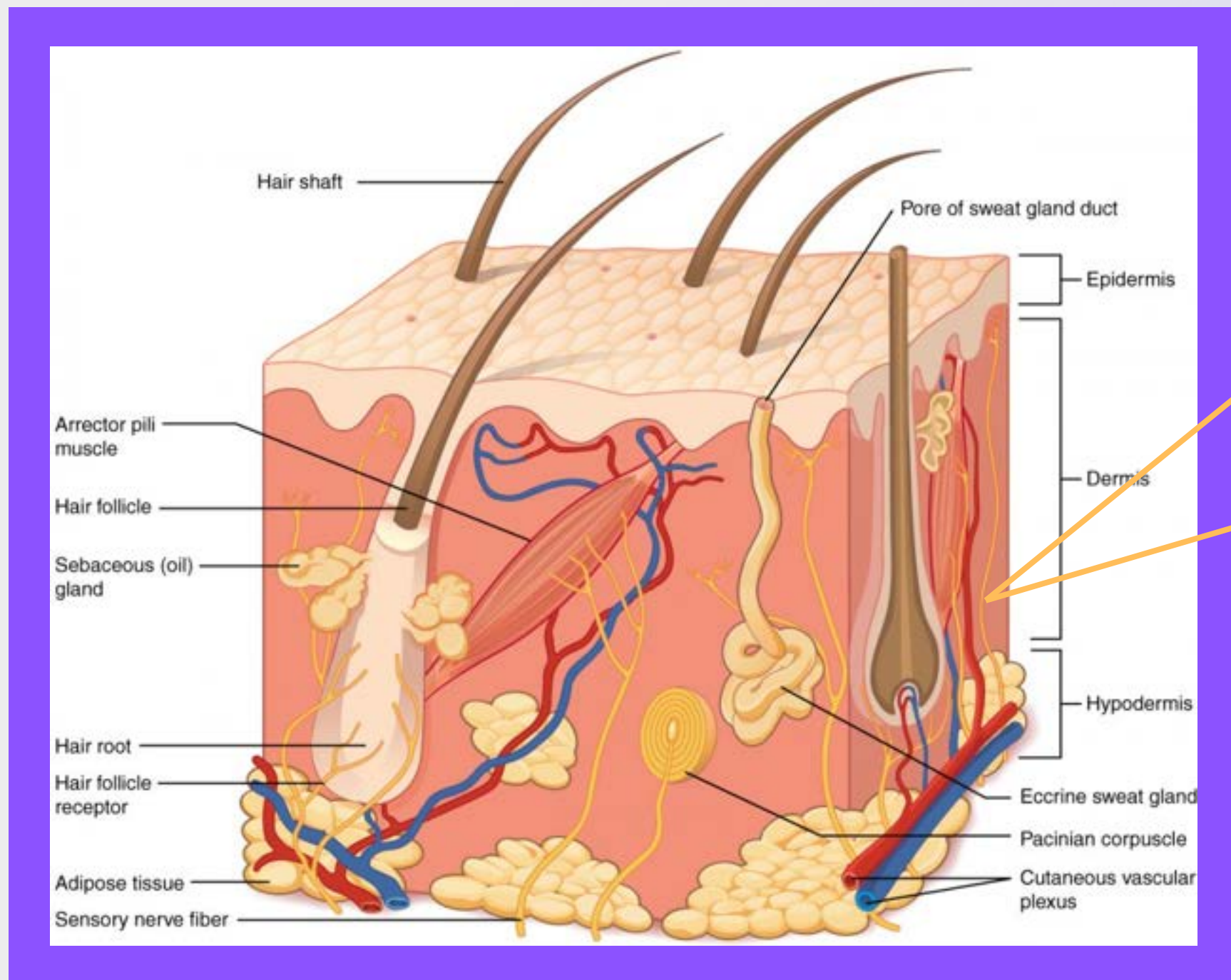
Skin Structure-Stratum Corneum



Skin is pretty hydrophobic!



Skin Structure-Dermis



This is where collagen and elastin is located

Why delivering actives isn't so easy...

The skin is complicated. We don't soak things up like a sponge.

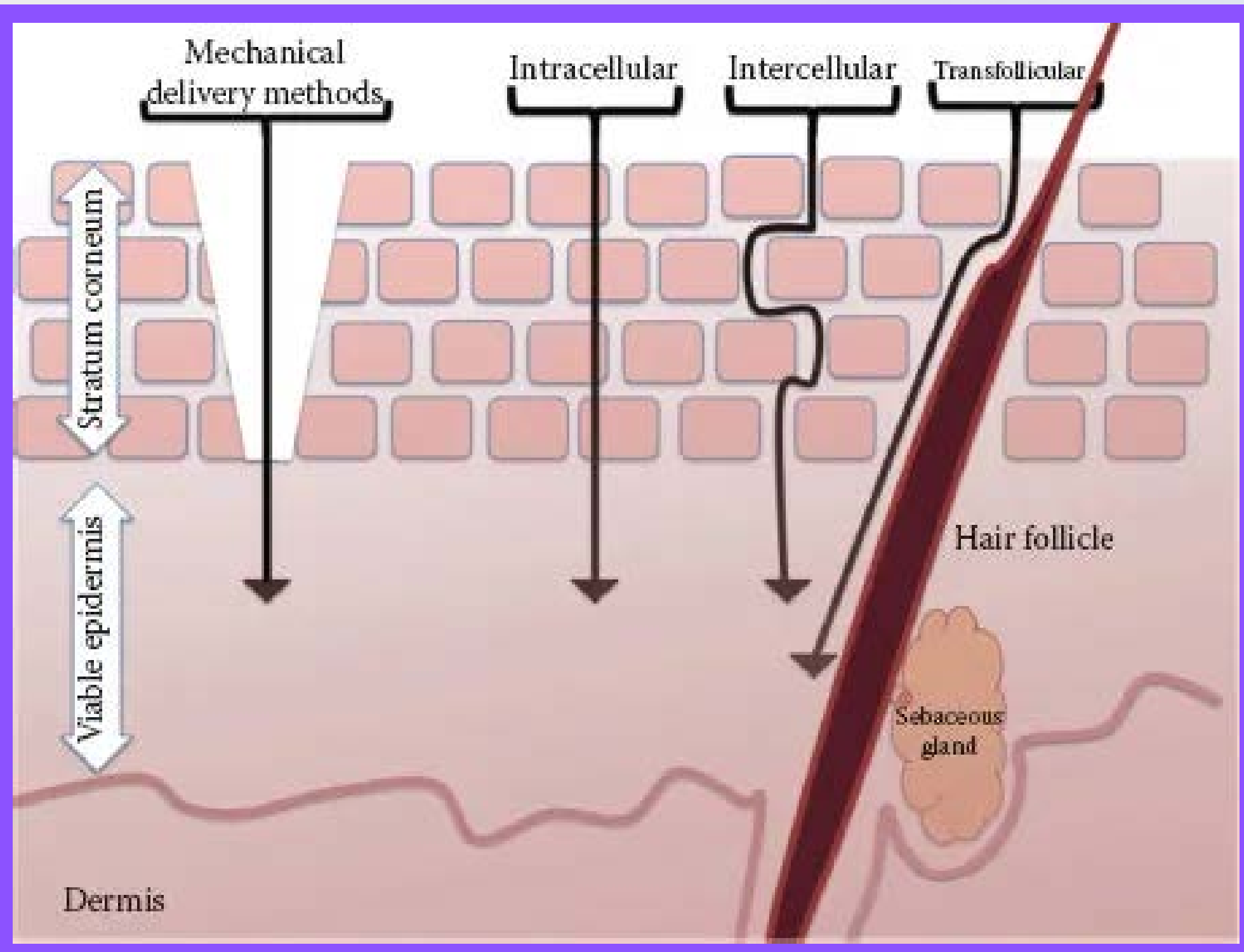
Majority of cosmetic ingredients are not both hydrophilic and lipophilic.

Cosmetic actives are not all the same. There is no one-size-fits-all approach.

Skin Delivery

Permeation Pathways

<https://clinicalgate.com/skin-structure-and-function/>



Intracellular

pass through lipid matrix and corneocytes

Intercellular

pass exclusively through lipid matrix

Transfollicular (Transappenageal)

pass via skin appendages (hair follicles or sweat ducts)

Delivery Systems



Emulsion
Systems

Vesicular
Systems

Particulate
Systems

Lipid
Nanoparticles

Emulsion Systems

Microemulsion

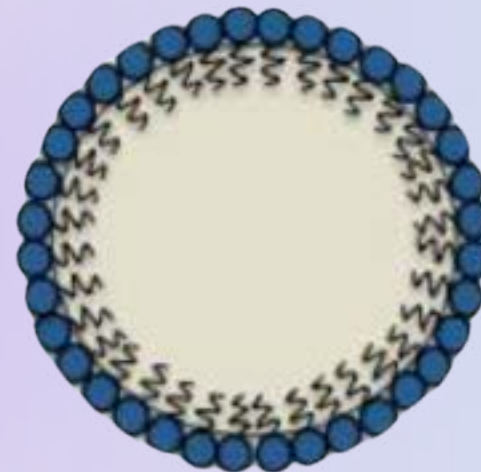


10-100 nm

Thermodynamically Stable

Translucent or Transparent

Nanoemulsion

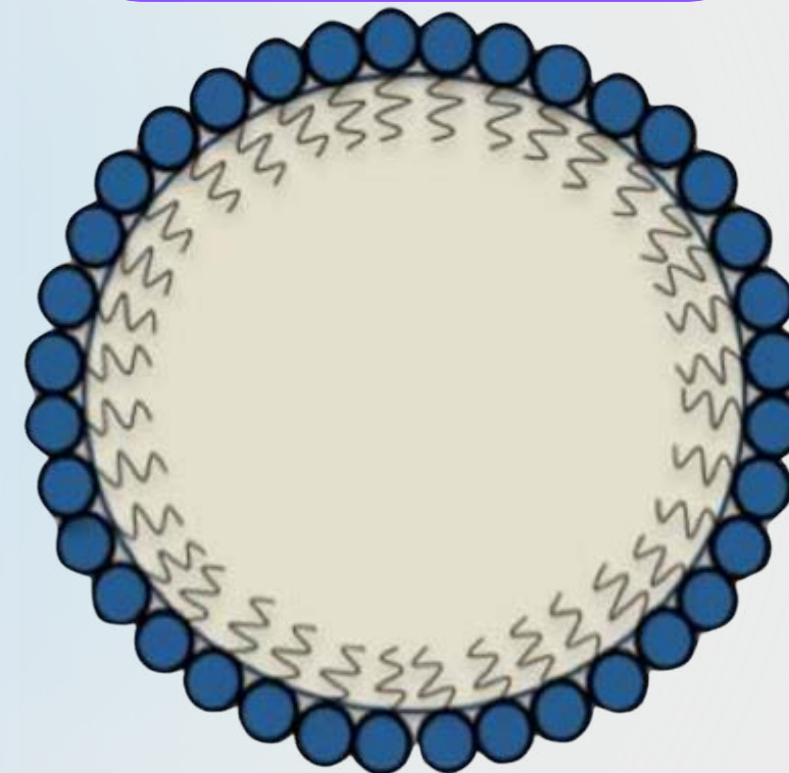


20-500 nm

Kinetically Stable

Translucent or Transparent

Macroemulsion

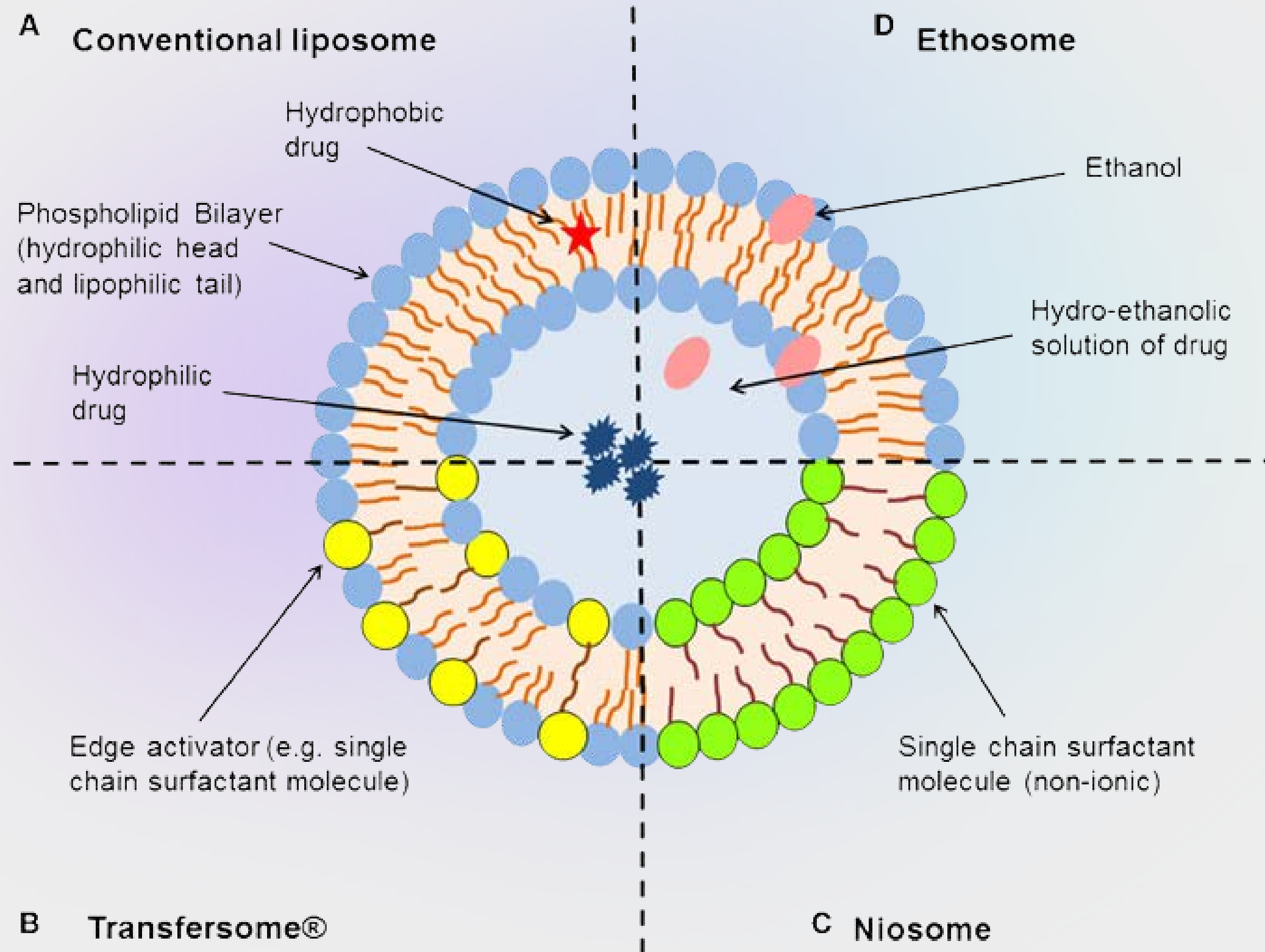


1-100 μm

Kinetically Stable

Opaque

Vesicular Systems



Drug=cosmetic active

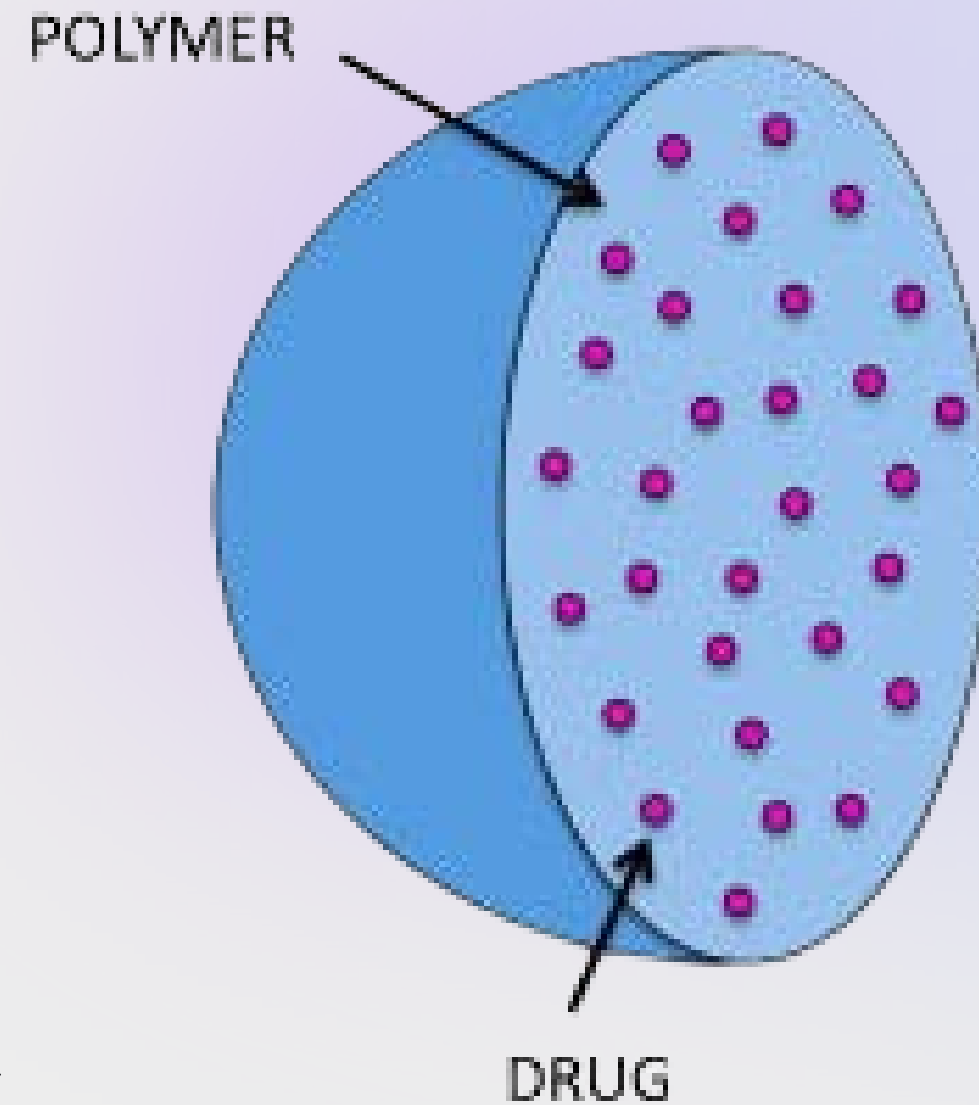
B Transfersome®

C Niosome

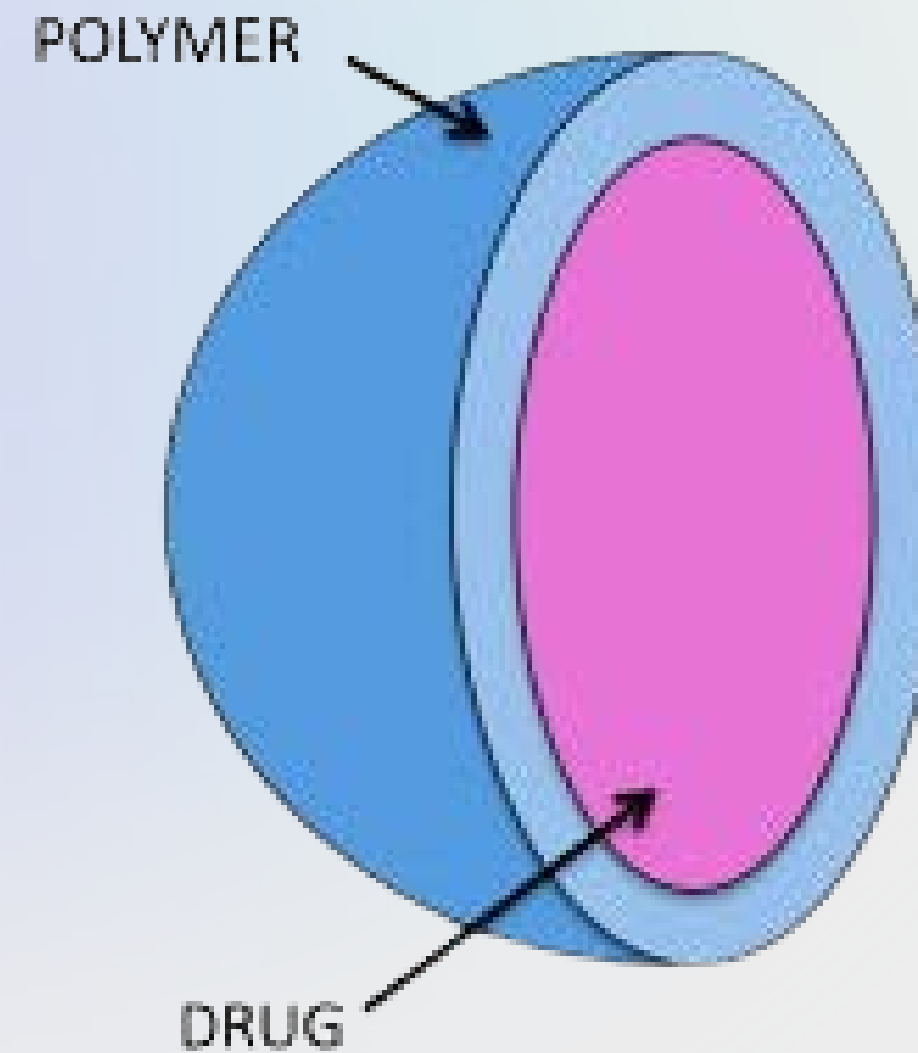
Particulate Systems

(also at the nano-level too)

**MICROSPHERES
(MATRIX SYSTEM)**

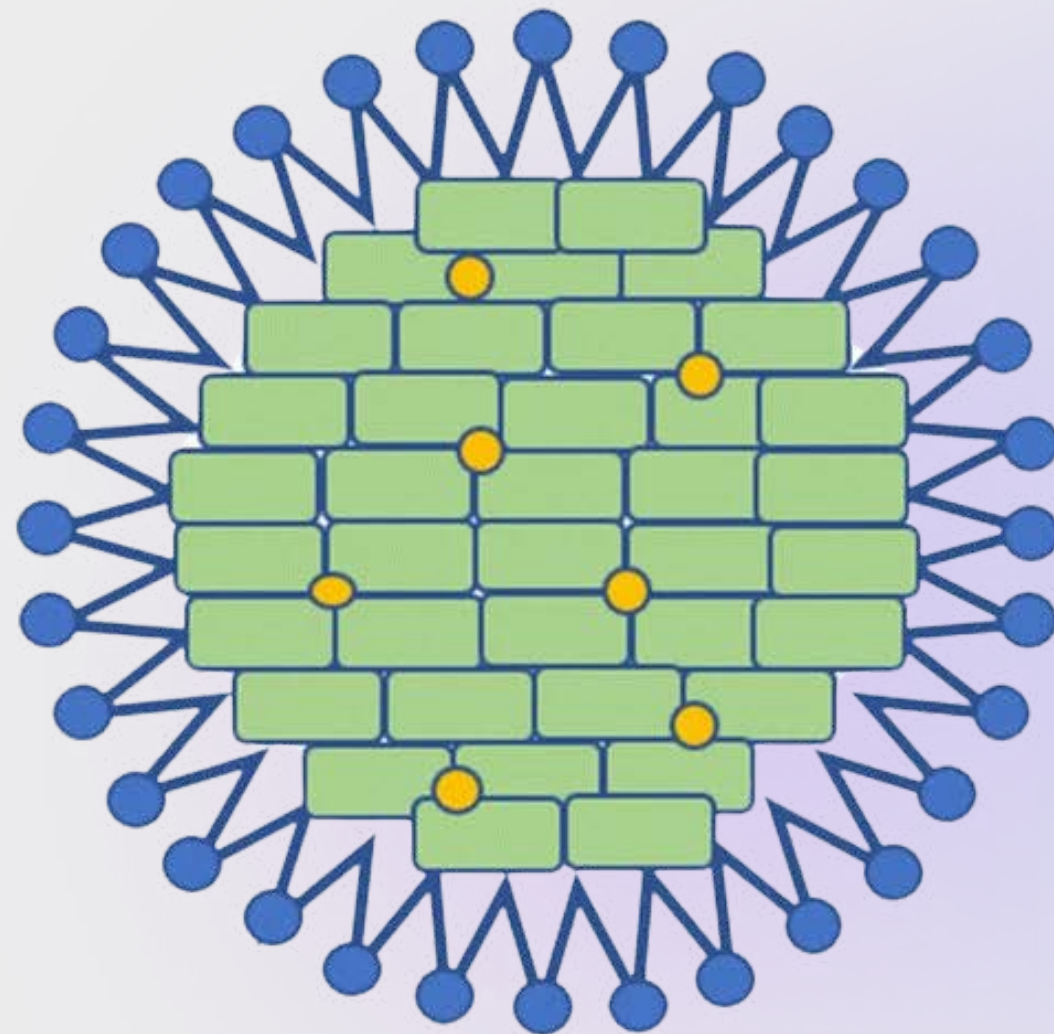


**MICROCAPSULES
(RESERVOIR SYSTEM)**

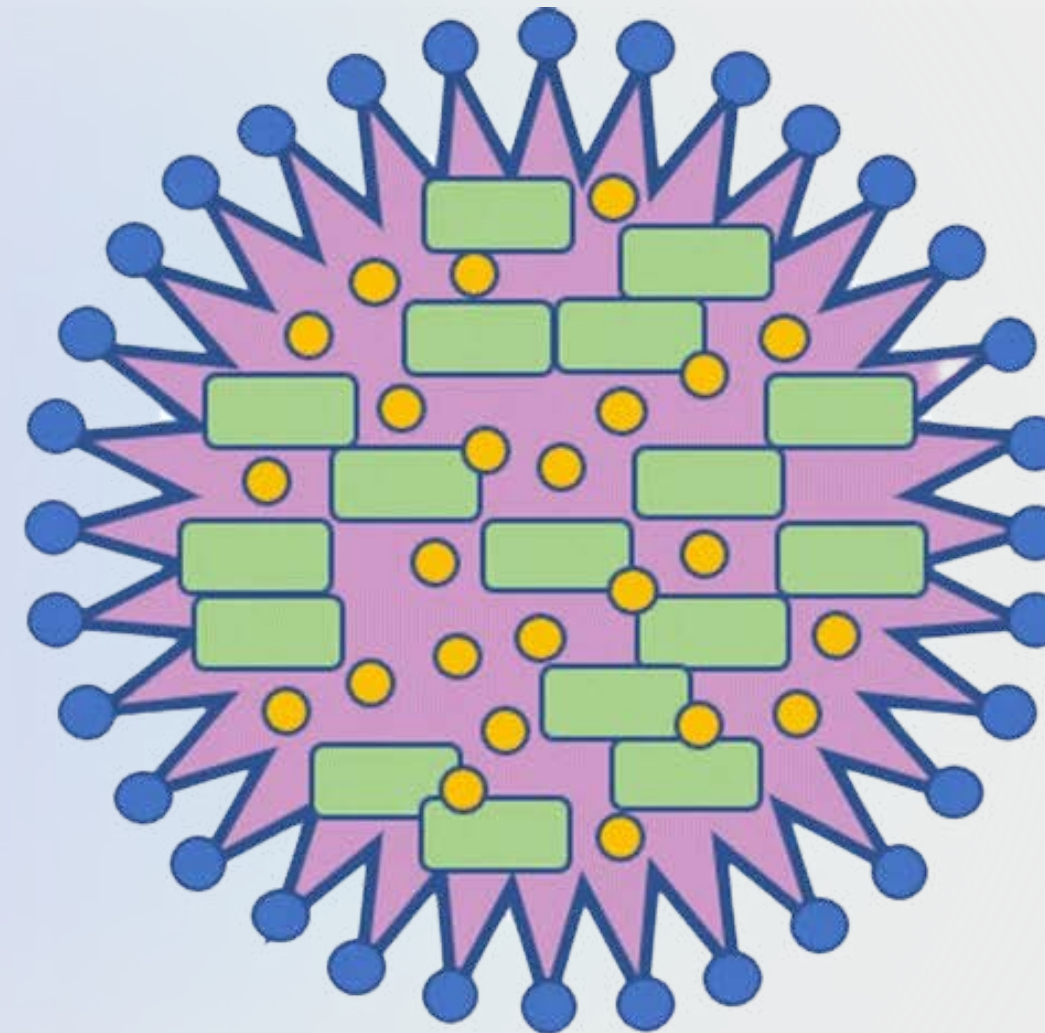


Drug=cosmetic active

Lipid Nanoparticles



Solid lipid nanoparticle



Nanostructured lipid carrier



Takeaways

Dosage forms are chosen & formulated intentionally

Skin is a complex organ

There are options to optimize delivery

Thank You!

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