

Part 2: Cosmeceuticals and Sunscreens in the Digital Age

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Conflicts of Interest

I have no conflicts of interest as it pertains to this presentation.



The New Frontier: Digital Age Cosmeceuticals



What are the digital age cosmeceuticals?

1. Product recommendations based the INCI and app assessments
2. Digital personal image processing
3. Virtual cosmetics and cosmeceuticals
4. AI programmed skin care devices
5. AI designed skin care regimens



1. Understanding the INCI and App Based Product Recommendations



App Based Product Recommendations: Apps and the INCI

Several apps available that will interpret the INCI:

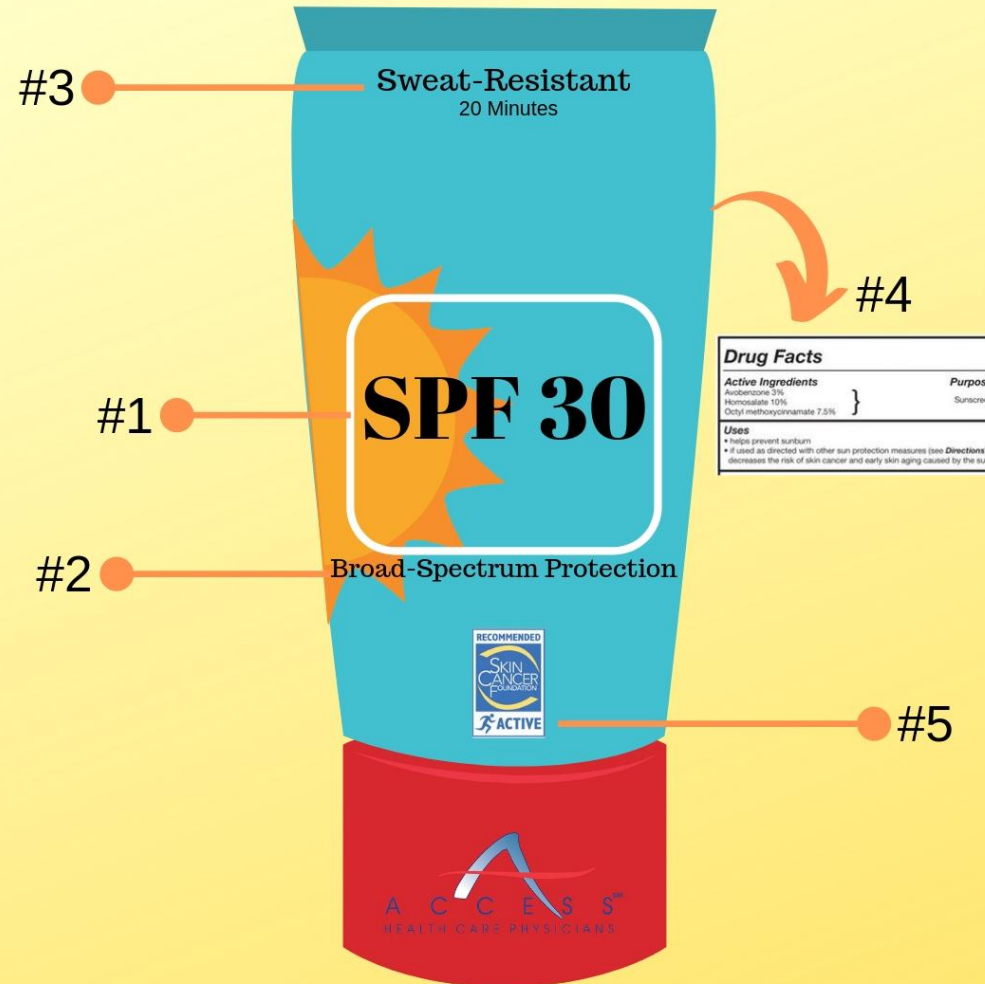
- INCI Beauty
<https://incibeauty.com/en>
- Think Dirty
<https://www.thinkdirtyapp.com/>
- Yuka
<https://yuka.io/en/>

INCI Labeling Convention

- Ingredients listed in order of predominance
- Ingredients less than 1% in concentration may be listed in random order
- Colors are listed in random order at end of list
- Fragrances listed in descending order
- OTC drug labeling different, must list active agent at top of label, followed by inactive ingredients below

Common Name	INCI Name
Vitamin A	retinol
Vitamin C	ascorbic acid
Vitamin E	tocopherol
Green tea extract	Camellia sinensis leaf extract
Lemongrass oil	Cymbopogon schoenanthus oil
Licorice extract	Glycyrrhiza glabra (Licorice) extract

Sunscreen Labeling



Sunscreen Labeling

Drug Facts

Active Ingredients

Avobenzone 2.9%
Octisalate 4.9%
Octocrylene 9.5%

Purpose

Sunscreen
Sunscreen
Sunscreen

Uses

- Uses Helps prevent sunburn, If used as directed with other sun protection measures (see Directions), decreases the risk of skin cancer and early skin aging caused by the sun.

Other Information Other information Protect this product from excessive heat and direct sun.

Inactive Ingredients: Alcohol (Organic), Aloe Barbadensis (Aloe Vera) Leaf Extract, Bisabolol, Butyloctyl Salicylate, Butyrospermum Parkii (Shea) Oil, Caffeine, Camellia Sinensis (Green Tea) Leaf Extract, Carthamus Tinctorius (Safflower) Seed Oil, Chlorella Vulgaris Extract, Cocos Nucifera (Coconut) Extract, Cucumis Sativus (Cucumber) Seed Oil, Diisooctyl Succinate, Ethyl Ferulate, Ethylhexyl Methoxycrylene, Fragrance, Musa Sapientum (Banana) Fruit Extract, Passiflora Edulis (Maracuja) Seed Oil, Polyester-8, Tocopherol (Vitamin E), VA/ Butyl Maleate/Isobornyl Acrylate Copolymer, Water

Deciphering the Sunscreen Label



Deciphering the Label: Basic Sunscreen

- Sunscreen are OTC drugs, with active agents
- Sunscreens: avobenzone (UVA), homosalate(UVB), octocrylene (UVB, UVA)
- Water, oil-in-water emulsion
- Sorbitol is a humectant
- Aluminum starch, carbomer are thickener
- Eicosene copolymer makes waterproof
- Phenoxyethanol, disodium EDTA (chelator), ethylhexyl glycerin preservative
- Triethanolamine, stearic acid is emulsifier
- Dimethicone film former

**SPF 50 Lotion**

Drug Facts	
Active ingredients	Purpose
Avobenzone 3.0%	Sunscreen
Homosalate 10.0%	Sunscreen
Octocrylene 6.0%	Sunscreen
Uses	
■ helps prevent sunburn ■ if used as directed with other sun protection measures (see Directions), decreases the risk of skin cancer and early skin aging caused by the sun.	
Warnings	
For external use only.	
Do not use on damaged or broken skin.	
When using this product ■ keep out of eyes. Rinse eyes with water to remove.	
Stop use and ask a doctor if rash occurs.	
Keep out of reach of children. If product is swallowed, get medical help or contact a Poison Control Center right away.	
Directions	
■ apply liberally 15 minutes before sun exposure. Reapply: ■ after 80 minutes of swimming or sweating ■ immediately after towel drying ■ at least every 2 hours. Sun protection measures: Spending time in the sun increases your risk of skin cancer and early skin aging. To decrease risk, regularly use a sunscreen with broad spectrum SPF of 15 or higher and other sun protection measures including: ■ limit time in the sun, especially from 10am to 2pm ■ wear long-sleeved shirts, pants, hats, and sunglasses ■ children under 6 months: ask a doctor.	
Other information ■ protect this product from excessive heat and direct sun ■ may stain fabrics.	
Inactive ingredients Water, Butyloctyl Salicylate, Sorbitol, Aluminum Starch Octenylsuccinate, VP/Eicosene Copolymer, Stearic Acid, Phenoxyethanol Ethylhexylglycerin, Polyglyceryl-3 Distearate, Sorbitan Isostearate Triethanolamine, Dimethicone, Carbomer, Disodium EDTA.	

Deciphering the Label:

Spray Sunscreen

- Sunscreen sprays leave droplets behind on skin in a discontinuous film
- Must spray and rub three times to get the thickness of a lotion sunscreen and film continuity
- Acrylates and copolymers make product water resistant
- Alcohol denatured is the propellant that evaporates once the product reaches the skin



TOTAL SUNCARE
SUN SCREEN
SPF
30
Continuous Spray
Water Resistant
BROAD SPECTRUM
UVA/UVB PROTECTION
Clear rub-free formula
fast and easy coverage
Net Contents 6 fl oz (177 ml)

Drug Facts	
Active Ingredients	Purpose
Avobenzone 3% Octisalate 2% Octinoxate 5% Oxybenzone 3%	Sunscreen
Uses	
■ Helps prevent sunburn ■ Higher SPF gives more sunburn protection ■ Provides high protection against sunburn ■ Retains SPF after 40 minutes of activity in the water	
Warnings	
■ For External Use Only ■ Flammable: Keep away from fire or flame ■ UV exposure from the sun increases the risk of skin cancer, premature skin aging, and other skin damage. It is important to decrease UV exposure by limiting time in the sun, wearing protective clothing, and using a sunscreen. ■ When using this product keep out of eyes. Rinse with water to remove. ■ Stop use and ask a doctor if rash or irritation develops and lasts ■ Contents under pressure. Do not puncture or incinerate. Do not store at temperature above 120°F. ■ Keep out of reach of children.	
Directions	
■ Apply evenly before sun exposure and as needed. ■ Hold can about 6in away from body and spray onto skin. ■ Do not spray directly onto face – spray into palm and smooth over face and neck. ■ Children under 6 months of age: ask a doctor. ■ Reapply as needed or after towel drying, swimming, or perspiring.	
Other information	
■ Sun Alert: Limiting sun exposure, wearing protective clothing, and using sunscreens may reduce the risks of skin aging, skin cancer, and other harmful effects of the sun. ■ May stain some fabrics. ■ Avoid long term storage above 104°F. ■ For your protection, this bottle has an imprinted seal around the neck. Do not use if tamper evident seal is missing, tampered, broken, or destroyed.	
Inactive Ingredients	
Acrylates / Octylacrylamide Copolymer, Alcohol Denat, Alkyl Benzoate, Aloe Barbadosensis Leaf extract, Fragrance, Mineral oil.	

Expiration Date?

Lot Number?

Distributed By:
Total Suncare LLC, 100 S. Washington Ave.
Dunellen, NJ 08812, United States
www.sunscreenus.com
Product of China

Deciphering the Label: Water Resistant Sunscreen

- Water resistant sunscreens must undergo special testing to make claim
- Subjects wear sunscreen and then get in a whirlpool followed by SPF testing:
 - Allow 15 to 30 minutes drying time after product application
 - First 20 minute immersion in water
 - Allow 15 minutes drying time (no towelling)
 - Second 20 minute immersion in water
 - Allow to dry for 15 minutes or until completely dry (no toweling)
- SPF testing is done with a solar simulator shown at an area where the sunscreen has been applied before and after exposure to water
- Water resistant 80 minutes is the maximum claim allowed



Deciphering the Label: Mineral Sunscreen?

- Labeled as mineral plus sunscreen, what does this mean?
- Contains zinc oxide and octisalate
- Why is it ideal for sensitive skin?
- Kukui nut oil, bisabolol (chamomile), shea butter, macadamia nut oil, ascorbyl palmitate (inactive vitamin C)
- Nut oils may be allergenic and comedogenic

The image shows the front and back of a sunscreen bottle. The front panel is orange and yellow with a blue rectangular area at the top. The text on the front includes 'MINERAL PLUS SUNSCREEN WITH ZINC OXIDE', 'SPF 30+', 'UVA/UVB PROTECTION', 'Very Water/Sweat Resistant', 'Vitamin & Botanical Blend Protects Against Signs of Aging', 'Ideal for Sensitive Skin', and '6 FL OZ (177 mL)'. The back panel is orange and contains detailed information about the product's benefits, drug facts, warnings, directions, and inactive ingredients.

Naturally Advanced Sun Protection
Sun Shades Mineral Plus Sunscreen uses naturally derived micronized zinc oxide to provide a high level of broad-spectrum UVA/UVB protection. This advanced, water-resistant formula dries sheer without leaving a white film and helps prevent moisture loss. It also combines a rich blend of natural, free-radical-fighting vitamins and antioxidants.

Active ingredient	Purpose
Octisalate 5%, Zinc oxide 10%	Sunscreen

Uses

- helps prevent sunburn
- higher SPF gives more sunburn protection
- for skin highly sensitive to sunburn
- retains SPF after 80 minutes of activity in the water or sweating

Warnings
For external use only

When using this product keep out of eyes. Rinse with water to remove.

Stop use and ask a doctor if rash or irritation develops and lasts.

Keep out of reach of children. If swallowed, get medical help or contact a Poison Control Center right away.

Directions

- apply liberally and evenly to all exposed areas before sun exposure
- reapply after 80 minutes of swimming or sweating and after towel drying. Otherwise, reapply at least every 2 hours.
- children under 6 months of age: ask a doctor

Inactive ingredients
aleurites moluccana seed oil, ascorbyl palmitate, bisabolol, bixa orellana seed extract, butyrospermum parkii (shea butter), C12-15 alkyl benzoate, caprylic/capric triglyceride, cera alba, cetearyl alcohol, ceteth-10 phosphate, cetyl alcohol, cetyl ethylhexanoate, dicaprylyl carbonate, dicetyl phosphate, disodium EDTA, disodium laurimidopropionate, tocopheryl phosphates, glycerin, hydrogenated palm glycerides, isoeicosane, isostearic acid, macadamia ternifolia seed oil, neopentyl glycol diheptanoate, parfum, pentylene glycol, phenoxethanol, phenyl trimethicone, polyester-7, polyhydroxystearic acid, potassium cetyl phosphate, potassium sorbate, sodium chloride, sucrose distearate, tocopherol, triethanolamine, water, xanthan gum

Melleuca, Inc., Kato Falls, ID 83402-6003
To order: 1-800-282-3000 • www.melleuca.com
Dist. by: Melleuca Southeast Asia (Singapore) Pte Ltd, 10 Eunos Rd 8, #14-03 Singapore Post Centre, Singapore 408600, SG 1800 800 0000
Product of USA #2144 05/09 USG

NOT FOR RESALE IN CANADA

Deciphering the Label: Baby Sunscreen

- No specific requirements or regulations pertain to baby products
- Baby sunscreens follow the same sunscreen monograph that has not been approved, but the monograph designation is under review
- Baby sunscreens may be the same as adult sunscreens, but they are sold in the baby isle of product display
- Adult and baby sunscreens can be used on anyone
- Zinc oxide and titanium dioxide based, labeled as mineral sunscreen
- Interesting botanical blend that has nothing to do with sun protection, but allows organic label



Drug Facts	
Active ingredients	Purpose
Titanium dioxide 3%, Zinc oxide 12%	Sunscreen
Uses	
• helps prevent sunburn • if used as directed with other sun protection measures (see Directions), decreases the risk of skin cancer and early skin aging caused by the sun	
Warnings	
For external use only	
Do not use on damaged or broken skin	
When using this product keep out of eyes. Rinse with water to remove.	
Stop use and ask a doctor if rash occurs	
Keep out of reach of children. If swallowed, get medical help or contact a Poison Control Center right away.	
Directions	
• apply liberally 15 minutes before sun exposure • reapply: • after 80 minutes of swimming or sweating • immediately after towel drying • at least every 2 hours • children under 6 months of age: ask a doctor • Sun Protection Measures. Spending time in the sun increases your risk of skin cancer and early skin aging. To decrease this risk, regularly use a sunscreen with a Broad Spectrum SPF value of 15 or higher and other sun protection measures including: • limit time in the sun, especially from 10 a.m.-2 p.m. • wear long-sleeved shirts, pants, hats, and sunglasses	
Other information protect this product from excessive heat and direct sun	
Inactive ingredients water, ethylhexyl palmitate, butyloctyl salicylate, caprylic/capric triglyceride, trimethylpentanediol/adipic acid/glycerin crosspolymer, cetearyl olivate, glycerin, sorbitan olivate, tocopheryl acetate, phenoxyethanol, cetearyl alcohol, cetearyl glucoside, propanediol, alumina, xanthan gum, jojoba esters, 1,2-hexanediol, bisabolol, helianthus annuus (sunflower) seed oil*, solanum lycopersicum (tomato) seed oil, lecithin, polyhydroxystearic acid, caprylhydroxamic acid, citric acid, isopropyl myristate, isostearic acid, polyglyceryl-3 polycinnoleate, vaccinium macrocarpon (cranberry) seed oil, nigella sativa (black cumin) seed oil*, rubus idaeus (red raspberry) seed oil	
*Certified Organic Ingredient • Unless otherwise specified, product not labeled as organic • *Learn about these and all our ingredients and the choices we make at babyganics.com/products	
dist. by KAS Direct, LLC san francisco, ca 94111 ©2021 • 1 800 378 7803	
1118921	

Deciphering the Label: Sensitive Skin Sunscreen

- What does sensitive skin mean on a sunscreen label? Nothing
- There is no regulatory or scientific definition of sensitive skin
- Sensitive skin claim may mean that the product was tested in subjects with sensitive skin
- Sensitive skin sunscreens are usually mineral based (titanium dioxide, zinc oxide)
- Minerals are naturally sourced!



sensitive
skin

SUNSCREEN

Broad Spectrum SPF 60+

60+

pureSCREEN®
broad spectrum uva•uvb

100% naturally sourced
sunscreen ingredients
fragrance free
water resistant (80 minutes)

#1 DERMATOLOGIST
RECOMMENDED SUNCARE

3.0 FL OZ (88mL)

30029187

Drug Facts

Active ingredients Titanium Dioxide 4.9%, Zinc Oxide 4.7%	Purpose Sunscreen
---	-----------------------------

Uses • helps prevent sunburn • If used as directed with other sun protection measures (see **Directions**), decreases the risk of skin cancer and early skin aging caused by the sun

Warnings
For external use only • Do not use on damaged or broken skin • When using this product keep out of eyes. Rinse with water to remove. • Stop use and ask a doctor if rash occurs • Keep out of reach of children. If swallowed, get medical help or contact a Poison Control Center right away.

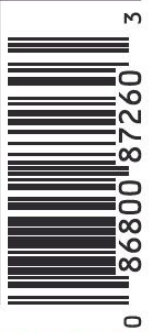
Directions • apply generously and evenly 15 minutes before sun exposure • reapply: • after 80 minutes of swimming or sweating • immediately after towel drying • at least every 2 hours • **Sun Protection Measures:** Spending time in the sun increases your risk of skin cancer and early skin aging. To decrease this risk, regularly use a sunscreen with a Broad Spectrum SPF value of 15 or higher and other sun protection measures including • limit time in the sun, especially from 10 a.m.–2 p.m. • wear long-sleeved shirts, pants, hats, and sunglasses • children under 6 months of age: Ask a doctor

Other information • protect this product from excessive heat and direct sun • may stain some fabrics

Inactive ingredients water, butyloctyl salicylate, beeswax, styrene/acrylates copolymer, silica, butylene glycol, PEG-8, glyceryl stearate, PEG-100 stearate, cetyl dimethicone, benzyl alcohol, dimethicone, methicone, arachidyl alcohol, polyhydroxystearic acid, hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer, PEG-8 laurate, xanthan gum, isohexadecane, behenyl alcohol, trisiloxane, ethylhexylglycerin, disodium EDTA, trimethylsiloxydimethylsilane, bisabolol, dipotassium glycyrrhizate, triethoxycaprylylsilane, BHT, polysorbate 60, stearic acid, methylisothiazolinone, polyaminopropyl biguanide, polymethyl methacrylate, tocopheryl acetate, ascorbic acid, panthenol, retinyl palmitate, alumina

Questions?
Visit www.neutrogena.com or call toll-free 800-299-4786 or 215-273-8755 (collect)

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Los Angeles, CA 90045 2014



Yuka: Most Popular Ingredient App

- French app, free, premium version \$10-\$20/year
- 56 million users
- 20,000 users daily
- Scan barcode on product
- Get full ingredient list with level of risk for foods, skin care products, cosmetics
- Rates products on scale from 0-100



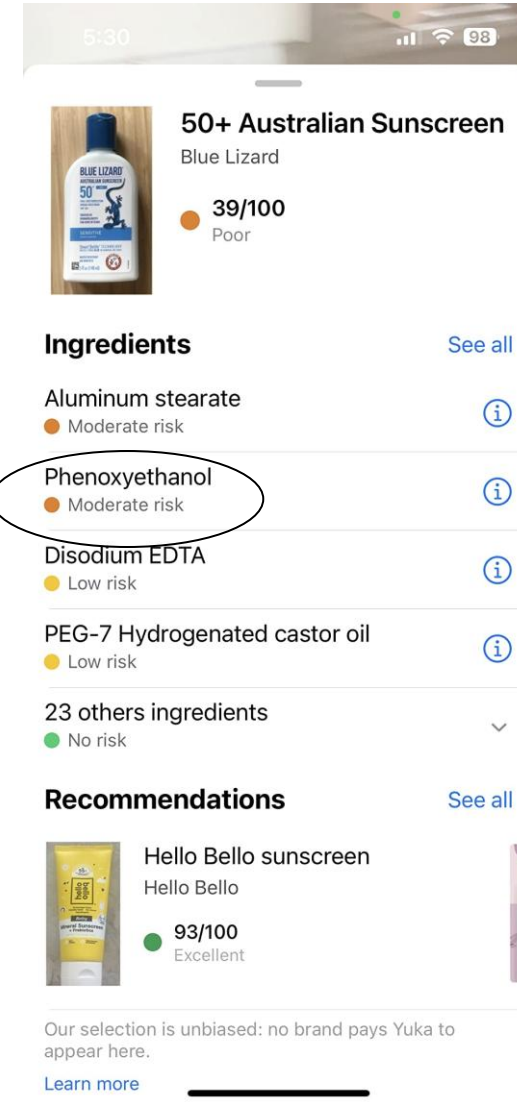
Ingredient App Rating Systems and Sunscreens

- Ratings:
 - Risk free (green dot)
 - Low risk (yellow dot)
 - Moderate risk (orange dot)
 - High risk (red dot)

INCI Beauty		YUKA	
Green	Safe ingredient - no penalty	Green	Excellent - no health risks
Yellow	Regulated OR irritating OR allergic ingredient - low penalty	Yellow	Good - generally safe but may have minor concerns such as mild irritants
Orange	An ingredient derived from petrochemicals AND/OR does not deserve a red - medium penalty	Orange	Poor - ingredients with significant risks, such as potential allergens or substances that could disrupt hormones
Red	A controversial or potentially risky ingredient - strong penalty	Red	Bad - ingredients that are highly risky, such as known carcinogens or substances banned in some countries.

Poorly Rated Sunscreen: Phenoxyethanol

- All preservatives are bad?
- Phenoxyethanol common preservative (gram –and+ plus yeasts), <1% common concentration
- Not an endocrine disruptor or carcinogen
- Found naturally in green tea
- Not recommended for ingestion in infants
- Felt to be one of the safest preservatives currently available



The screenshot shows the Yuka app interface. At the top, the time is 5:30 and the battery is at 98%. The main section displays the product "50+ Australian Sunscreen" by Blue Lizard. It has a rating of 39/100, labeled "Poor". Below the product name is a list of ingredients: Aluminum stearate (Moderate risk), Phenoxyethanol (Moderate risk), Disodium EDTA (Low risk), and PEG-7 Hydrogenated castor oil (Low risk). There are also 23 other ingredients listed as "No risk". Below the ingredients list is a "Recommendations" section showing "Hello Bello sunscreen" by Hello Bello with a rating of 93/100, labeled "Excellent". At the bottom, there is a disclaimer: "Our selection is unbiased: no brand pays Yuka to appear here." and a "Learn more" link.

5:30 98

50+ Australian Sunscreen
Blue Lizard

39/100
Poor

Ingredients [See all](#)

Aluminum stearate
Moderate risk

Phenoxyethanol
Moderate risk

Disodium EDTA
Low risk

PEG-7 Hydrogenated castor oil
Low risk

23 others ingredients
No risk

Recommendations [See all](#)

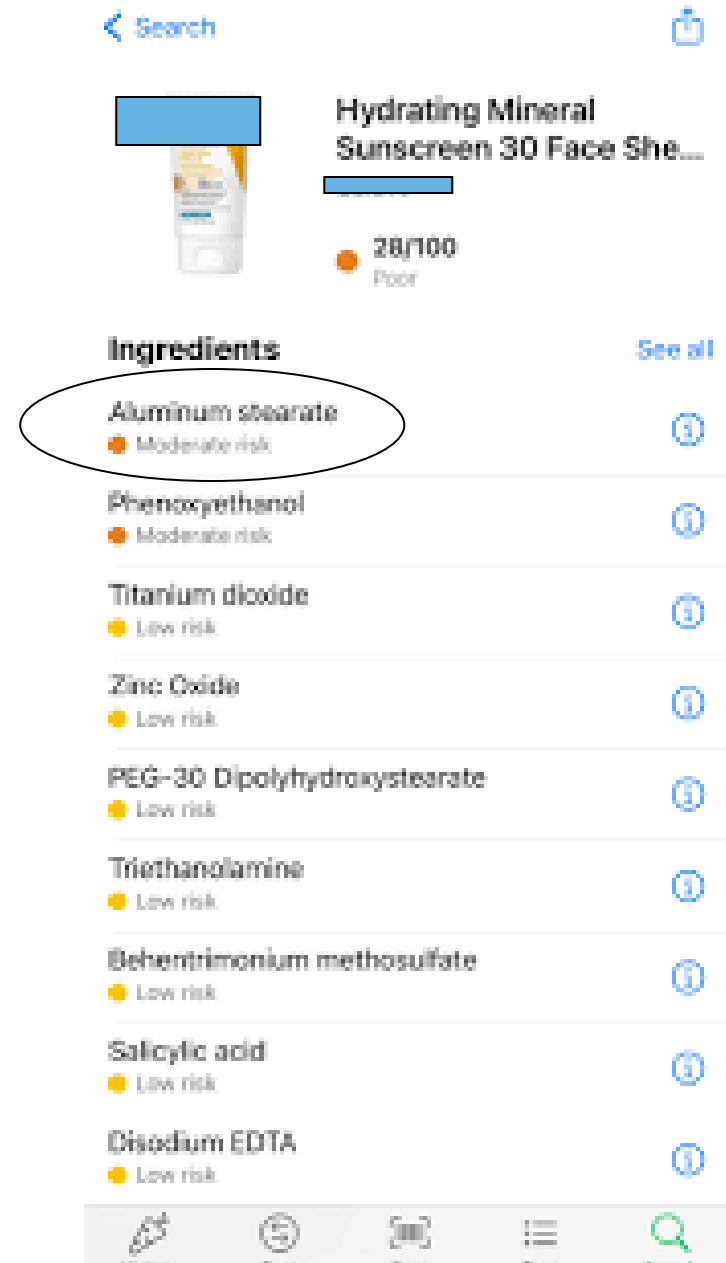
Hello Bello sunscreen
Hello Bello

93/100
Excellent

Our selection is unbiased: no brand pays Yuka to appear here.
[Learn more](#)

Poorly Rated Sunscreen: Aluminum Stearate

- Aluminum salt of stearic acid
- Water repellant, opacifying agent, lubricant, oil control, thickener white powder
- Used as a thickener and an emulsifier in sunscreens
- Low absorption through skin
- FDA considered safe in foods, CIR considered safe in skin care products



The screenshot shows a product page for 'Hydrating Mineral Sunscreen 30 Face She...'. The product is rated 'Poor' with a score of 28/100. The ingredients list is as follows:

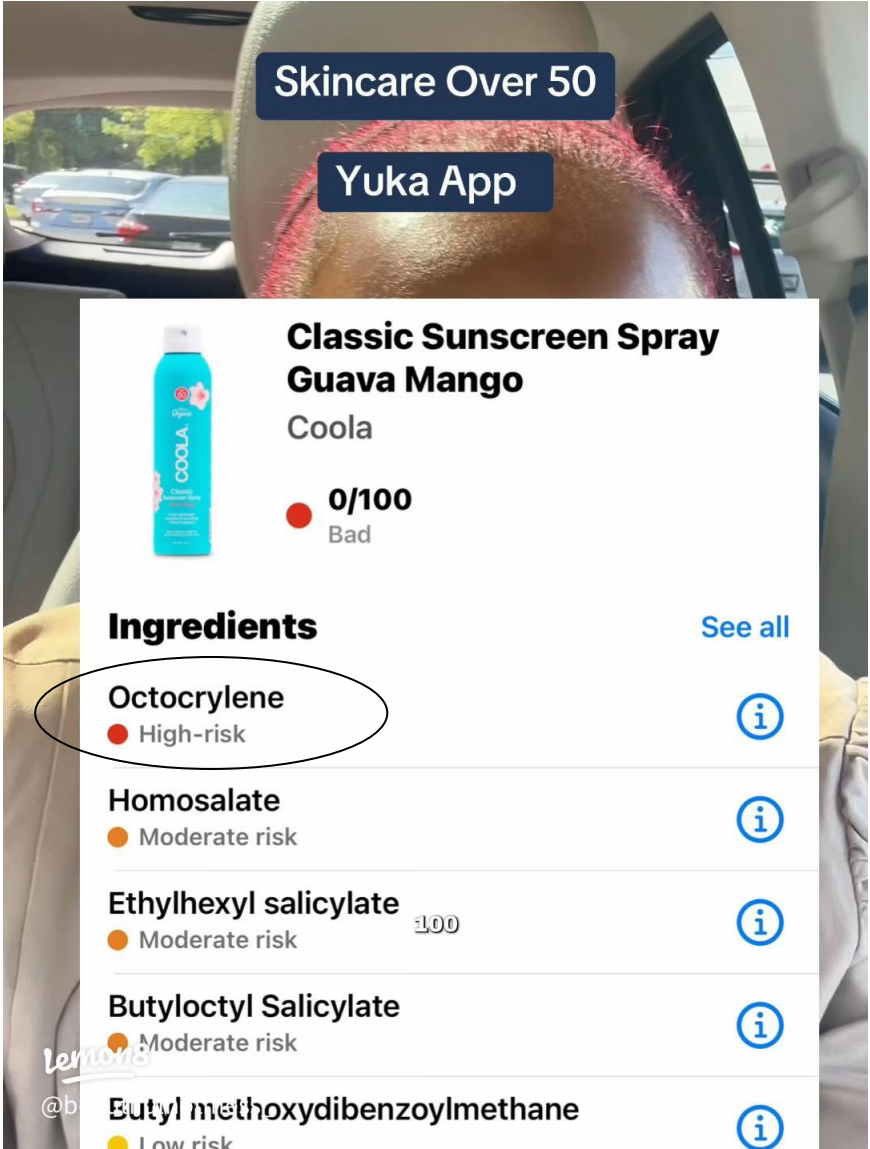
Ingredients	Risk Level	See all
Aluminum stearate	Moderate risk	ⓘ
Phenoxethanol	Moderate risk	ⓘ
Titanium dioxide	Low risk	ⓘ
Zinc Oxide	Low risk	ⓘ
PEG-30 Dipolyhydroxystearate	Low risk	ⓘ
Triethanolamine	Low risk	ⓘ
Behentrimonium methosulfate	Low risk	ⓘ
Salicylic acid	Low risk	ⓘ
Disodium EDTA	Low risk	ⓘ

Poorly Rated Sunscreen: Octocrylene

- UVA/Short UVB sunscreen active
- Stabilizes avobenzone
- Improves water resistance and SPF of sunscreens
- Functions as an emollient
- Octocrylene can get absorbed into the skin
- May be marine pollutant
- May degrade into benzophenone, an endocrine disruptor and carcinogen

Skincare Over 50

Yuka App



Classic Sunscreen Spray
Guava Mango
Coola

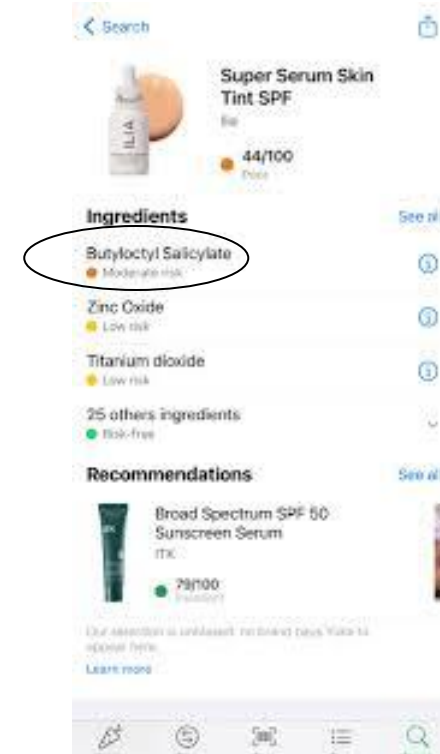
0/100
Bad

Ingredients [See all](#)

Octocrylene ● High-risk	i
Homosalate ● Moderate risk	i
Ethylhexyl salicylate ● Moderate risk	i
Butyloctyl Salicylate ● Moderate risk	i
Butyl methoxydibenzoylmethane ● Low risk	i

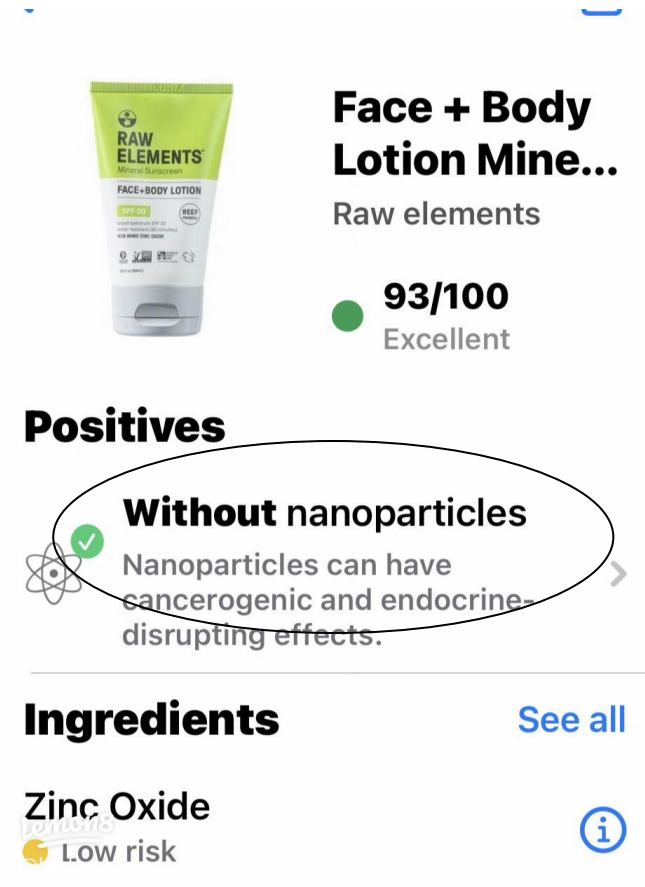
Poorly Rated Sunscreen: Butyloctyl Salicylate

- No evidence of hormone disruption in humans
- Can cause allergic or irritant contact dermatitis
- Commonly found in mineral sunscreens (may not be all mineral)
- Sunscreen benefits:
 - Increases SPF
 - Stabilizes mineral sunscreens and avobenzone
 - Improves spreadability
 - Improves texture
 - Enhances water resistance



Well Rated Sunscreen: Nanoparticles

- Zinc oxide used in small particle size to make white powder colorless
- Smaller particles look less white on the skin, but have a lower SPF
- Inevitable that some nanoparticles are created as part of the grinding process
- Not sure why zinc oxide has any risk topically



The screenshot shows a product page for 'RAW ELEMENTS Mineral Sunscreen FACE+BODY LOTION'. The product is a white tube with a green cap. To the right of the tube, the text reads 'Face + Body Lotion Mine...' and 'Raw elements'. Below this, a green circle indicates a rating of '93/100 Excellent'. Under the heading 'Positives', there is a green checkmark icon and the text 'Without nanoparticles'. Below this, a greyed-out text block states: 'Nanoparticles can have cancerogenic and endocrine-disrupting effects.' To the right of this text is a right-pointing arrow. Below the 'Positives' section is the 'Ingredients' section, which lists 'Zinc Oxide' with a 'Low risk' label and a blue information icon (i).

Face + Body Lotion Mine...
Raw elements

93/100
Excellent

Positives

Without nanoparticles

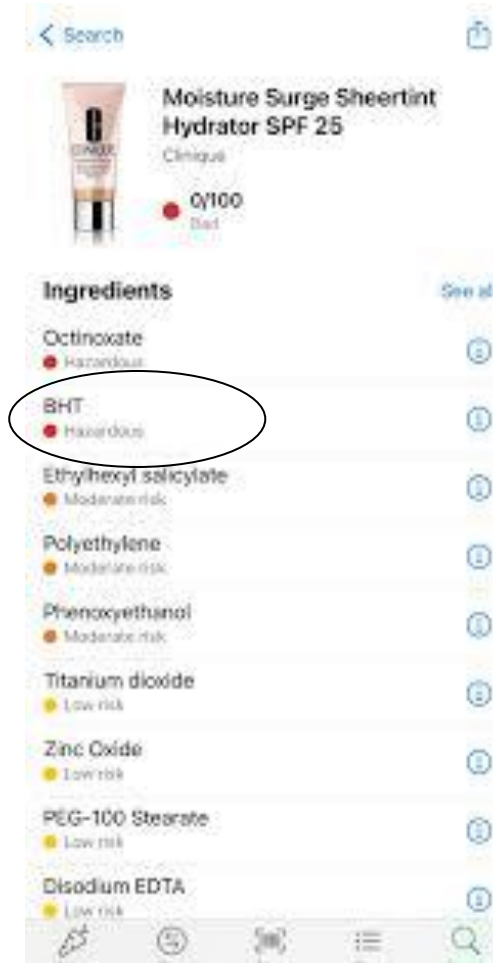
Nanoparticles can have cancerogenic and endocrine-disrupting effects.

Ingredients [See all](#)

Zinc Oxide
Low risk [i](#)

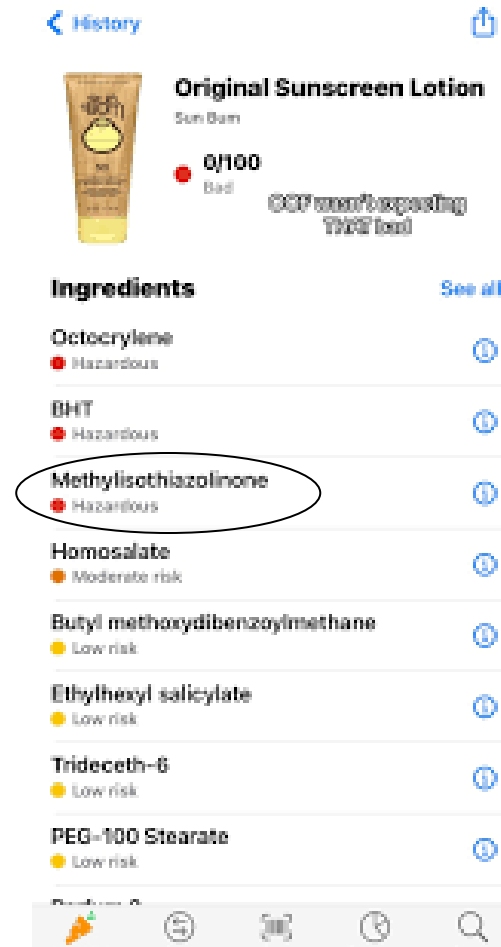
Poorly Rated Sunscreen: BHT

- BHT=butylated hydroxytoluene is a synthetic antioxidant and preservative
- Free radical scavenger, prevents fats from becoming rancid
- Widely used preservative in foods and cosmetics
- BHT is generally recognized as safe (GRAS) by the US FDA
- Does not penetrate the skin
- May be a hormone disruptor in high doses beyond those used in skin care products

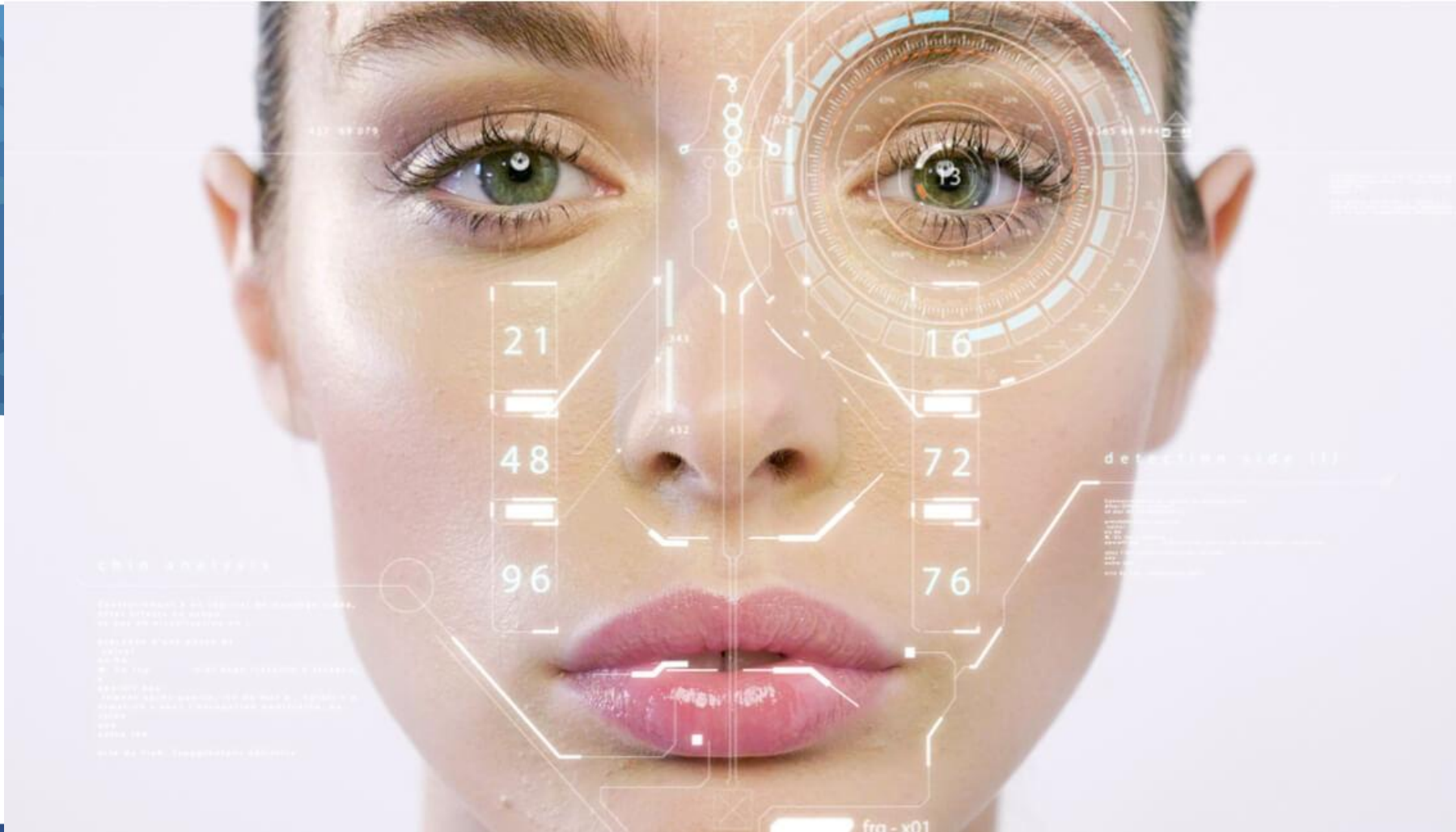


Poorly Rated Sunscreen: Methylisothiazolinone

- Preservative known as Kathon-CG
- Was developed as a safe substitute for parabens
- Known to be an allergen
- Parabens ended up being safer!
- Not sure this preservative is hazardous



2. Digital Personal Image Processing



Digital Imaging Challenges

- Digital cameras possess poorer resolution than a film camera
- Edge enhancement is used in all phone cameras to increase image sharpness, but what you see in the phone/computer screen is not what you see in the mirror
- The technique identifies sharp boundaries and increases contrast, but also magnifies fine lines and wrinkles
- This imaging error has created the consumer need for personal image processing with apps such as Facetune
- Facetune app was developed as a start up in 2013 and has been downloaded 200 million times as of 2023
- 85% of girls by age 13 have used image filters

Digital Imaging App Tools

- Digital apps can remove acne lesions, smooth skin, apply cosmetics, whiten teeth, change hair style/color, and modify facial architecture
- All uses version of Photoshop
- Uses 3D Face Mesh Modeling: 3D model made of user face and applied consistently across frames as user moves. 3D model can be used for machine learning training with confidentiality issues.
- AI machine learning used to analyze facial features and provide personalized image enhancement recommendations
- Can do individual pixel manipulation



Digital Imaging App Tools

The following digital modification tools are used to adjust the image:

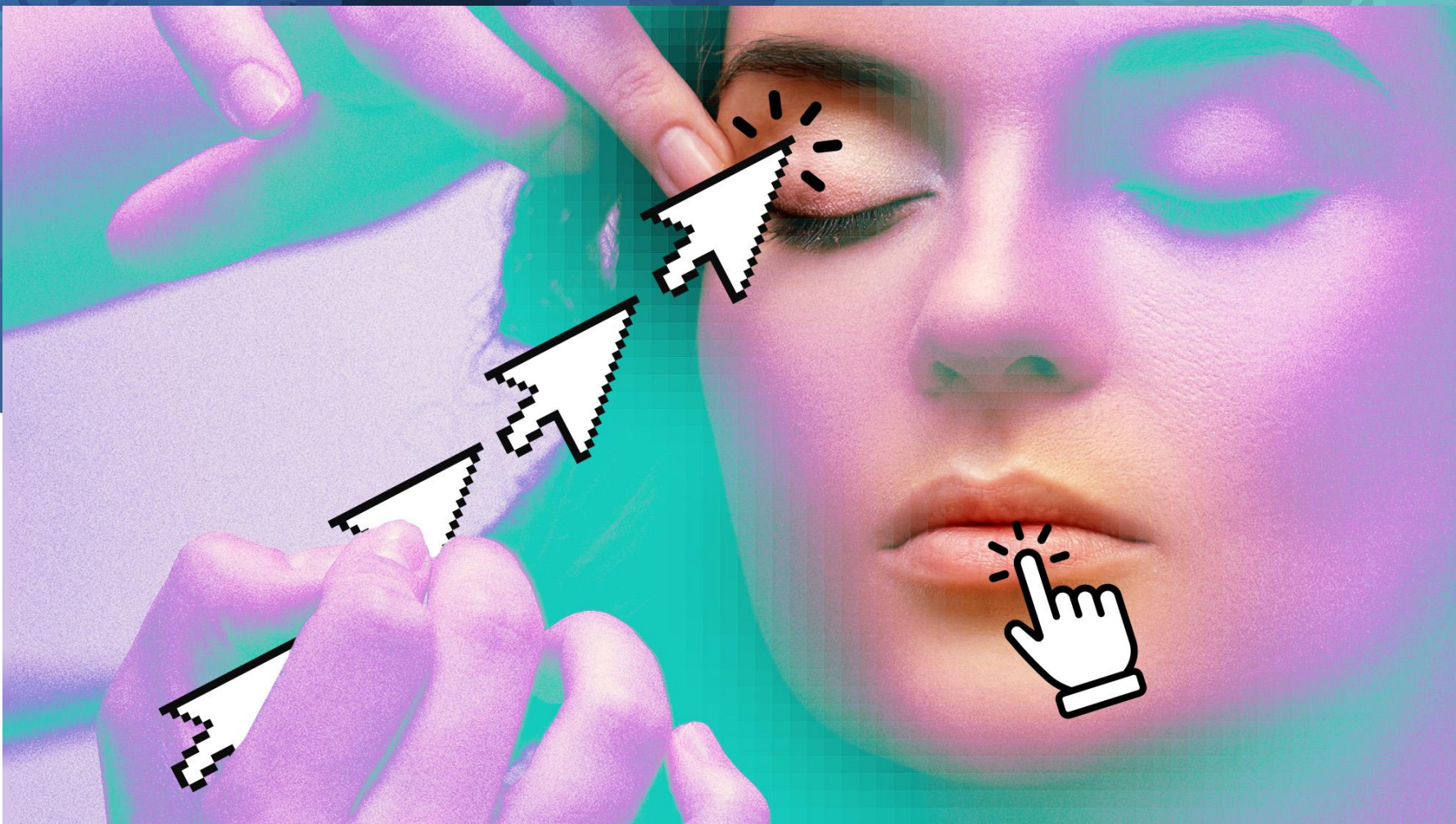
- **Smooth:** Evens out skin texture with AI-assisted blurring and texture re-application.
- **Heal & Patch:** The "Heal" tool uses surrounding pixels to seamlessly cover blemishes. The "Patch" tool allows users to manually copy a clear area of skin and paste it over an imperfection.
- **Reshape:** Adjusts facial structure by subtly shifting pixels to slim jawline, decrease nose width, enlarge eyes, broaden smile.
- **Relight:** Mathematically re-adjusts the flash light reflex on the face to highlight brow, nose, medial cheek, and chin.
- **Generative AI:** Modify clothing, hair style, hair color, background using generative AI models.

Image Manipulation Challenges

- The side effects of digital image manipulation include:
 - Body dysmorphia: dissatisfaction with actual appearance
 - Erosion of self-esteem
 - Social anxiety and isolation: inability to show actual self
 - Unrealistic beauty standards impossible to attain



3. Virtual Cosmetics and Cosmeceuticals



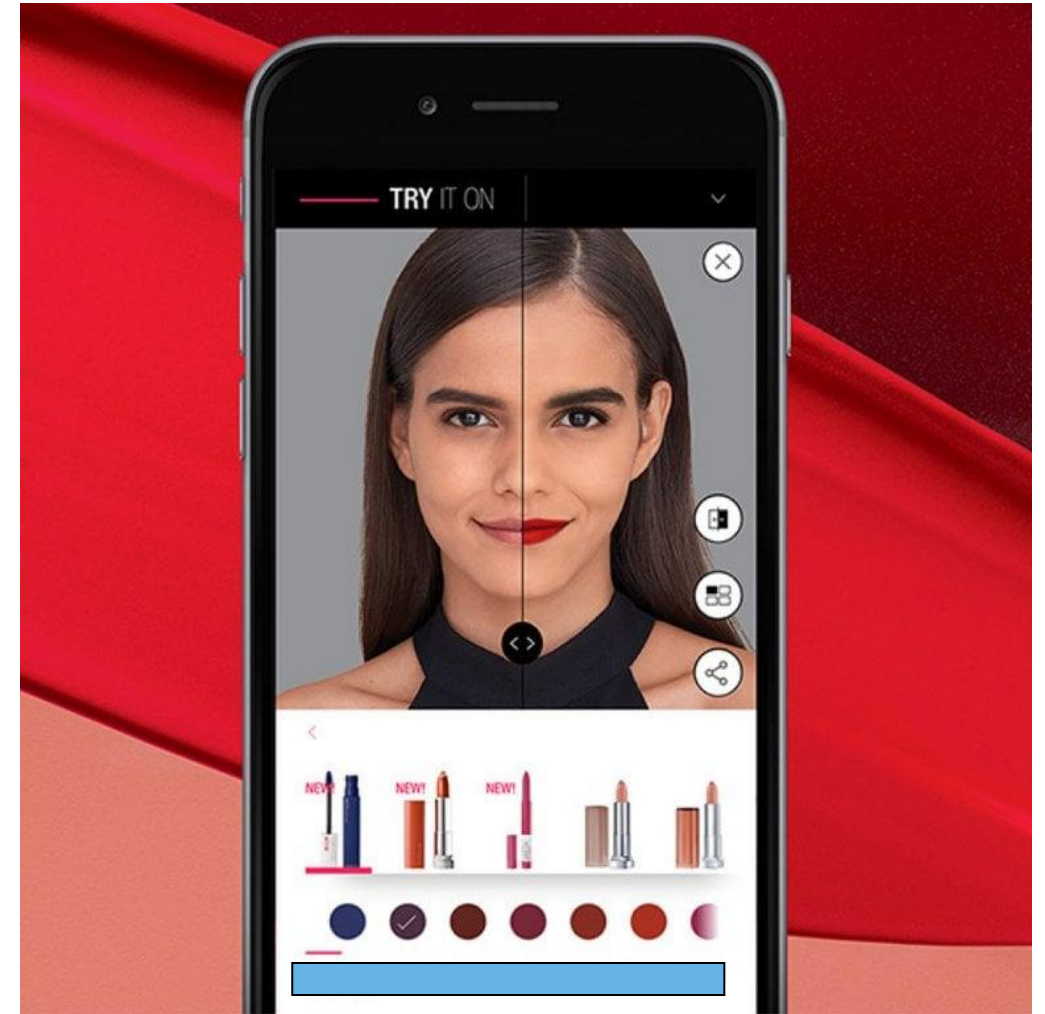
Virtual Cosmetics: Death of the Cosmetic Counter Attendant

Colored cosmetic and cosmeceutical selection used to require a visit to the department store cosmetic counter. Enter virtual cosmetics!

- Virtual makeup for your video conference meeting can be applied instantly and virtually through an app for both females and males
- Many apps have a variety of professionally generated virtual cosmetic applications you can select for instant video application prior to joining your meeting, such as:
 - Glossy: shiny lip gloss and cheek blush
 - Red: bold red lipstick
 - Winged: Cleopatra eye liner with wings
 - Soft Blur: Softens wrinkles, lines, and pores
 - Blur: More pronounced softening of wrinkles, lines, and pores
 - Natural: Subdued facial blush and lip gloss

Virtual Cosmetic Demonstration

- Advantage:
Cosmetics can be sampled in comfort of own home
- Disadvantage:
The cosmetic was never really applied to your face

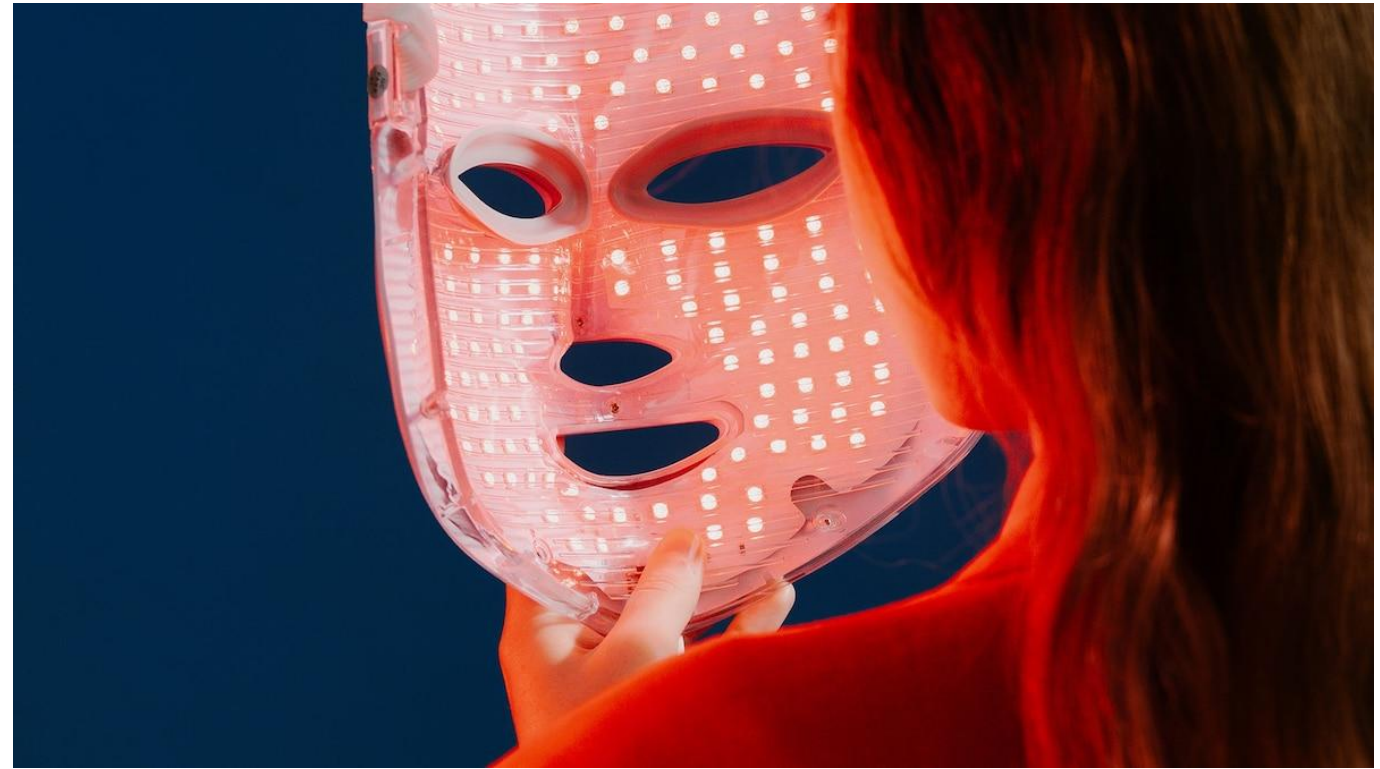


4. AI Customized Devices



Devices: LED Masks

- LED masks are the most popular home device with AI designed programs
- Device market growing at 12% per year
- Red light (620-700nm) mitochondrial absorption increases ATP production, nitric oxide, and intracellular calcium
- Effect based on power density, amount of energy per unit time
- Amount of energy delivered to tissue depends on tissue absorption and scattering properties



Photobiomodulation is mediated by the absorption of photons by photoreceptors in the body to include mitochondrial cytochrome C oxidase (COX) for red light and infrared.

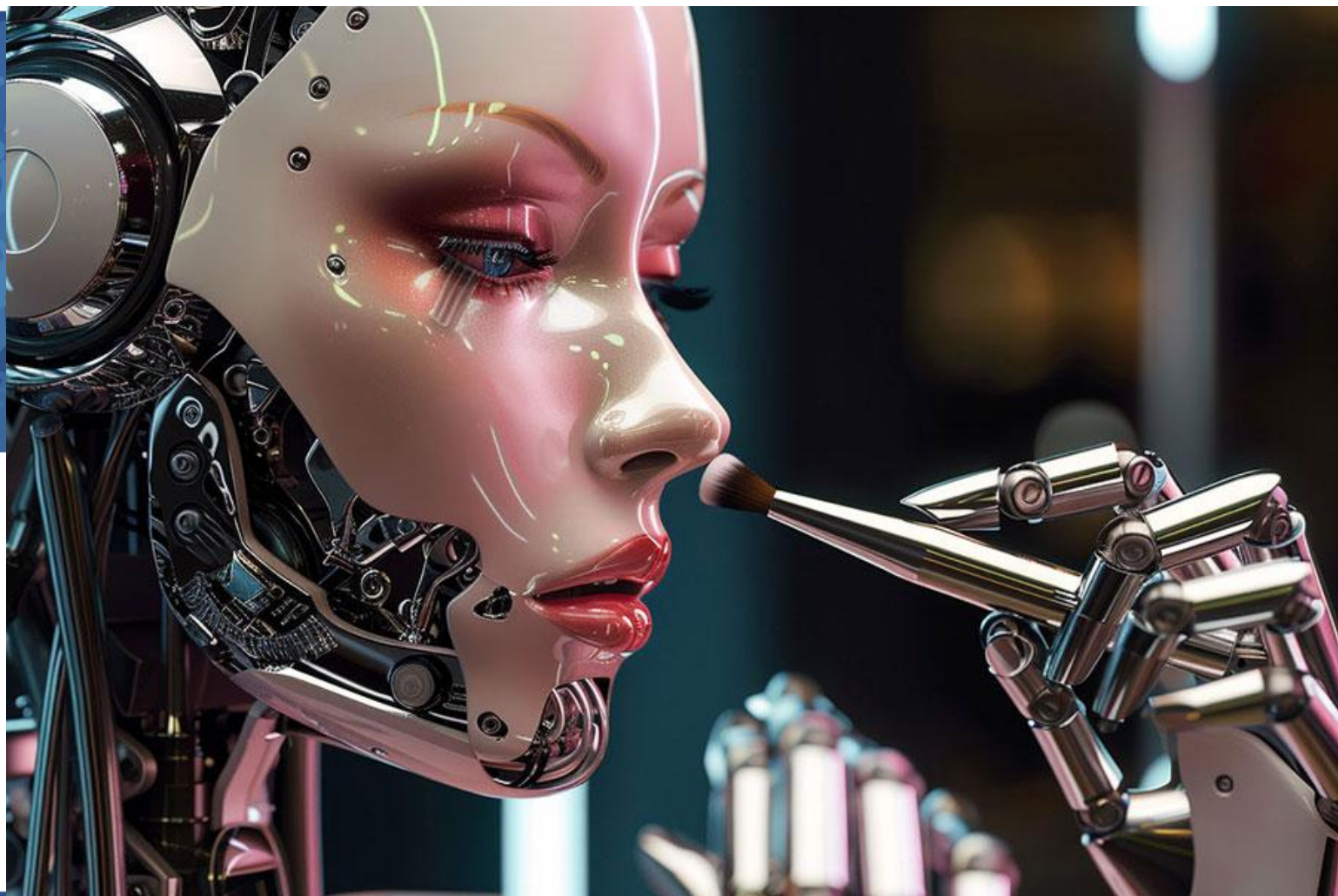
Devices: High Frequency Wands

- High frequency wands (HFW) contain electrified gas:
 - Neon for aging (orange)
 - Argon antibacterial for acne (violet)
- Electrical current is transmitted to the skin causing (?)
 - Collagen production
 - Warming
 - Increased penetration of skin care products
 - Muscle contractions increasing facial tone
 - Tightening of pores



High frequency energy is only transmitted to the skin surface.

5. AI Designed Skincare Regimens



AI Skincare Disadvantages

- Poor quality phone camera image is submitted for analysis
- Lighting makes a difference: LED lighting produces image graded 5 years older than incandescent lighting
- Your images are being used for large database training purposes
- You lose control of your image that could be hacked from a database
- Recommendations could be based on hidden sales agenda



AI Skincare Advantages

- Increased compliance with sunscreen and medication use due to tracking
- Real time skin assessments in the privacy of your home
- Avoidance of products that contain substances in your history of allergens or irritants
- AI trained on dermatologist assessments
- Your information could be used to improve the accuracy of AI assessments



Revolutionizing Your
Skincare Routine with
AI Skin Analysis

Summary: Cosmeceuticals and Sunscreens in the Digital Age



Summary: Cosmeceuticals and Sunscreens in the Digital Age

1. App based product recommendations seem to follow a pre-programmed algorithm based on ingredient function rather than individualized thought
2. Digital personal image processing may create a new form of body dysmorphic disorder and reduced self esteem with unrealistic aesthetic procedure expectations
3. Images loaded into virtual cosmetic databases risk loss of confidentiality, images used to train AI models
4. AI programmed skin care devices may offer totally customizable treatments
5. AI designed skin care regimens could more accurately eliminate problematic products based on large database analysis

