



Public Workshop on Chemicals in Hair Straightening Products

JUNE 23, 2021



Meeting Guidelines

- Participants have been entered in listening mode with cameras and microphones turned off.
- Participants will have the opportunity to actively participate during questions and comments.
- This meeting is being recorded and will be posted on our website.
- If you would also like a copy of the PowerPoint presentation, it is available for download on our website at:
<https://dtsc.ca.gov/scp/safer-consumer-products-workshops-events/>



Workshop Goals

- We seek information on the use of **potentially hazardous chemicals** in hair straightening products, their **function** and **prevalence** in products, and **safer alternatives** under development or already in use
- Facilitate dialogue among experts from industry, academia, NGOs, and other government agencies



Web attendees: Raise your hand to comment verbally
or type your comment in the Q&A

Phone attendees: Use *9 to raise your hand
and *6 to unmute or

Submit your comments to
SaferConsumerProducts@dtsc.ca.gov



Agenda

- WELCOME
- DTSC Presentations
 - Safer Consumer Products Regulatory Framework
 - Social Context of Hair
 - Background on Hair Straightening Products
 - Summary of DTSC Screening Research
- BREAK
- Overexposed and Underprotected
- Endocrine Disrupting Chemicals in Hair Products Used by Black Women
- Occupational Chemical Exposure among Hairdressers of Color: A Pilot Study
- Use of Hair Straighteners in Relation to Breast and Ovarian Cancer Risk
- The Cost of Beauty – Attitudes, Beliefs, and Hair Product Toxicity
- Wrap Up
- CLOSING REMARKS



Welcome

Meredith Williams, Ph.D.

DTSC Director



Safer Consumer Products Program Overview

Christine Papagni, M.S.

Senior Environmental Scientist

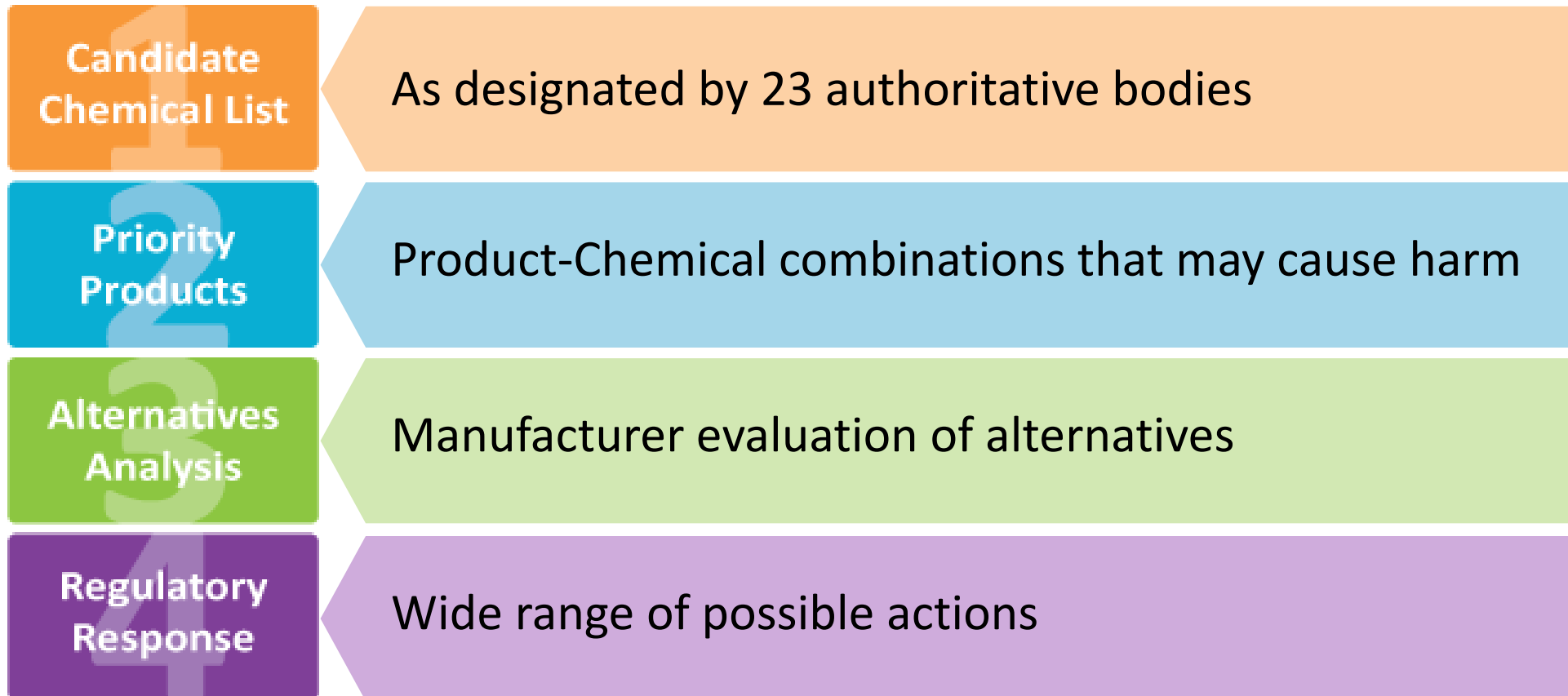


Safer Consumer Products Program

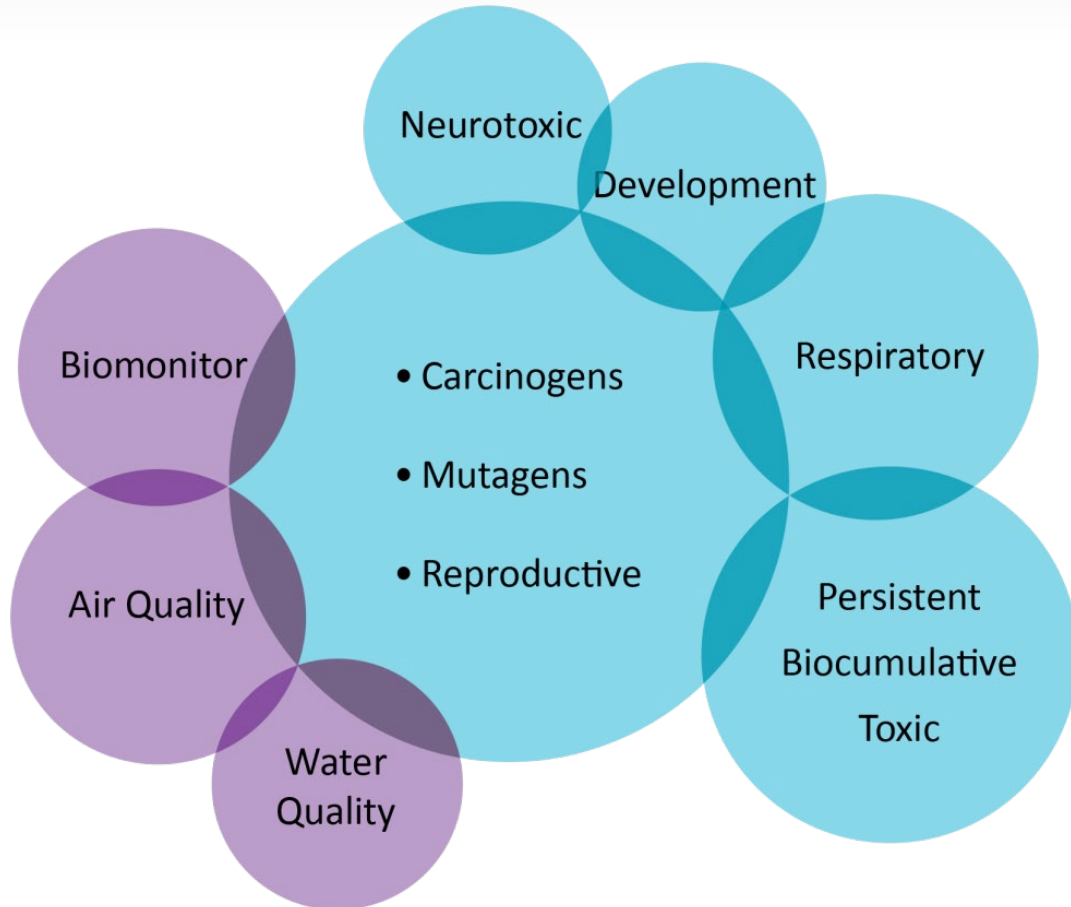
- Safer Consumer Product Regulations
 - Took effect October 1, 2013
- 2008 California Green Chemistry Law
 - Health and Safety Code section 25252
 - Health and Safety Code section 25253



The Safer Consumer Products Framework



Our Menu of Chemical Options



23 authoritative lists

- 15 hazard trait lists
- 8 exposure potential lists

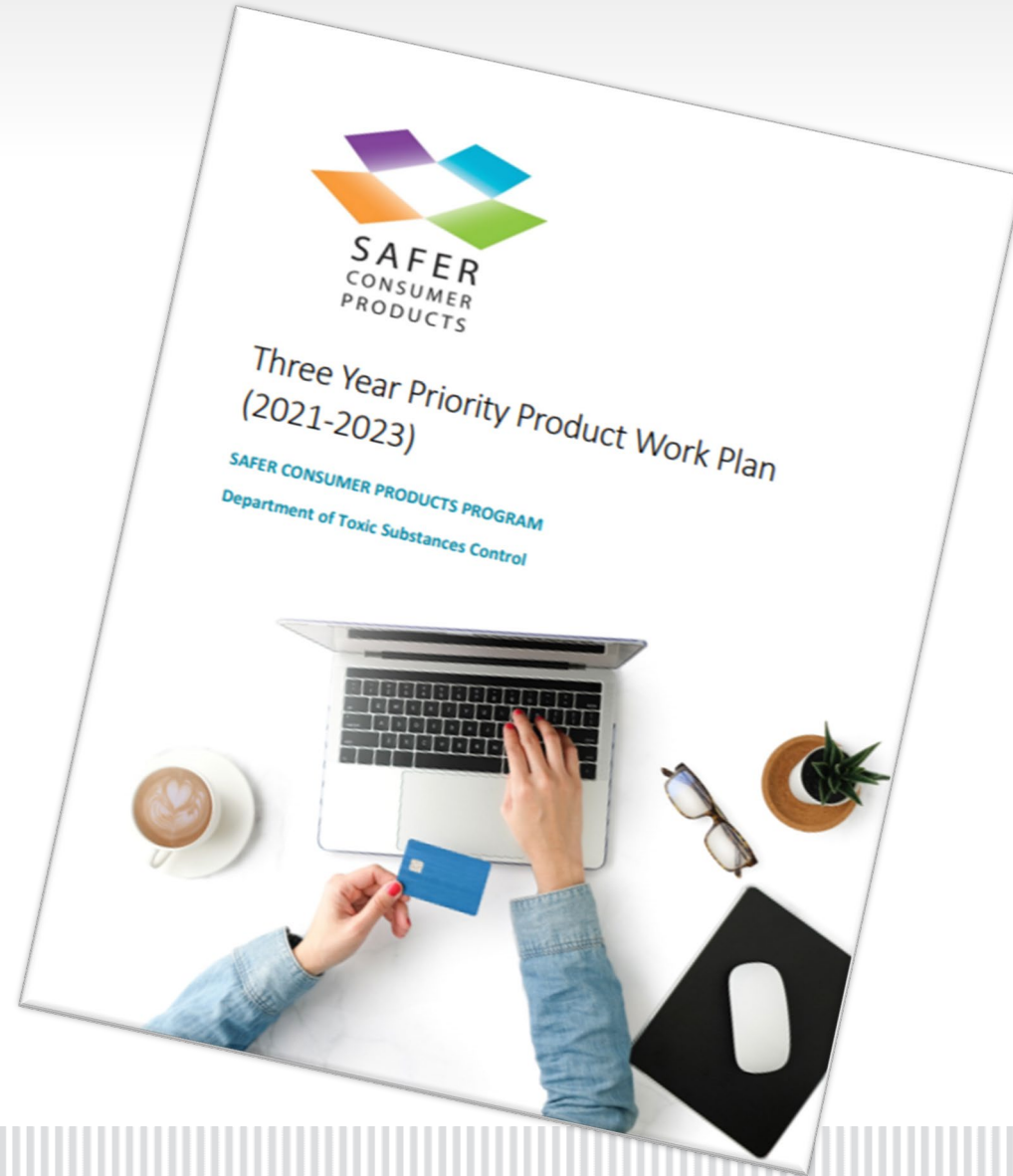
Exclusions

- Pesticides
- Prescription drugs
- Radioactive chemicals
- Natural toxins

<https://dtsc.ca.gov/scp/candidate-chemicals-list/>



Our Menu of Product Options



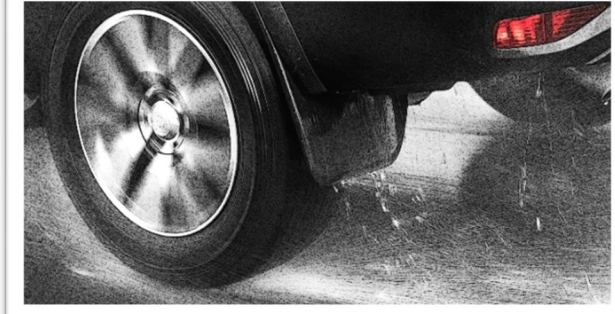
The 2021-2023 Priority Product Work Plan Categories



**Beauty, Personal Care,
and Hygiene Products**



**Building Products and
Materials Used in
Construction and Renovation**



Motor Vehicle Tires



Food Packaging



Cleaning Products



Children's Products



A Three-Year Priority Product Work Plan Provides Focus

- ✓ Adversely impact the health of **children and workers**
- ✓ Chemicals in the **indoor environment**
- ✓ Disproportionally impact **environmental justice communities**
- Leverage the **work of other agencies** within the California Environmental Protection Agency
- Potential products to release **microplastics** to the environment



Priority Product Selection Principles



- Potential **exposure** to the Candidate Chemicals in the product
- **AND**
- Potential for exposures to contribute to or cause **significant or widespread adverse impacts**



Product
(Product-Chemical Combinations)

2 **Priority Product**

Potential exposure to the Candidate Chemicals in the product

AND

Potential for exposures to **contribute** to or **cause** significant or widespread adverse impacts

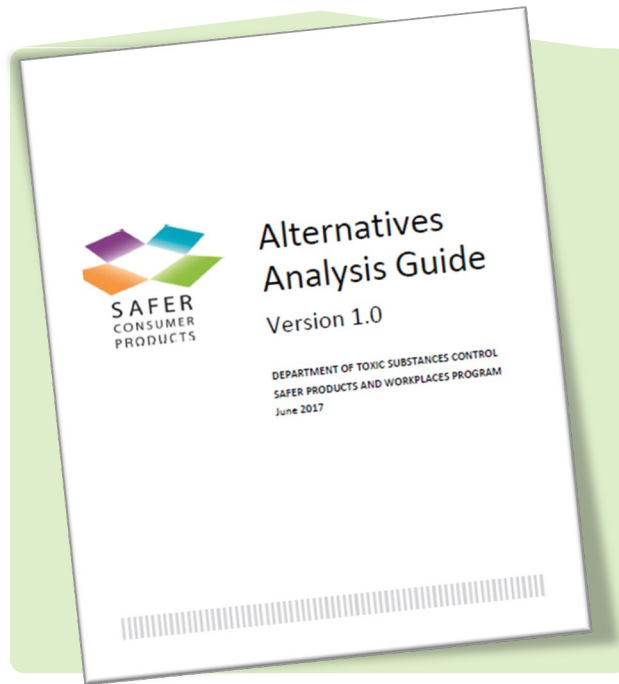
Our Prioritization Process

- Chemicals considered in the product context
- Narrative approach
- No numerical weighting or ranking system



Alternatives Analysis
(Industry Step)

3 Alternatives
Selection



The AA Process

Answers key questions:

- Is it necessary?
- Are there safer alternative?

Requires evaluation of:

- Public health impacts
- Ecological impacts
- Life cycle impacts
- Economic analysis
- Performance evaluation
- Public comment



4

Regulatory Response

- Draft Regulatory Response proposed by DTSC
- Available for public comment
- Final Regulatory Response

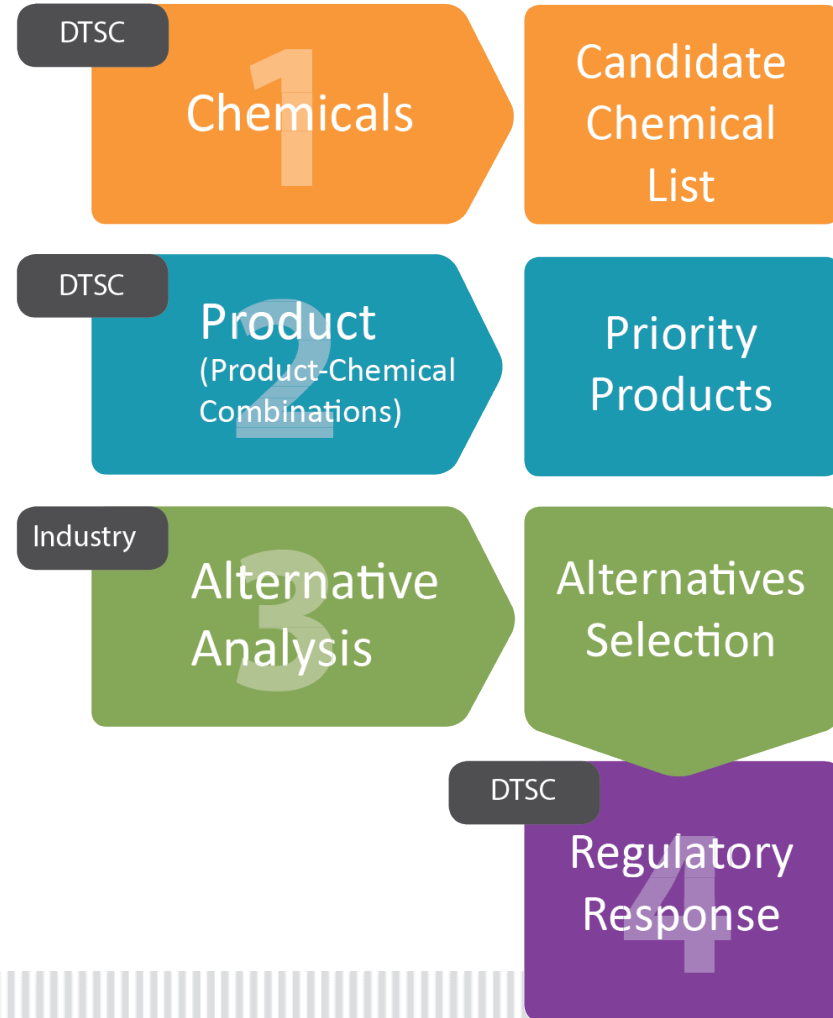
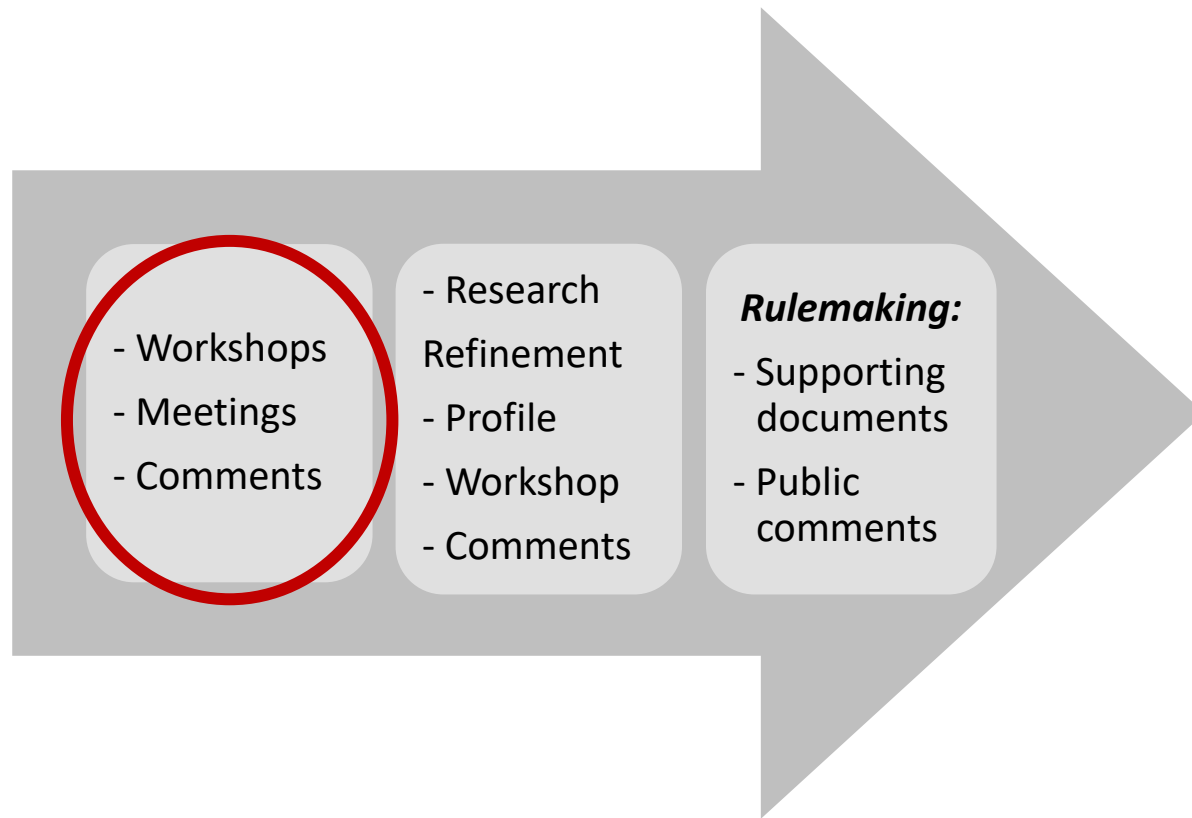
The Regulatory Response is Customized to Each Entity

Options include:

- Additional info to DTSC
- Additional info to consumers
- Additional safety measures
- Sales restrictions/ prohibitions
- End-of-life product stewardship
- Research funding
- No response



Next Steps - Product Evaluation Process



Stakeholder Feedback

- Public comment period:
May 24 - July 23, 2021
- Provide comments at CalSAFER
- calsafer.dtsc.ca.gov/cms/comment/package/?rid=12756



Clarifying Questions



Web attendees: Raise your hand to comment verbally
or type your comment in the Q&A

Phone attendees: Use *9 to raise your hand
and *6 to unmute or

Submit your comments to
SaferConsumerProducts@dtsc.ca.gov



SCP Findings - Presentation Overview

- Social Context of Hair
- Background on Hair Straightening Products
- Summary of DTSC's Screening Research



Social Context of Hair

Michelle Banks-Ordone
Public Participation Specialist



Cultural and Historical Significance of Hair

- Hair has played a significant role in our society throughout history.
- It is associated with beauty, devotion, youthfulness, and masculinity.
- Hair is often used to communicate messages about health, wealth and status.



Significance of Hair in African Culture

- Hair has always been an important part of adornment in African cultures.
- Hairstyles indicate a person's family background, tribe and social status.



Getty Images



The Slave Trade and Slavery

- Many slaves were forced by slave owners to shave their hair.
- Shaving their hair and linguistic isolation, stripped Africans of their culture and heritage.
- These acts alienated Africans from anything that resembled their identity.

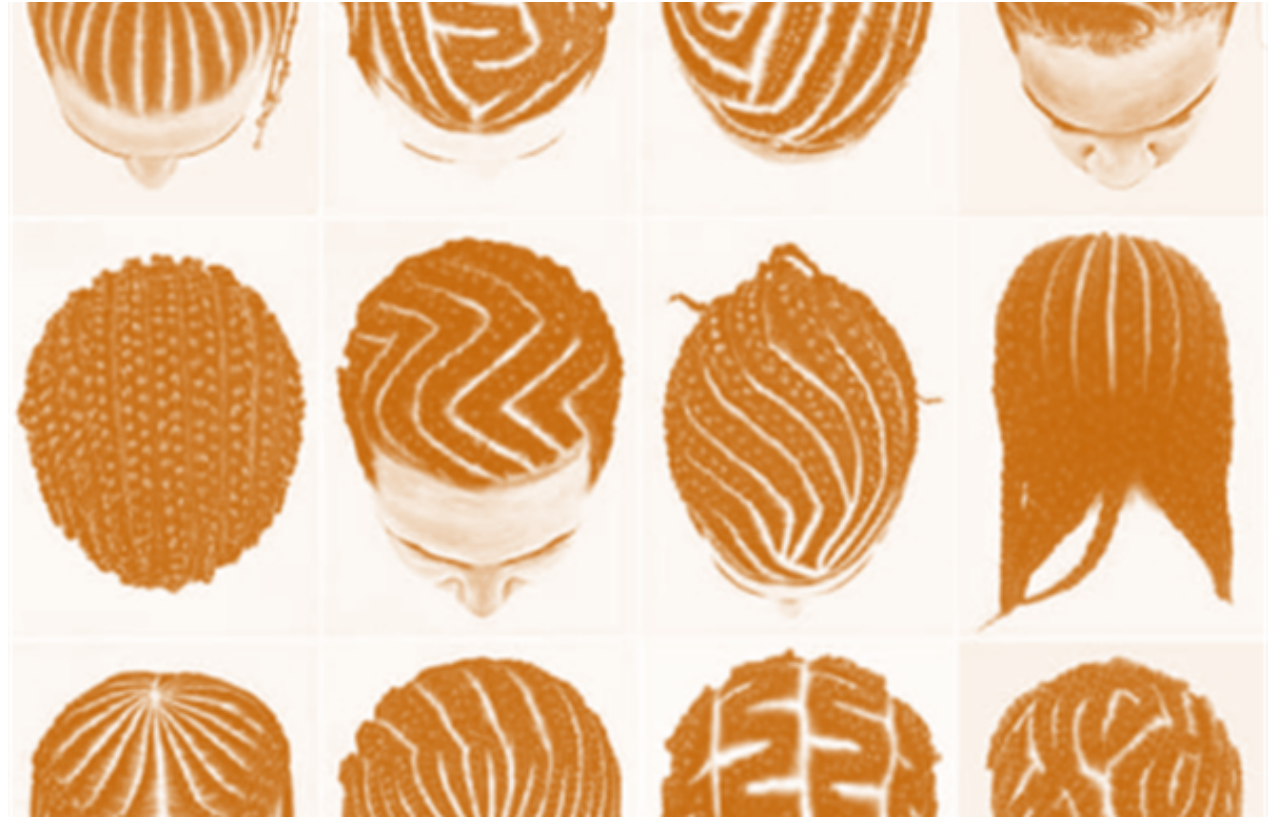


Getty Images



Hair, Self-Expression and Rebellion

- Cornrows were allowed because they were considered “neat and clean.”
- They were efficient and lifesaving.
- Columbian slaves used elaborate maps in their cornrows to escape.



Images: [African Beauty and Braids](#) and [The African Exponent](#)



Post Emancipation Era

- Slavery abolished
- Pressure to fit in with the dominant culture
- Personal care product industry
- Madam C.J. Walker



Images: [Indiana Historical Society](#)



Civil Rights and Socio-Economic Impacts

- Pride
- Empowerment
- Mainstream Media



Rigid Appearance Standards and the Politics of Hair

- Tignon Law
- Civil Rights Act of 1964
- 1975 - Jenkins v. Blue Cross Mutual Hospital Insurance
- 1981 - Rogers vs. American Airlines
- 1987 - Tatum, Parahoo and Boone vs. Hyatt Regency
- 2010 - Equal Employment Opportunity Commission (EEOC) on behalf of Chastity Jones) vs. Catastrophe Management Solutions



Hairstyle Trends

1970

- Afros become more of a fashion statement

1980

- Jheri Curls
- Asymmetric Bobs
- Fades

1990

- Box and Micro Braids
- Relaxed Strands and Baby Hair

2000

- Relaxed, layered hair with side-swept bangs
- Short spiky hair/Pixie Cut
- Cornrows with patterns and Short Bobs

2010

- Crochet Braids
- Weaves
- Natural Hairstyles and Bantu Knots

2020

- Curly Natural Textures
- More to come...



The C.R.O.W.N. Act

Creating a **R**espectful and **O**pen **W**orld for **N**atural Hair

The Official Campaign of the CROWN ACT Led by the CROWN Coalition

1.5X

Black women are 1.5 times more likely to be sent home from the workplace because of their hair.

80%

Black women are 80% more likely than white women to agree with this statement.

“I have to change my hair from its natural state to fit in at the office.”



Terms Used to Describe Ethnic Groups

Terminology	Place of Ancestral Origin
* African Descent	Sub-Sahara Africa
Asian Descent	Asia
European Descent	Europe
Latin/Hispanic Descent	European (Spain) and Latin America countries
Middle Eastern/*North African Descent	Middle East or North Africa
Native American Tribal Ancestry or Alaskan Native	The Americas (North, Central and South America)
Native Hawaiian or Pacific Islander	Hawaii, Guam, Samoa and other Pacific Islands

** Individuals from North or Sub-Saharan Africa may consider themselves of African descent.*

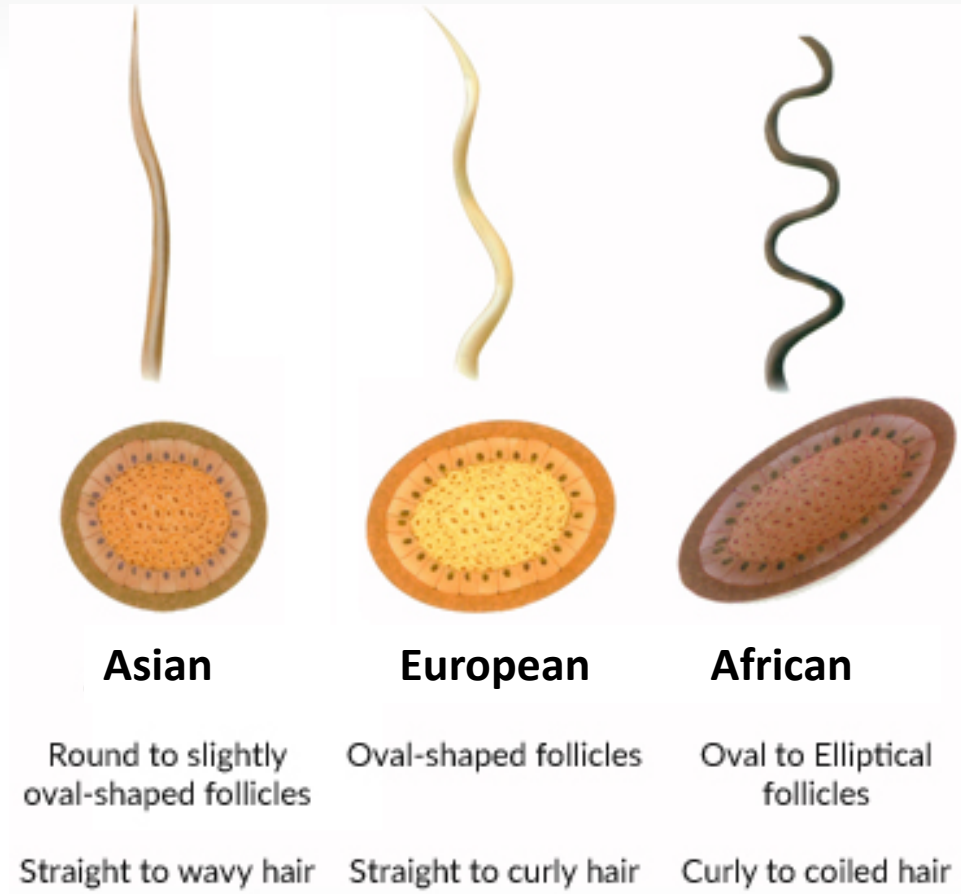


Background on Hair Straightening Products

Michelle Romero Fishback, Ph.D.
Senior Environmental Scientist



Hair Products Marketing



<https://www.belgraviacentre.com/blog/hair-types-and-race-differences/>



<https://www.cosmopolitan.com/style-beauty/beauty/a31956130/hair-types/>



Hair Types - Additional Parameters for Classification

- All human hair fibers typically have the same basic structure
- However, physical characteristics help to differentiate hair types
 - Three-dimensional shape of the fiber (varies depending on ethnicity)
 - Curve diameter, curl index, number of waves



Types of Hair Straightening Products

- Broadly, we will be discussing two types of hair straightening products
 - **Permanent** – effect may last a few months, even when the hair gets wet
 - **Temporary** – effect may last until hair gets wet or damp



https://americanhistory.si.edu/collections/search/object/nmah_209586



<https://www.latimes.com/bestcover/best-hair-straightening-cream>



Permanent Straightening Product Definitions

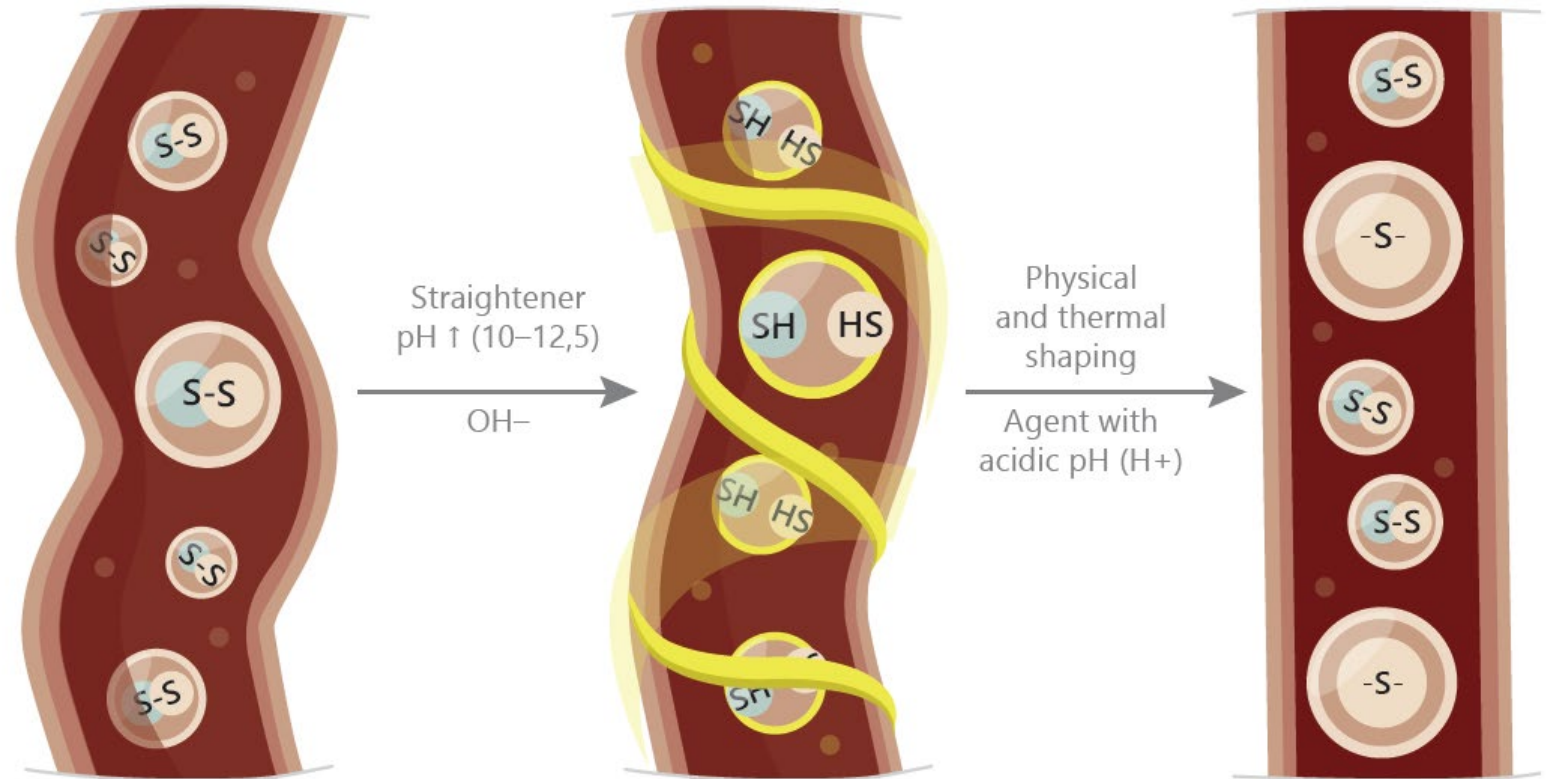
- Hair relaxers
 - Chemical treatments designed to permanently straighten highly coiled hair by breaking disulfide bonds
- Keratin hair straightening products
 - Brazilian keratin treatments (containing formaldehyde)
 - Other types of keratin treatment
- Japanese straightening or thermal reconditioning
 - "Hybrid" of keratin straighteners and hair relaxers (active ingredient is ammonium thioglycolate)



How does a hair relaxer work?

A relaxer works rearranging the basic structure of keratin (breakage of disulfide bonds between keratin filaments)

Disulfide bonds between keratin
Chains are broken

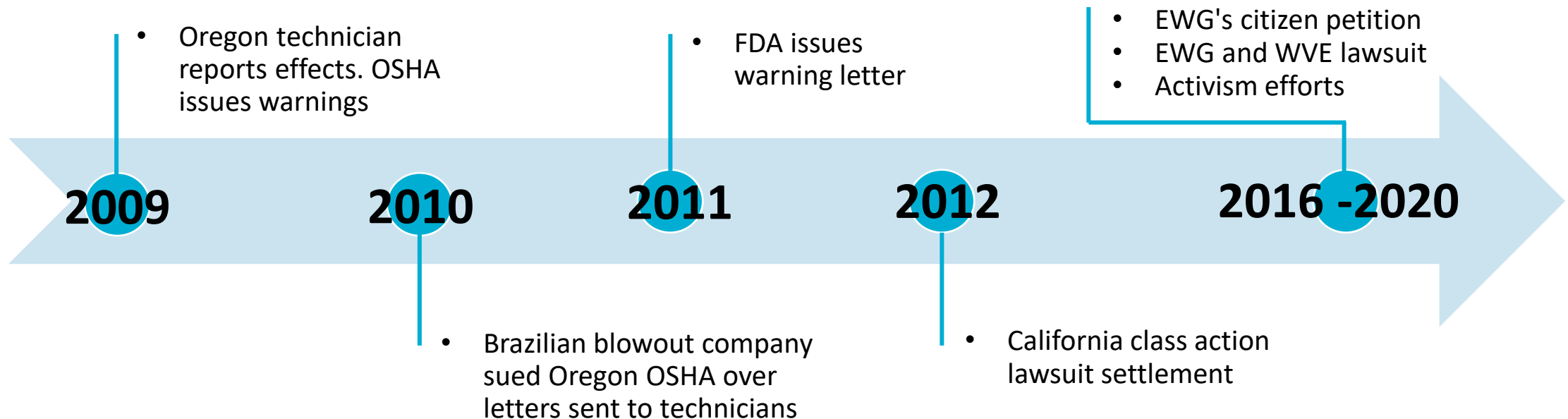


Partial replacement of cystine by lanthioni
and new disulfide bridges formed



Actions on Keratin-based Straighteners

- Claims of adverse health outcomes related to hair straightening products have been public since 2009



2020 California's Toxic-Free Cosmetics Act

- Banning added ingredients from cosmetics (effective January 1, 2025)
 - Dibutyl phthalate and diethylhexyl phthalate
 - Formaldehyde and paraformaldehyde
 - Methylene glycol
 - Quaternium-15
 - Mercury
 - Isobutylparaben and Isopropylparaben
 - m-Phenylenediamine and its salts, o-Phenylenediamine and its salts
 - 13 types of per- and polyfluoroalkyl substances (PFAS) and their salts



Use of Hair Straightening Products Starts Early

- Girls of African descent begin using chemical hair relaxers and straighteners as early as 4 years old
- Early and continuous use of hair straightening products increases the likelihood of chemical exposures during critical stages of development



Key Study on Hair Straighteners

Chemical	Concentration (µg/g)		Hazard traits
	Median	Max	
Benzophenone-1 (BP-1)	-	36	Reproductive toxicant (rep tox), carcinogen 2B
Cyclosiloxanes (decamethylcyclopentasiloxane)	289	1530	Bioaccumulation, env persistence, rep tox
DEA	14	314	Carcinogen 2B, respiratory
BPA	-	46	Endocrine disruption, rep tox
Triclosan	-	56	Endocrine disruption, dermatotoxicity
Phthalates (diethyl phthalate)	52	120	Endocrine disruption
Parabens (methyl paraben)	796	922	Endocrine disruption, rep tox

Helm et al. 2018. Measurement of endocrine disrupting and asthma-associated chemicals in hair products used by Black women. *Environmental research*, 165, 448-458.



Health Disparities - Concerns About Chemicals in Hair Products

- Critical window of exposure to endocrine disruptor chemicals leads to health effects (e.g., early menarche)
- Epidemiological research on use of hair relaxers and breast cancer risk is ongoing
- Black and White women get breast cancer at about the same rate, **but women of African descent die from breast cancer at a higher rate than White women**



Our Current Efforts (SCP work on hair straightening products)

- Black women use more hair products than other women
 - In general women of color (Latinx and Asian) also report a higher number of cosmetic products used compared to other women
- There are existing underlying circumstances related to health disparities, which may exacerbate health effects linked to chemicals in products
- In the next section, we will cover the current state of SCP research and preliminary findings



Summary of Chemicals in Hair Straightening Products Research

Lynn Nakayama Wong, Ph.D.
Staff Toxicologist



Product Types

- Permanent and temporary hair straightening products
- Chemical evaluations focused on keratin-based products and relaxer kits
- Relaxer kit components including protectants, relaxer creams, shampoos, and conditioners
- Japanese hair straighteners not a main research focus
 - Ammonium thioglycolate is not a Candidate Chemical



Exposure Potential

- Contain chemicals that may be absorbed dermally
- Contain volatile chemicals which may off-gas to indoor air
- Frequent use or application of hair straighteners
- Girls of African descent begin use at an early age
- Cumulative exposures from Candidate Chemicals
- Down-the-drain exposures to the environment



Chemical	Functional Use	Hazard Traits
Formaldehyde	Cross-link disulfide bonds	Carcinogenicity, ocular toxicity, respiratory toxicity, dermatotoxicity
Sodium hydroxide	Strong base to break disulfide bonds	Dermatotoxicity, ocular toxicity, respiratory toxicity
Benzophenone-3	Ultraviolet filter	Dermatotoxicity, endocrine and aquatic toxicity
Diethanolamine (DEA)	pH adjuster Contaminant in DEA-related ingredients	Carcinogenicity
Triclosan	Antibacterial	Endocrine toxicity

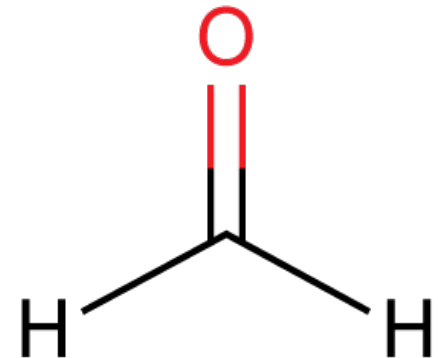


Chemical Classes	Functional Use	Hazard Traits
Cyclosiloxanes <ul style="list-style-type: none"> • Octamethylcyclotetrasiloxane (D4) • Decamethylcyclopentasiloxane (D5) • Dodecamethylcyclohexasiloxane (D6) 	Antistatic, emollient, humectant	Environmental persistence, bioaccumulation, reproductive toxicity, and carcinogenicity
Parabens <ul style="list-style-type: none"> • Methylparaben • Ethylparaben • Isobutylparaben • Butylparaben • Propylparaben 	Preservative Fragrance ingredient (excluding Isobutylparaben)	Endocrine toxicity, reproductive and developmental toxicity
Ortho-phthalates <ul style="list-style-type: none"> • Diethyl phthalate (DEP) • Diethylhexyl phthalate (DEHP) 	Fragrance carrier	Developmental and reproductive toxicity, endocrine toxicity, and carcinogenicity (DEHP only)



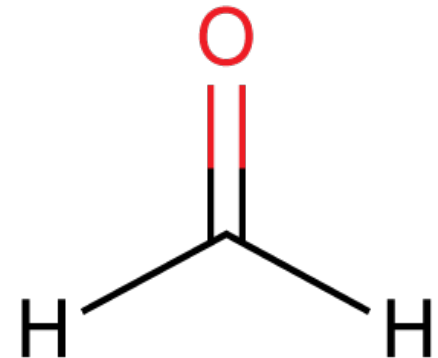
Formaldehyde

- Used to cross-link the keratin treatment to the hair in keratin-based hair straighteners
- Brazilian Blowout SDS reports 3-7% by volume
- Hazards
 - Human carcinogen
 - Respiratory toxicant
 - Eye irritant
 - Skin and respiratory sensitizer



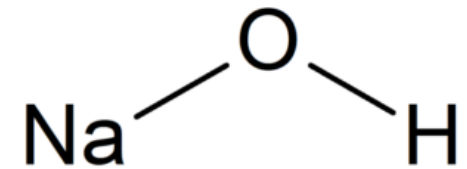
What is Formaldehyde?

- Gas at room temperature
- Highly reactive with water
- Methylene glycol or formalin
 - Formaldehyde and water reaction
- OSHA's permissible exposure limit is 0.75 ppm
- Alternatives include other aldehydes and glyoxal
- Formaldehyde and methylene glycol will be banned in California cosmetics starting 2025



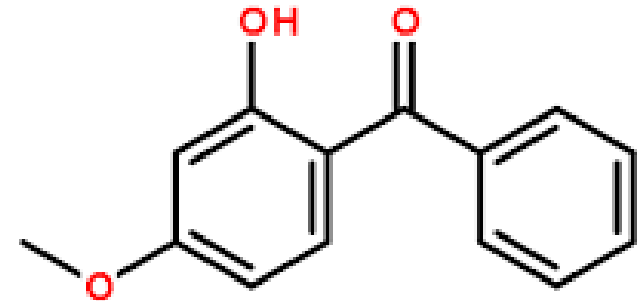
Sodium Hydroxide “Lye”

- Used in hair relaxers to break the disulfide bonds in hair and alter its curl pattern
- Concentrations below 2.5% (considered low lye relaxers)
- Hazards
 - Skin irritant and corrosive
 - Eye irritant
 - Respiratory irritant
- “No-lye” alternatives use strong bases such as calcium hydroxide and guanidine hydroxide



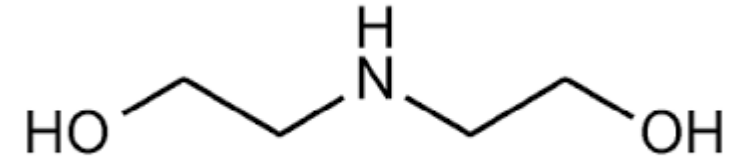
Benzophenone-3 (BP-3)

- Used as a UV filter in relaxer kits, Japanese hair straighteners, and temporary straighteners
- Widespread detection in biomonitoring studies
- Hazards
 - Suspected endocrine disrupting compound
 - Dermal allergen
 - Coral bleaching and ossification



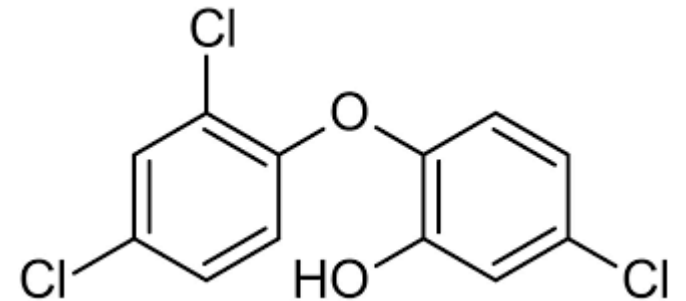
Diethanolamine (DEA)

- Contaminant of DEA-related ingredients
 - Cocamide DEA, lauramide DEA
- DEA-related ingredients used in shampoos and conditioners of relaxer kits, keratin-based and temporary straighteners
- Functions as surfactant foam boosters, thickeners, or conditioning agents
- Hazards
 - Possible human carcinogen
 - Respiratory toxicant
- Free DEA may react with nitrosating agents to form carcinogenic nitrosamines
- Possible alternatives include cocamide monoethanolamine (MEA)



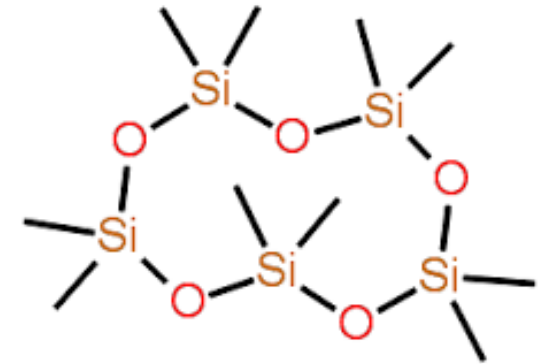
Triclosan

- Detected in relaxer kit
- Antibacterial in consumer products
- Rarely used in hair products
- Detected in human breastmilk and urine in biomonitoring studies
- Hazards
 - Suspected endocrine disrupting compound
- Phased out of personal care products



Cyclosiloxanes (D4, D5, D6, Cyclomethicone)

- Used as conditioning and smoothing agents in relaxer kits (conditioners and leave-in) and temporary products
- Volatile; detected in indoor air environment
- Environmental persistence
- Bioaccumulation
- Toxicological endpoints vary
 - Reproductive Toxicant (D4)
 - Uterine endometrial tumors (D5)
 - Liver and thyroid effects (D6)
- Possible alternative: Isodecylneopentanoate

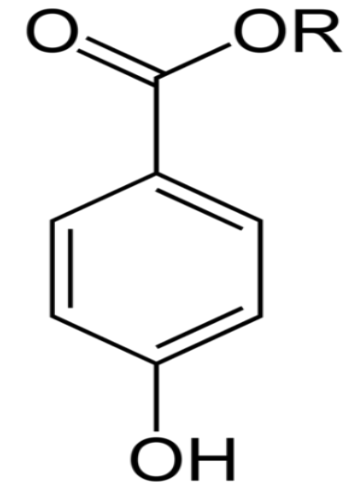


Decamethylcyclopentasiloxane (D5)



Parabens

- Used as fragrance ingredients and/or preservatives in both permanent and temporary straightener products
- Detected in various human tissues/samples
- Hazards
 - Endocrine disrupting compounds
 - Reproductive and developmental toxicants
 - Stimulate breast cancer cell proliferation, migration, and invasive activity *in vitro*



Paraben

R = an alkyl group



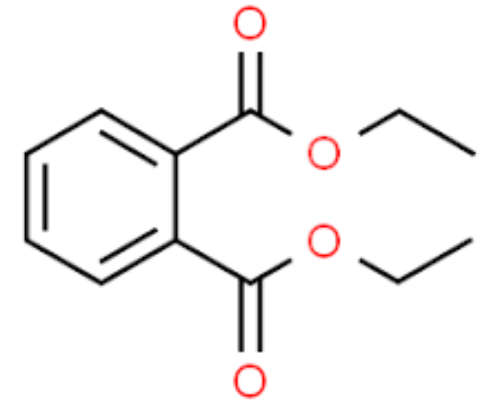
Alternatives and Regulatory Actions

- Possible alternatives identified include phenoxyethanol, sorbic acid, and benzoic acid
- The EU restricts mixtures of parabens to 0.8%
 - Propylparaben and butylparaben restricted to 0.14% in cosmetic products
- Isopropylparaben and isobutylparaben will be banned from cosmetic products in California in 2025



Ortho-phthalates (DEP and DEHP)

- Used as a solvent in fragrances
- Hazards
 - Endocrine toxicity
 - Reproductive and developmental toxicity
 - Carcinogenicity (DEHP only)
- Possible alternatives: essential oils
- DEHP will be banned from cosmetics in 2025



Diethyl phthalate



Summary of DTSC's Findings

- Hair straightening experience of U.S. women of African descent
- Differences in hair structure type
- 3 types of permanent hair straighteners and temporary hair straighteners
- Evaluated 5 compounds and 3 chemical classes
- Frequent exposure
- Exposure at an early age
- Sensitive subpopulations



Team Acknowledgements

- Christine Papagni, M.S.
- Michelle Banks-Ordone
- Michelle Romero Fishback, Ph.D.
- Eric Sciullo, Ph.D.
- Michael Ernst, P.E.
- Armeen Etemad, M.S.
- Dennis Guo, Ph.D.
- Kyle Harris, Ph.D.
- Efrem Neuwirth, MPH, Ph.D.
- Diana Phelps, Ph.D., P.E.
- Zachary Kearns
- Jennifer Branyan
- Jeff Wong, Ph.D.
- André Algazi



Clarifying Questions



Web attendees: Raise your hand to comment verbally
or type your comment in the Q&A

Phone attendees: Use *9 to raise your hand
and *6 to unmute or

Submit your comments to
SaferConsumerProducts@dtsc.ca.gov



Comments and Public Feedback



Web attendees: Raise your hand to comment verbally
or type your comment in the Q&A

Phone attendees: Use *9 to raise your hand
and *6 to unmute or

Submit your comments to
SaferConsumerProducts@dtsc.ca.gov



On Break



QUESTIONS

Web attendees: Raise your hand to comment verbally or type your comment in the Q&A

Phone attendees: Use *9 to raise your hand and *6 to unmute or

Submit your comments to SaferConsumerProducts@dtsc.ca.gov



Stakeholder Feedback

- Public comment period:
May 24 - July 23, 2021
- Provide comments at CalSAFER
- calsafer.dtsc.ca.gov/cms/commentpackage/?rid=12756



Themes for Public Comment

- Theme 1. Chemicals in Hair Straightening Products
- Theme 2. Exposure to Chemicals from Hair Straightening Products
- Theme 3. Toxicity of Chemicals in Hair Straightening Products
- Theme 4. Market Presence



Contact Information

- Join our E-list to get updates: bit.ly/scpupdates
- General questions: SaferConsumerProducts@dtsc.ca.gov
- Media inquiries: Sanford.Nax@dtsc.ca.gov
- Technical questions: Christine.Papagni@dtsc.ca.gov
- Meeting requests: Heather.Kessler@dtsc.ca.gov



Closing Remarks

Karl Palmer

DTSC Deputy Director, Safer Consumer Products Program

