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SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai

Approved by Pharmacy Council of India, New Delhi.

Coimbatore -641035

COURSE NAME : COSMETIC SCIENCE- BP809ET

B.PHARM IV YEAR / VIII SEM

UNIT II

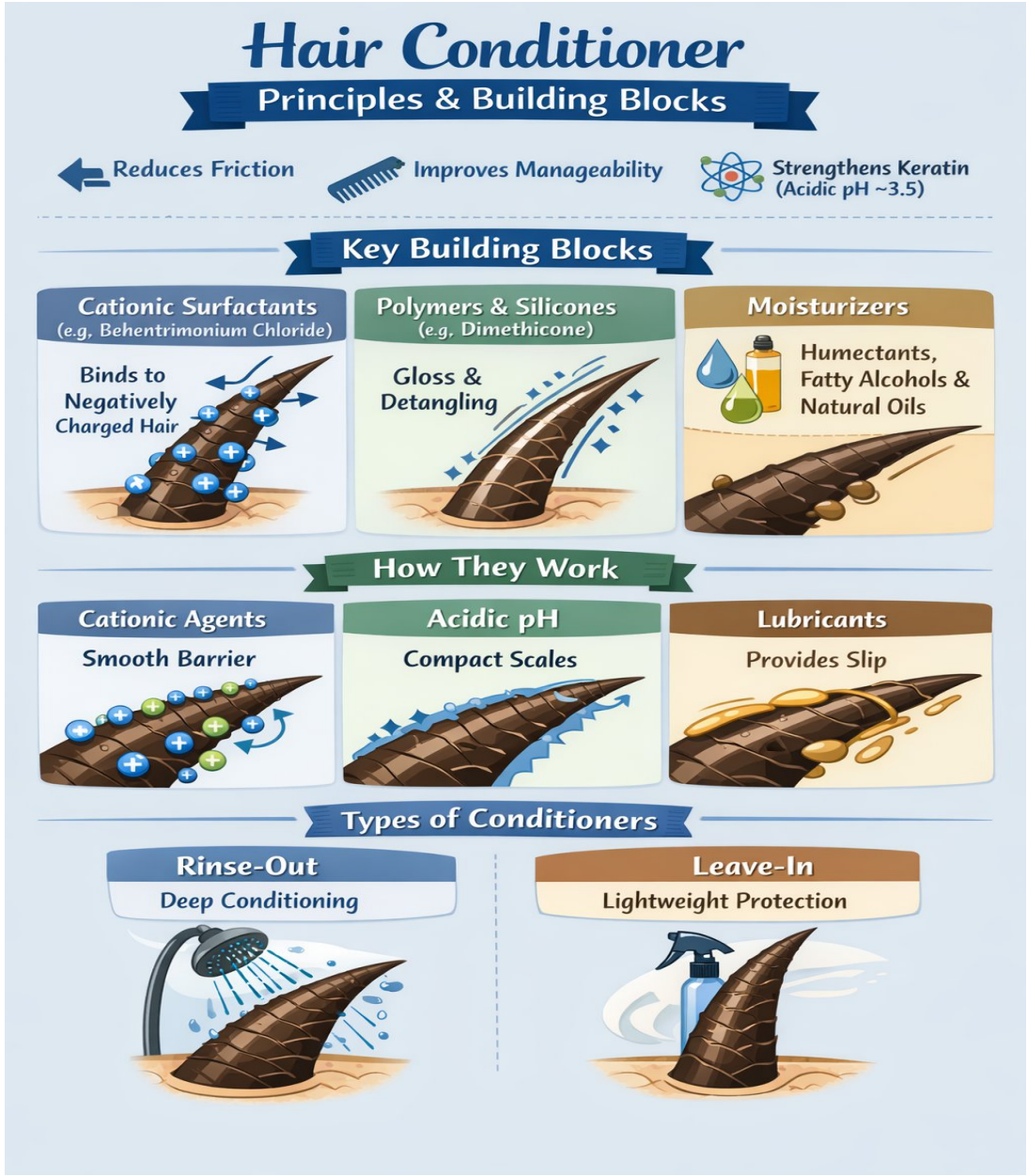
SUB TOPIC : PRINCIPLES OF FORMULATION AND BUILDING BLOCKS OF HAIR AND ORAL CARE PRODUCTS

?? PRINCIPLES OF FORMULATION & BUILDING BLOCKS OF HAIR CARE AND ORAL CARE PRODUCTS

To understand **how formulation principles and biological building blocks** guide the design of **effective, safe, and consumer-acceptable hair and oral care products**.


Introduction to Hair Care Products
Formulations to Cleanse, Condition, Protect & Treat Hair & Scalp
Key Building Blocks
Citric Acid
Surfactants for Cleansing
Conditioners for Smoothness
Preservatives for Stability
pH Adjusters (e.g. Citric Acid)
Principles of Hair Care
Balance Cleansing & Natural Oils
Enhance Manageability
Reduce Irritation
Target Dandruff & Damage
Natural Ingredients for Mildness & Efficacy
Coconut Oil
Aloe Vera
Argan Oil
Herbal Extracts


Conditioning Shampoo
Principles & Building Blocks
Cleans & Moisturizes
pH Balanced ~5.5
Smooths & Shines
Cleansing Ingredients
Surfactants
Sodium Lauryl Sulfate
Traps Oils & Dirt
Co-Surfactants
Cocamidopropyl Getaine
Gentle & Mild
Conditioning Agents
Silicones
Reduces Frizz & Adds Shine
Polyquaternium-10
Hydrates & Adds Fullness
How It Works
Surfactants Remove Oil & Dirt
Conditioners Coat & Smooth Hair
Citric Acid
pH Adjuster & antioxidant
Sodium Lauroampho
Tear-Free Mild Cleansing


Hair Conditioner
Principles & Building Blocks
Reduces Friction
Improves Manageability
Strengthens Keratin
(Acidic pH ~3.5)
Key Building Blocks
Cationic Surfactants
(e.g, Behentrimonium Chloride)
Binds to Negatively Charged Hair
Polymers & Silicones
(e.g, Dimethicone)
Gloss & Detangling
Moisturizers
Humectants, Fatty Alcohols & Natural Oils
How They Work
Cationic Agents
Smooth Barrier
Acidic pH
Compact Scales
Lubricants
Provides Slip
Types of Conditioners
Rinse-Out
Deep Conditioning
Leave-In
Lightweight Protection


Anti-Dandruff Shampoo:
— Principles & Building Blocks —
Targets Fungal Overgrowth (Malasezia)
Reduces Flaking & Irritation
Medicated for Exfoliation & Antimicrobial Action
— Key Ingredients —
Antifungals
Zinc Pyrithione
Ketoonazole
Zinc Pyrithione
Ketoconazole
Kills Fungi
Exfoliants
Salicylic Acid
Selenium Sulfide
Salicylic Acid
Selenium Sulfide
Removes Dead Skin
— Shampoo Base —
Surfactants & Co-Surfactants + Preservatives
— How They Work —
Inhibit Fungal Growth
Remove Dead Skin Cells
Leave On Scalp for Efficacy
Coal Tar Derivatives
For Symptom Relief

Hair Oils:

Principles & Building Blocks

Principles:

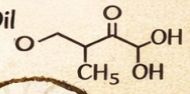
- Mimic natural sebum to reduce water loss
- Prevent hygral stress & surfactant damage
- Better penetration with saturated & monounsaturated oils

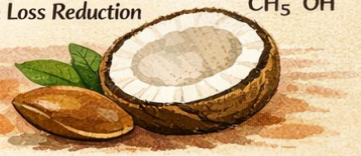
Key Building Blocks:

Vegetable & Mineral Oils as Base (e.g., Coconut, Argan)

Specific Ingredients:

- Lauric Acid in Coconut Oil for Shaft Penetration & Protein Loss Reduction





Nutrients:

- Vitamin E in Avocado Oil for Antioxidants & Growth

How They Work:

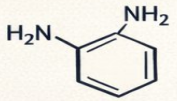
- Form Hydrophobic Film to Lock in Moisture
- Applied Pre/Post-Wash for Conditioning & Frizz Relief

Examples:

- Almond or Jojoba for Elasticity & Dryness Prevention

Chemistry of Para-Phenyelene Diamine (PPD)

PPD ($C_6H_4(NH_2)_2$): Aromatic compound used as colorless precursor in permanent dyes



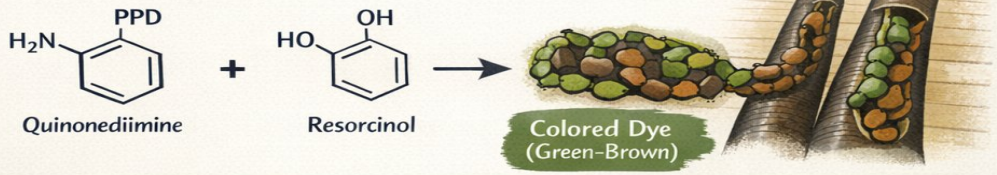
Oxidation Reaction

Oxidizes to quinonediimine intermediate via H_2O_2 + Base

Quinonediimine Intermediate

Coupling Reaction

Quinonediimine reacts with couplers (e.g., Resorcinol)



Quinonediimine Resorcinol

Final Oxidation

Forms large, insoluble colored polymers trapped in hair cortex

Role: Provides base reactivity for shade variety; Lightens melanin during process

Concerns: Potential allergen; used in leuco form

Formulation of PPD-Based Hair Dye

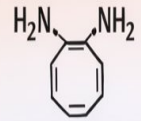
Principles:

- Permanent coloring via oxidation & penetration into cortex
- Alkaline environment swells cuticles
- NH_3 (Ammonia)

Key Building Blocks:

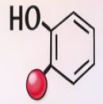
PPD

Primary Intermediate

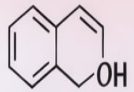


Couplers

3-Aminophenol (Magenta)



1-Naphthol (Purple)



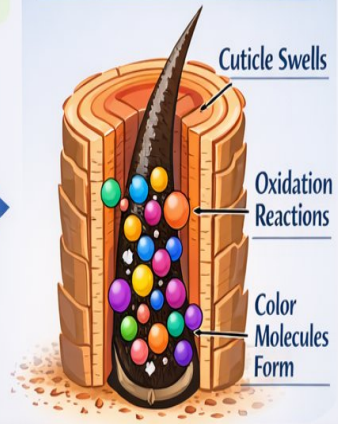
Oxidant:

Hydrogen Peroxide H_2O_2

Activation & Lift

How It Works:

Mix Precursors with Developer



Alkaline Agent:

Ammonia (NH_3)

pH & Melanin Oxidation

Variations: Semi-Permanent

- Lower PPD
- No Strong Lightening

Introduction to Oral Care Products

Oral care formulations focus on plaque removal, decay prevention, and targeted relief (e.g., sensitivity, whitening)

Common Building Blocks

Abrasives for Polishing

Fluorides for Remineralization

Surfactants for Foaming

Principles of Oral Care

- **Balance Efficacy with Safety**
- **< 250 RDA** (Low Abrasivity)
- **Adjunct to Brushing & Flossing**

Targeted Ingredients

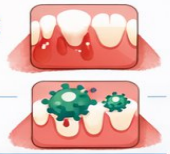
Antibacterials for Gum Health

Desensitizers for Sensitivity Relief

Toothpaste for Bleeding Gums

Principles:

- Reduces gingivitis & plaque to minimize inflammation/bleeding
- Antibacterial action inhibits biofilms



Key Building Blocks:

Stannous Fluoride (0.454%)

SnF

Up to 48% Less Bleeding

Silica or **Calcium Carbonate**

Gentle Cleaning

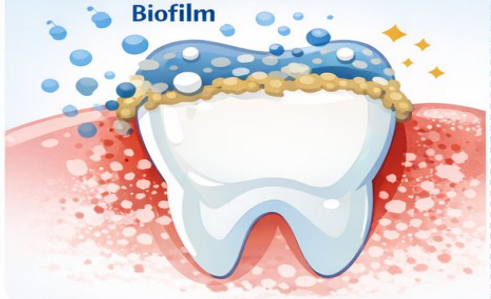
Zinc Chloride or **Triclosan**

Antibacterial Action

$ZnCl_2$

How It Works:

Stannous Ions Disrupt Plaque Biofilm



Fluoride Prevents Tooth Decay

Stannous Fluoride + Abrasives + Zinc Chloride


Toothpaste for Sensitive Teeth
Principles & Building Blocks
Occludes Dentin Tubules
Blocks Pain Stimuli
K+
Erosion Protection
Barrier Against Acid
Key Building Blocks
Potassium Nitrate or Arginine
Seals Tubules
KNO3
Arg
Stannous Fluoride
Hypersensitivity Relief
SnF2
Gentle Abrasives
Low RDA (e.g. Hydroxyapatite)
Low RDA
How It Works
Protective Layer & Nerve Desensitization
K+
K+
Benefits
Reduces Pain from Hot & Cold
Supports Remineralization


Teeth Whitening Products
Principles & Building Blocks
Core Principles
Removes extrinsic stains
(Abrasion or chemical dissolution)
Safe for Enamel
(RDA <250)
Key Building Blocks
Abrasives (Silica)
For Polishing
Sodium Tripolyphosphate
Stain Dissolving
Fluorides
Decay Protection
Peroxides (Historical)
Bleaching Agents of the Past
How It Works
Gentle Polishing
2-4 Weeks
Breaking Down Stains
No Color Alteration

Mouthwash

Principles and Building Blocks

Principles:

Antiseptic Reduction of Microbes

Breath Control, Anti-Plaque, Sensitivity Relief

Key Building Blocks:

Antiseptics

- Chlorhexidine for Anti-Gingivitis
- Cetylpyridinium Chloride for Halitosis

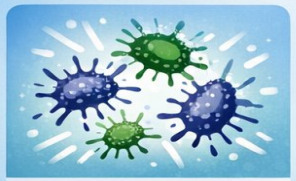
Carriers:

- Alcohol or Water
- Essential Oils: Menthol, Thymol

Fluorides:

- Sodium Fluoride for Anticavity Protection

How It Works:



Lyses Bacteria

Binds to Tissues

Stimulates Saliva

Key Principles Summary Across Products

Hair Care

- pH Balance & Mild Surfactants
- Antifungals for Dandruff
- Targeted Agents

Oral Care

- Fluoride for Protection
- Abrasives for Cleaning
- Tubule Blockers for Sensitivity

Common Themes

- Natural Derivatives for Mildness
- Preservatives for Stability
- Multifunctional Ingredients

Safety

- Low Irritation & Biodegradability in Hair
- Controlled Abrasivity in Oral Care

ASSESSMENTS


The Anti-Dandruff Speed Test
10-Second Rinse & Rush
10 SECONDS
1 Week Later...
DANDRUFF STILL PARTYING!
Proper Contact Time
LEAVE ON 3-5 MINUTES
Antifungal Shampoo
TARGETED ATTACK!
Malassezia Resistant...?
Or Were You Impatient?
Active Ingredients Need Time to Work!
Zinc Pyrithione
Ketoconazole
Other Antifungals
THE LESSON:
Contact Time is Essential!
For Antifungals to Work Effectively


The Whitening Toothpaste Illusion
You use a whitening toothpaste faithfully,
but continue drinking tea and coffee all day.
Your teeth look... exactly the same.
WHITENING TOOTHPASTE
=
=
Is the toothpaste weak—Or is your lifestyle stronger than abrasives?
Why can't high-RDA toothpaste solve a chemistry problem caused by diet?
Hidden Lesson:
Whitening relies on controlled abrasivity and stain chemistry, not miracles.

REFERENCES :

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2) Cosmetics– Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3) Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.


thank you