**Cosmetics: hair dyes**

**Check points of hair dyes**

<table>
<thead>
<tr>
<th>Properties</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity, Hardness, Stability</td>
<td>Viscosity for shampoo type, hardness for cream type after conditioning at 30°C for 24 hours</td>
</tr>
<tr>
<td>pH</td>
<td>pH measurement of 10% diluted solution</td>
</tr>
<tr>
<td>Drop movement</td>
<td>Measure the running distance after dropping the Mixture of phase 1 and 2 on an inclined (67.5°) surface</td>
</tr>
<tr>
<td>Color difference</td>
<td>CIE L*, a*, b* and ΔE by using a color measurement instrument</td>
</tr>
<tr>
<td>Dye penetration</td>
<td>Microscopic observation of cross-section of dyed human hair</td>
</tr>
<tr>
<td>Stability of oxidizing agent</td>
<td>Titration of hydrogen peroxide after neutralization at 100°C water for 48 hours with reduction less than 4%</td>
</tr>
</tbody>
</table>

**Cosmetics: hair dyes**

**Check points after dyeing**

<table>
<thead>
<tr>
<th>Tests</th>
<th>method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical damage measurement</td>
<td>Quantitative analysis of Cationic fluorescent dye stained on the sulfonic acid which was formed after dyeing (by using HPTLC)</td>
</tr>
<tr>
<td>Physical damage measurement</td>
<td>Friction Test</td>
</tr>
<tr>
<td>Shampoo Test</td>
<td>Color change measurements after shaking in shampoo solution for 3 min (5 times repeat)</td>
</tr>
<tr>
<td>Ultraviolet Test</td>
<td>Fadometer test</td>
</tr>
</tbody>
</table>

**Pharmaceutical applications**

**Pharmaceutical applications**

**Colorants purpose in pharmaceutical preparation**

- Increase aesthetic appearance
- For identification
- Insoluble colors or pigment contributes to the stability of light
- The psychological effects of color
  - Red area, warm colors = warmth, comfort/anger hostility
  - Blue area, cool colors = calm/sadness
Pharmaceutical applications

**Ideal properties of colorants**

- **Nontoxic** & no physiological activity & free from harmful Impurities
- Stable on storage: Unaffected by light, temp., hydrolysis and micro-organisms
- Compatible with medicaments and not interfere with them
- High coloring power (tinctorial strength): use small quantities
- Assay is practicable and easier
- Should not be appreciably adsorbed on to suspended matter
- Ready solubility in water but some oil-soluble and spirit-soluble colors are necessary
- Free from objectionable taste and odor
- Readily available and inexpensive

---

**Organic dyes and their *lakes***

*A Lakes have been defined by the FDA as the "Aluminum salts of FD&C water soluble dyes extended on a substratum of alumina".*

- Lakes are formed by the precipitation and absorption of a dye on an insoluble base or substrate.

**B. Inorganic colors or mineral colors**

**C. Natural colors or vegetable and animal colors**

---

### Dyes Lakes

▶ Are insoluble and color by dispersion.
▶ Particle size of lakes is very critical to their coloring capacity: smaller the particle size, the higher the tinctorial strength due to increased surface area for reflected light.
▶ Insoluble enables the drying stages to be performed more quickly.
▶ The opacity of the system minimizes the defect of tablet surface depressions.
▶ Good color reproducibility.
▶ Soluble in propylene glycol and glycerin.
▶ Wider range of shades or hues with higher coloring power.
▶ Cheap.

#### Table 1: Typical characteristic properties of Aluminum lakes

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average particle size</td>
<td>5-10 μm</td>
</tr>
<tr>
<td>Moisture content</td>
<td>12-15%</td>
</tr>
<tr>
<td>Oil absorption</td>
<td>40-45 (s)</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.7-2.9 g/cm³</td>
</tr>
<tr>
<td>pH stability range</td>
<td>4.0-8.0</td>
</tr>
</tbody>
</table>

**Pharmaceutical applications**

**Classification**

- Stability towards light
- Some of them have useful opacifying capacity (e.g. TiO₂)
  → to color and opacify hard gelatin capsules
- Wide regulatory acceptance: most useful for multinational companies wishing to standardize international formulae.
- Limited range of colors
- Many mineral colors have toxic effects and have been replaced by synthetic dyes.
Extraction from a natural source
A wide acceptability
Low stability to light
Variation in coloring power and difficulty of standardization
The tinctorial power is very low and fugitive in solution
Less readily available and more expensive

The only three left in the codex are caramel, cochineal and carmine.
Caramel: formerly called burnt sugar, prepared by heating water-soluble carbohydrates with an accelerator until a black viscid mass is formed
Cochineal: a dried insect
Carmine: the aluminum lake of the coloring matter of cochineal.

Caramel color is one of the oldest and most widely used food colorings widely approved for use in food globally but application and use level restrictions vary by country.
found in many foods and beverages including:
batters, beer, brown bread, buns, chocolate, cookies, cough drops, spirits and liquor such as brandy, rum, and whisky, chocolate-flavored confectionery and coatings, custards, decorations, fillings and toppings, potato chips, dessert mixes, doughnuts, fish and shellfish spreads, frozen desserts, fruit preserves, glucose tablets, gravy, ice cream, pickles, sauces and dressings, soft drinks (especially colas), sweets, vinegar, and more.

Other examples for natural colorants include Riboflavin and Anthocyanins, Paprika Oleoresin, Annatto, Beet Root Red, Curcumin [Turmeric].

Capsaicin
Riboflavin (Vitamin B2)
Anthocyanins
Pharmaceutical applications

Natural colors or vegetable and animal colors

> Other examples for natural colorants include Riboflavin and Anthocyanins, Paprika Oleoresin, Annatto, Beet Root Red, Curcumin [Turmeric].

![Riboflavin](image1)

![Anthocyanins](image2)

![Paprika Oleoresin](image3)

![Annatto](image4)

![Beet Root Red](image5)

![Curcumin](image6)

![Riboflavin](image7)

![Anthocyanins](image8)

![Paprika Oleoresin](image9)

![Annatto](image10)

![Beet Root Red](image11)

![Curcumin](image12)

Pharmaceutical applications

Physical and chemical properties

<table>
<thead>
<tr>
<th>FD&amp;C name</th>
<th>Chemical class</th>
<th>Stability to Light</th>
<th>Stability to Oxidation</th>
<th>Stability to pH change</th>
<th>Toxicity strength</th>
<th>Hue</th>
<th>Solubility (g/100ml) Water</th>
<th>Solubility (g/100ml) 25°C</th>
<th>Solubility (g/100ml) E10H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red No. 3 (Erythrosine)</td>
<td>Xanthine</td>
<td>Poor</td>
<td>Fair</td>
<td>Poor</td>
<td>V. good</td>
<td>Bluish pink</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Red No. 40</td>
<td>Monosazo</td>
<td>U. good</td>
<td>Fair</td>
<td>Good</td>
<td>V. good</td>
<td>Yellowish red</td>
<td>22</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Yellow No. 6 (T breast Yellow FCF)</td>
<td>Monosazo</td>
<td>Moderate</td>
<td>Fair</td>
<td>Good</td>
<td>Good</td>
<td>Reddish</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Yellow No. 5 (Tartrazine)</td>
<td>Pyrazolone</td>
<td>Good</td>
<td>Fair</td>
<td>Good</td>
<td>Good</td>
<td>Lemon Yellow</td>
<td>20</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Green No. 3 (Fast Green FCF)</td>
<td>TPP*</td>
<td>Fair</td>
<td>Poor</td>
<td>Good</td>
<td>Excellent</td>
<td>Bluish green</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Blue No. 1 (Brilliant Blue FCF)</td>
<td>TPP*</td>
<td>Fair</td>
<td>Poor</td>
<td>Good</td>
<td>Excellent</td>
<td>Greenish Blue</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Blue No. 2 (Indigotin)</td>
<td>Indigoid</td>
<td>V. Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Deep blue</td>
<td>1.6</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>


Pharmaceutical applications

The food, drug, and cosmetic act

> FD&C colors: colorants that are certifiable for use in foods, drugs, and cosmetics.

> D&C colors: dyes and pigments considered safe in drugs and cosmetics when in contact with mucous membranes or when ingested.

> External D&C colors: colorants, due to their oral toxicity, are not certifiable for use in products intended for ingestion but are considered safe for use in products applied externally.

Pharmaceutical applications

E numbers

> Codes for substances that can be used as food additives for use within the European Union and Switzerland.

> The "E" stands for "Europe". They are commonly found on throughout the European Union.

> Safety assessment and approval are the responsibility of the European Food Safety Authority.

> E100-199 (Colors), E200-299 (Preservatives), E300-399 (antioxidants, acidity regulators), E400-499 (thickeners, stabilizers, emulsifiers), E500-599 (acidity regulators, anti-caking agents), E600-699 (flavor enhancers), E700-799 (antibiotics), E900-999 (glazing agents and sweeteners), E1000-1599 (additional chemicals).
**Pharmaceutical applications**

**Tartrazine**
- FD&C Yellow 5, E102, CI 19140
- Yellow or orange yellow powder
- Aqueous solutions are yellow
- Monoazo pyrazolone dye
- Used to improve the appearance of a product and to impart a distinctive coloring for identification purposes.
- US regulation require that prescription drugs for human use containing tartrazine bear the warning statement:
  "This product contains FD&C yellow #5 (Tartrazine) which may cause allergic-type reactions (including bronchial asthma) in certain susceptible persons."

**Pharmaceutical applications**

**Sunset Yellow FCF**
- FD&C Yellow 6, CI 15985, E110
- Reddish yellow powder, and aqueous solutions are bright orange
- Monoazo dye
- Often used in conjunction with E123, Amaranth, in order to produce a brown coloring in both chocolates and caramel.

**Pharmaceutical applications**

**Quinoline Yellow SS**
- FD&C Yellow 11, Solvent Yellow 33, CI 47000
- Bright yellow dye with green shade
- Insoluble in water, but soluble in non polar organic solvents
- Used in spirit lacquers, polystyrene, polycarbonates, polyamides, acrylic resins, and to color hydrocarbon solvents.
- Also used in externally applied drugs and cosmetics

**Pharmaceutical applications**

**Brilliant Blue FCF**
- FD&C Blue 1, Eriosty Blue, E133, CI 42090,
- Can be combined with Tartrazine (E102) to produce various shades of green.
- Widely used in saps, shampoos, mouth washes, and other hygiene and cosmetics applications.
- May induce an allergic reaction in individuals with preexisting & moderate asthma
Pharmaceutical applications

Indigo carmine

- FD&C Blue 2, E132, CI 73015
- Dark blue powder and aqueous solutions are blue or bluish purple
- Primary use is as a pH indicator
- Used with yellow colors to produce green colors.
- Used as a dye in the manufacturing of capsules

β-carotene

- CI 75130(natural) 40800(synthetic), E160a
- Pure state as red crystals: varying from pale yellow to dark orange
- Used as a color for sugar-coated tablets
- Very unstable to light and air: should be securely packaged
- Particularly unstable when used in spray-coating processes, probably owing to atmospheric oxygen attacking the finely dispersed spray droplets.
- Because of its poor water solubility, β-carotene cannot be used to color clear aqueous systems, and cosolvents such as ethanol must be used.
- Suppositories have been successfully colored with β-carotene in approximately 0.1% concentration

Erythrosine

- FD&C Red 3, E127, CI 45430
- Organoiodine compound, a derivative of fluorone.
- The lake of erythrosine has been delisted in the USA since 1990, following studies in rats that suggested that it was carcinogenic.
- However, erythrosine was not regarded as being an immediate hazard to health: chronic ingestion can cause cancer

Allura Red AC

- FD&C Red 40, Food Red 17, E129,, CI 16035
- Dark red powder approved by the US FDA for use in cosmetics, drugs, and food.
- May have slightly less allergy or intolerance reaction but people with skin sensitivities should be careful
- Not recommended for consumption by children: cancer in mice
- It is banned in Denmark, Belgium, France, Germany, Switzerland, Sweden, Austria and Norway.
Chap5- 73

Pharmaceutical applications

**The Real Truth on Red Food Dye**

Red Dye #3 is considered a carcinogen and yet it is still used in mass food production. Did you know that compounds in food dyes are linked to allergies, learning problems, hyperactivity and mood disorders in children?

**Red #2** - carcinogenic; increases bladder tumor risk found on Florida oranges.

**Red #1** - thyroid carcinogen; banned from external use products; found in maraschino cherries, sausage and candy among others.

**Red #4** - most common food dye; linked to allergies and ADHD in children; found in candy, cereal, desserts, drugs and cosmetics among others.

**Yellow #3** - currently undergoing testing; linked to behavioral problems in children; found in beverages, candy, gelatin, pharmaceuticals and cosmetics among others.

**Yellow #4** - currently undergoing testing; suspected of causing adrenal tumors and hyperactivity; found in baked goods, cereal, candy, gelatin and cosmetics among others.

**Yellow #6** - currently undergoing testing; suspected of causing kidney tumors; found in beverages, candy, cereal and pharmaceuticals.

**Red #6** - currently undergoing testing; suspected of increasing tumor risk - especially of the brain; found in beverages, candy, pet food and pharmaceuticals.

www.undergroundhealthreporter.com

Chap5- 74

Pharmaceutical applications

**Fast Green FCF**

- FD&C Green 3, Food Green 3, E143, CI 42053
- Triarylmethane structure
- Its use as a food dye is prohibited in EU and some other countries
- is the least used of the seven main FDA approved dyes in USA

![Triarylmethane](image)

Chap5- 75

Pharmaceutical applications

**Quinizarin Green SS**

- D&C Green 6, Solvent Green 3, CI 61565
- Green dye, an anthraquinone derivative.
- Appearance of a black powder with m.p of 220~221°C.
- Insoluble in water
- Used for adding greenish coloring to materials: cosmetics and medications

Chap5- 76

Pharmaceutical applications

**Titanium dioxide**

- Pigment White 6, CI 77891, E171
- An effective opacifier in powder form, where it is employed as a pigment to provide whiteness and opacity to products
- Applications: paints, coatings, plastics, papers, inks, foods, toothpastes and medicines (i.e. pills, tablets and also in topical pharmaceutical formulations)
Pharmaceutical applications

Iron oxides

- Pharmaceutical applications: Iron oxide black, Iron(III) oxide hydrated, Iron oxide red, and iron oxide yellow monohydrate
- The color depends on the particle size and shape, and the amount of combined water
- UV absorbers
- Becoming of increasing importance as inorganic colorants
- Have restrictions in some countries on the quantities

- Iron oxide black
- Iron oxide red
- Iron oxide yellow monohydrate

Coloring systems for dosage forms

- Tablets
- Tablet coating
- Capsules
- Liquid products
- Ointment s & salves
- Tooth pastes

- Colorant is to be incorporated.
- Should meet as many characteristics as the ideal colorant.

Pharmaceutical applications

Tablets – Wet granulation

- Common approach to coloring a tablet formulating
- Dissolving water-soluble dyes in a binding solution
- Disadvantages
  - during drying of the granulation, the soluble colors migrate
  - more than one color, the dyes may migrate at different rates
  - have a mottled appearance
- Solutions
  - starches, clays, and talc absorb the dye
  - Reducing the migration (not eliminating)
  - by using lakes or other pigments (not insoluble)
  - light stability of the product will be improved

Tablets – Direct compression

- economic reason
- The number of processing steps reduced, requires blending only
- lakes and other pigments are used (elimination of the wetting step)
- Disadvantage
  - poor blending -> color specking and “hot spots.”
- Solutions
  - can be minimized by pre-blending the pigment
  - with other small ingredients before addition to the entire mixture; reduce pigment particle agglomeration
Pharmaceutical applications

Tablets coating – sugar coating

- Patented by Arnold Nicholson and Stanley Tucker
- Very time-consuming and delicate operation.
- Before the 1950s, traditional color coating used soluble dyes as the prime colorant.
- Can produce the most elegant tablet but, dye being soluble.
- Color migration readily occurs in the drying stage. Not handled properly ⇒ non-uniform distribution of color or mottling.
- Small depressions or irregularities in the surface ⇒ non-uniform color.
- Many smoothing coats are needed before any color can be applied.
- Need to care - do not become over colored.
- Syrups
  - Increasing dye concentrations are used to control mottling.
  - Essentially aluminum lake and a pacifier dispersed in a syrup solution.
  - Produced brightly colored, elegant tablets.
  - Eliminated many of the problems about sugar-coating techniques.

Sugar coating is a multistage process and can be divided into the following steps:

1. Sealing of the tablet cores-against water
2. Subcoating-to attain rounded sugar coated tablet
3. Smoothing- sucrose syrup
4. Coloring- Nearly all sugar-coated tablets are colored
5. Polishing- to acquire an acceptable appearance
6. Printing - To facilitate identification

Pharmaceutical applications

Tablets coating – film coating

- Application of a film-forming polymer onto the surface of substrate
- Polymers also contains plasticizers and colorants-to achieve the desired properties.
  - The polymer and the plasticizer dissolved in a solvent ->to form a coating solution ->the colorants can be dissolved or dispersed.
    (used organic solvents for polymer solution)
- Today, aqueous systems for environmental reasons (replaced the organic solvent)
  - Disadvantage
    - Color migration on drying of the films
    - relatively thin-> small differences in film thickness ->color variation.
  - Success in using pacified dye systems; But, poorer light stability
  - The colorants - lakes and inorganic pigments.
    - reduce moisture diffusion through film and improve light stability

Temperature control of the film coating dryers is important. In general, the dryer should be designed to provide hot and cold air to control the rate of drying.
Ideal characteristics of a film coating polymer

- **Solubility**: good solubility in aqueous fluids
- **Viscosity**: low viscosity for given concentration to permit easy trouble-free spraying
- **Permeability**: to optimize the shelf-life of a tablet preparation, some polymers are efficient barriers against the permeability of water vapor or other atmospheric gases
- **Mechanical properties**: sufficient coating strength to prevent cracks

Pharmaceutical applications

**Tablets coating – film coating**

To modify the physical properties of the polymer ⇒ One important property is their ability to decrease film brittleness.

In general, only water-miscible plasticizers can be used for aqueous-based spray systems.

Examples of plasticizers are:
- polyols, such as polyethylene glycol 400
- organic esters, such as diethyl phthalate
- oils/glycerides, such as fractionated coconut oil.

Pharmaceutical applications

**Tablets coating – film coating: film forming polymers**

- Hydroxypropyl methylcellulose
- Methylcellulose and hydroxypropyl cellulose
- Methacrylate amino ester copolymers

Pharmaceutical applications

**Tablets coating – film coating: plasticizer**

- Water-insoluble colors (pigments).

Pigments have certain advantages over water-soluble colours:
- they tend to be more chemically stable towards light,
- provide better opacity and covering power,
- optimize the impermeability of a given film to water vapor.

Examples of colorants are:
- iron oxide pigments
- titanium dioxide
- aluminium Lakes.
Pharmaceutical applications

Sugar coating vs film coating

<table>
<thead>
<tr>
<th>Features</th>
<th>Sugar coating</th>
<th>Film coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Rounded with high degree of polish</td>
<td>Retains contour of original core. Usually not as shiny as sugar coat types</td>
</tr>
<tr>
<td>Weight increase due to coating materials</td>
<td>30-50%</td>
<td>2-3%</td>
</tr>
<tr>
<td>Logo or 'break' lines</td>
<td>Not possible</td>
<td>Possible</td>
</tr>
<tr>
<td>Other solid dosage forms</td>
<td>Coating possible but little industrial importance</td>
<td>Coating of multiparticulates very important in modified release forms</td>
</tr>
<tr>
<td>Process</td>
<td>Multistage process</td>
<td>Usually single stage</td>
</tr>
<tr>
<td>Stages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical batch coating time</td>
<td>Eight hours, but easily longer</td>
<td>1.5-2 hours</td>
</tr>
<tr>
<td>Functional coatings</td>
<td>Not usually possible apart from enteric coating</td>
<td>Easily adaptable for controlled release</td>
</tr>
</tbody>
</table>

- Capsules are colored primarily using FD&C or D&C colorants (sometimes an opacifying agent such as Titanium dioxide)
- Colored using water-soluble dyes -> solution of these colors is simply added to the gelatin melt
- The pH can alter the shade of the color.
- It is also important to control the tackiness of the capsule wall because variations can change color intensity.
- If the active ingredient is photosensitive -> opaque capsule (contain pigments or dyes and an opacifier)
- Spin printing: color identify capsules through the use of colored imprinting inks.

- Capsules: hard gelatin capsules
  - one piece, hermetically sealed, soft gelatin shells containing a liquid, a suspension, or a semisolid
  - Color used in shell has to be darker
  - Opacifier, usually Titanium dioxide, may be added to produce an opaque shell, to prevent photo degradation of light sensitive fill ingredients.

- Capsules: soft gelatin capsules or soft gels
  - Dyes should be completely soluble in the particular solvent & at the required concentration
  - Dyes that correspond to the flavor will be chosen
  - Factors influencing the shade and stability of dyes in the liquid system
    - pH, microbiological activity, light exposure in the final product package, the compatibility of the dye with other ingredients
  - The lowest possible concentration of dye needed to give the desired color should be used -> higher concentrations can result in a dull color
  - Do not added dye directly to the bulk mixing tank -> difficult to determine and could cause additional problems
  - In non-aqueous systems, (solubility restrictions) the use of pigments is necessary.
  - If pigments are chosen as the colorants, it may be necessary to predispersed them before adding them to the final product.

- Liquid products
  - Dyes should be completely soluble in the particular solvent & at the required concentration
  - Dyes that correspond to the flavor will be chosen
  - Factors influencing the shade and stability of dyes in the liquid system
    - pH, microbiological activity, light exposure in the final product package, the compatibility of the dye with other ingredients
  - The lowest possible concentration of dye needed to give the desired color should be used -> higher concentrations can results in a dull color
  - Do not added dye directly to the bulk mixing tank -> difficult to determine and could cause additional problems
  - In non-aqueous systems, (solubility restrictions) the use of pigments is necessary.
  - If pigments are chosen as the colorants, it may be necessary to predispersed them before adding them to the final product.
**Pharmaceutical applications**

**Ointments and salves**

- Dyes and pigments can be used.
- Pigments are preferred because they will not migrate to the surface.
- To incorporate the pigments, it may be necessary to blend the pigment and the product on a roll or ointment mill.

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**Tooth pastes**

- A major problem impacting the aesthetic appearance of striped toothpaste is the bleeding or migration of color from one component into another. This is especially severe if one colored component is applied to the surface of a white base. For this reason, a colorant that exhibits substantially no visible bleeding is required.
- The high density polyethylene entrained colorants of the present invention unexpectedly are substantially non-bleeding when present in conventional toothpaste or gel formations, particularly when contrasted with similar colorants entrained in wax and synthetic polymeric resins including paraffin wax and low density polyethylene. For example, the colorant may be entrained in the High Density Polyethylene* (HDPE) matrix using methods of encapsulation.

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**Blending of colorants**

- The permitted colors most popular tints and shades can be obtained by blending.
- Color combinations can attract or distract. So, while blending the colorants to produce different shades, require knowledge about the individual colorant.
- The National Formulary of the United States gives information on the proportion of various water soluble and oil soluble dyes 
⇒ to give particular hues to liquid preparations and drug powders.

---

**Colorants should be protected during processing, use and storage, against**

1. Oxidizing agents, reducing agents
2. Microorganism
3. Extreme pH levels (should not be used below pH 5.0)
4. Minimize the exposure of products to direct sunlight, especially products containing dye blends.
Pharmaceutical applications
Stability and storage conditions

- Lakes, inorganic dyes, and synthetic dyes – should be stored in well-closed & light-resistant containers at a temperature below 30°C.
- Natural and nature-identical colors - storage conditions are important to extend shelf life ⇒ sealed in containers under nitrogen
- To compensate for losses during processing and storage, some formulators add a slight excess of dye at the beginning.
  - This approach should be cautiously employed since one can obtain unattractive shades when too much color is added at the beginning