**Suspensions**: dispersion of a solid in a liquid phase

**Particle Size:**
- **Coarse** – 10-50um; visible to naked eye (suspensions and emulsions); think of suspension that we would add water to or compound
- **Fine** – 0.5 to um; ex. gels
- **Colloidal** – 1 to 1000 nm; ex. milk

**Reasons for Suspensions**
- Drug stability in suspension may be better
- Easier to administer
- Flexibility in dosing
- Masking awful taste

**Characteristics of a Good Suspension**
- Slow sedimentation
- Readily dispersed
- Particle size (not growing in suspension)
- Uniform dosage form

**Stokes Law** (factors that affect settling)
- Large diameter particles settle faster
- Dense particles settle faster
- Density of medium lessen settling (more dense, less settle)
- More viscous, less setting
- DO not forget about gravity

**Extemporaneous Preparation of a Suspension**
1. Medium should be viscous
2. Suspending agent will coat particles to lessen aggregation
3. This coating means easier dispersion when shaken
4. Get smaller particles (think micronized powdered drugs or trituration)

**More on the Extemporaneous Preparations of a Suspension**
- Know the characteristic of drug and medium
- Consider wetting the drug powders
  - **For aqueous**: water soluble wetting agent (glycerin, alcohol)
  - **For non-aqueous**: oil soluble wetting agent (mineral oil, olive oil, corn oil)
**Procedure of Extemporaneous Prep with Wetting**

*Wet* suspending agent with glycerin, add water, and **triturate** the **medium** (this is hydration)

*Triturate* drug in a separate mortar (real fine), then **wet** with wetting agent

Once agent is hydrated and drug is wet, **add** suspending agent to drug in geometric proportion and trituration

Get it **homogenous**

**Transfer** to conical graduate for measurement of volume and qs to final volume

<table>
<thead>
<tr>
<th>Dispersion Media/Suspending Agents</th>
<th>What you want in a Suspending Agent</th>
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<tbody>
<tr>
<td><strong>Synthetic celluloses</strong>: ex. anything with the ending cellulose</td>
<td>Used in <strong>small</strong> quantities relative to drug (think of geometric mixing)</td>
</tr>
<tr>
<td><strong>Polymeric System</strong>: ex. polyvinylpyrrolidone</td>
<td>Should <strong>increase</strong> viscosity (prevent settling)</td>
</tr>
<tr>
<td><strong>Natural gums</strong>: ex. xanthan gam, acacia gum, tragacanth gum</td>
<td>Not too viscous though (need to <strong>redisperse</strong>)</td>
</tr>
<tr>
<td><strong>Clay</strong>: ex. Bentonite</td>
<td>Should <strong>coat</strong> particles (prevent aggregation)</td>
</tr>
<tr>
<td></td>
<td>Should <strong>not bind drug</strong> (this is decrease the bioavailability)</td>
</tr>
</tbody>
</table>

**Alteration of Existing Dosage Form to Prepare a Suspension**

Think of **shelf-life**. The drug may degrade faster in liquid.

There are **handbooks** with stability references (Handbook of Ped/Ger Care, Trissel’s Handbook, Journal of Pharmaceutical Compounding). You can also **read the package insert or contact the manufacturer**. And of course, **google**.

This is important because you **MUST** supply the expiration date on the label. Be conservative and think of the patient – ask dose and length of treatment to make sure the suspension will remain fresh until then.
## Cautions

**Neonates**: no preservatives, no coloring agents, no flavors, no alcohol

**Geriatric**: similar but think of drug and excipient interactions (ex. alcohols and antidepressant)

**Avoid parenteral dosing** for oral formulation

- They have **preservatives**.
- They have **co-solvents**.
- They might have **high amounts of base**.

Avoid using **controlled released oral dosage** (ex. SR, CR, RA) or EC (could irritate the stomach)

Consider purchasing pure drug entity from wholesalers

### Mixing Suspensions Together

- Make sure the ingredients of both are compatible
- Look for stability data for the mixing of two particular suspensions
- Look for stability data in mixing suspensions with syrup or elixir formulations

### An example of an Incompatibility

A mixture used for mouth sores that involved lidocaine viscous, Benadryl elixir, Maalox

- **Lidocaine viscous** – weak base
- **Benadryl elixir** – weak base and alcohol
- **Maalox** – strong base

The stability of the lidocaine and diphenhydramine goes down. Alcohol concentration also goes down. Precipitates form. A mess.