Effects of Magnesium stearate on Tablet Properties

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BIG PICTURE

• Rutgers Pharmacy: Dr. Kalyana Pingali

*Overall Goal ➔ To decrease the time for a drug to take effect.*
OUR OBJECTIVE

• LUBRICANTS...? THE GOOD AND THE BAD:
  - prevent powder from sticking and building up in machines
  - decrease the effectiveness of the active drug

Goal: To find the ideal amount of lubricant that will maximize drug efficiency and production safety.
METHOD

• 1%, 2% 3% MgSt

• Other ingredients: acetaminophen, avicel, pharmatose, cab-o-sil

• Blend, Sieve, Shear, Tablet Press

• Tested the tablets for certain properties...
Method: Play by Play
IDEAL TABLET PROPERTIES

1. Uniformity $\rightarrow$ low standard of deviation of weight and hardness

2. Low Hydrophobicity $\rightarrow$
   high solvent penetration rate

3. High Dissolution $\rightarrow$
   high percent of drug release
UNIFORMITY

• **Obj**: Complete homogeneity, consistency of weight, and high hardness.

  - *Blend/sieve the powder mixture thoroughly*
  - *Balance—Record weight*
  - *Hardness Test*
IDEAL TABLET PROPERTIES

1. Uniformity ➔
   Weight: ✭
   Hardness.

2. Low Hydrophobicity ➔

3. High Dissolution ➔
# Tablet Hardness

<table>
<thead>
<tr>
<th>% MgSt</th>
<th>Hardness (N)</th>
<th>Hardness RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>175.88</td>
<td>0.085062</td>
</tr>
<tr>
<td>2</td>
<td>154.52</td>
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**Conclusion:** 1% MgSt yields harder tablets at a higher consistency.
IDEAL TABLET PROPERTIES

1. Uniformity ➔
   Weight:
   Hardness.

2. Low Hydrophobicity ➔

3. High Dissolution ➔
HYDROPHOBOICITY

- **Obj**: Low hydrophobicity so drugs may dissolve faster.

Washburn equation $\Rightarrow \frac{\eta}{C\rho^2 \gamma \cos \theta} = \frac{t}{m^2}$

**Hydrophobicity** $= \frac{t}{m^2}$

Hydrophobicity is the slope of the plot of time vs. $m^2$. 
Hydrophobicity Between Different Concentrations of Magnesium Stearate as a Function of Mass of Aborption Squared and Time

3% MgSt: $y = -31088x + 21.92$

2% MgSt: $y = 1240.4x + 4.7818$

1% MgSt: $y = 44.152x + 2.9342$
Hydrophobicity

**Conclusion:** 1% MgSt absorbs the most liquid (Thus, least hydrophobic).
IDEAL TABLET PROPERTIES

1. Uniformity ➔
   Weight: 🟢
   Hardness:

2. Low Hydrophobicity ➔

3. High Dissolution ➔
Dissolution

• *Obj*: High dissolution for quicker drug release.

Dissolution = rate tablet dissolves
More tablet dissolves – more drug released

Dissolution depicts the effectiveness of the lubricant
• **Result:** 1% MgSt has the highest drug release.
IDEAL TABLET PROPERTIES

1. Uniformity →
   Weight: ✭
   Hardness: ✭

2. Low Hydrophobicity →

3. High Dissolution →
CONCLUSION

• 1% MgSt:
  - Least variability in tablet hardness, highest hardness
  - Least variability in tablet weight
  - Least hydrophobicity
  - Highest dissolution rate
  - Nearly double the amount of drug released after 30 mins (compared to 2% or 3% blends)
Thank You!

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