Who Knew You Could Make Glue From Milk?

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Research Question
How does fat content in milk affect the adhesion ability of casein glue?
Why Glue?

Milk Composition: 87.7% Water, 4.9% Lactose, up to 3.4% Fat,
3.3% Protein, 0.7% Minerals

Difference Between Skim Milk, 50% Fat Milk,
and Whole Milk → Fat Content

Curds—part of milk that coagulates
Whey—liquid remaining after milk
has been curdled
Casein Protein—a phosphoprotein in milk
Hypothesis

Whole milk will produce the most adhesive glue because the fat in the milk will help create a smooth, glue-like texture we see in everyday glue.
# Experiment Results

Table A: Force Needed to Break Sticks for Glue From Different Types of Milk

<table>
<thead>
<tr>
<th>Type of Milk</th>
<th>Average Force Needed to Break Sticks (Newtons) (±0.01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim Milk</td>
<td>52.72 Newtons</td>
</tr>
<tr>
<td>50% Fat Milk</td>
<td>40.94 Newtons</td>
</tr>
<tr>
<td>Whole Milk</td>
<td>30.09 Newtons</td>
</tr>
</tbody>
</table>
Conclusion

• Glue In Order of Decreasing Adhesion Ability:
  Skim Milk
  50% Fat Milk
  Whole Milk

• Why? Fat Interferes with Casein Polymerization
• Compared to Elmer’s Glue
Evaluation

👍 Strengths:
• Precise Measuring Devices
• Controlled for Drying Time and Amount of Glue
• Many Trials

👎 Weaknesses:
• Drying Time Did Not Allow Complete Drying
• Ratios Not Adjusted For
• Reuse of Materials
Improvements

• Calculation of Ratios
• Better Choice of Drying Time
• Alternative Methods for Testing Force
• More Materials
Works Cited


Images

- http://biology.clc.uc.edu/Fankhauser/Cheese/Cheese_5_gallons/26_finish_curd_cutting_P3120290.jpg
- http://www.a1supplements.com/files/milkybig.jpg
- http://www.milkfacts.info/Structures/casein.JPG