Utilization of Poultry By-products in Adhesive Development
Nandika Bandara, Jianping Wu

Project timeline: September 2012 – March 2013

Summary

- The poultry industry generates huge amount of by-product annually in the means of feathers, poultry meal, mechanically separated meat residue and as spent hen.
- End value of such by-product is reduced due to limited applications.
- Developing value added products from poultry by-products will increase the economic value.

Problem

- Byproducts of poultry industry in Alberta per year a:

<table>
<thead>
<tr>
<th>Type of By-product</th>
<th>Total number of animal in Alberta</th>
<th>Live Weight (millions of kg)</th>
<th>Amount of byproduct available (millions of kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spent hen</td>
<td>2,457,000</td>
<td>3.69</td>
<td>2.76</td>
</tr>
<tr>
<td>Chicken</td>
<td>55,845,000</td>
<td>93.43</td>
<td>5.14</td>
</tr>
<tr>
<td>Turkey</td>
<td>1,727,000</td>
<td>14.81</td>
<td>0.81</td>
</tr>
<tr>
<td>Spent broiler breeders</td>
<td>572,776</td>
<td>2.00</td>
<td>1.50</td>
</tr>
</tbody>
</table>

*a: Numbers of animals were obtained from Statistics Canada “Poultry and Egg Statistics” (2012); “Cattle Statistics” (2012) and “Hog Statistics” (2012).

- Current main applications of poultry by-products is in the animal feed industry or disposal in landfills.
- Wood adhesives are mainly produced from petroleum based chemicals. eg: Urea formaldehyde, Phenol formaldehyde.
- Issues with synthetic wood adhesives: formaldehyde emission, non-renewability, environmental impact.
- Developing wood adhesives from by-product proteins:
  1. Eliminates the problems of synthetic adhesives
  2. Add value to the poultry by-products

Our Approach

Extraction of Protein from Mechanically Separated poultry meat residue (MSPM-R)

Modification of protein for wood adhesive:

Extracted proteins
Mix with water to prepare 5% w/v solution
Add modification agents (Urea and SDS)
Stir for 3 hr to denature protein
Testing the adhesion strength using automated bonding evaluation system (ABES II)

Our Observations

![Figure 1. Adhesion strength of protein extracted from mechanically separated poultry meat residue with optimized modification conditions](image)

- Increased adhesion strength after denaturing the proteins with urea and SDS
- Changes in the thermal transitions were observed in DSC after modifications
- Potential to use biomimetics to improve the adhesion strength

What Does this mean?

- Low adhesion strength from MSPM-R proteins compared to the spent hen protein adhesive developed in our lab – still within the requirement for wood adhesives used for internal applications
- Potential to use low value MSPM-R proteins alone or mixing with spent hen protein to develop strong wood adhesives

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Contact Information

Dr. Jianping Wu,
Phone: (780)492-6885
E-mail: jwu3@ualberta.ca

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Dr. Jianping Wu, Phone: (780)492-6885
E-mail: jwu3@ualberta.ca