# Making Adhesives from Agricultural Waste and By-Products

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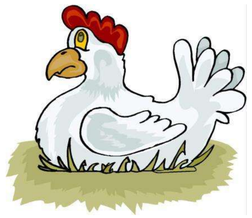
## Summary

In the **poultry industry**, as the hens near the end of their productive lives, they are of little economic value to the farmers and seen as a by-product or waste. One way to add value to spent hen products is to produce adhesives from their protein.

**Adhesive** bonding of wood plays an increasing role in the forest products industry and is a key factor for efficiently utilizing our timber resource.

Concerns over emissions have created the necessity for the industry to investigate new alternatives to petroleum-derived, synthetic adhesives.

## Summary Problem



A ***spent-hen*** is seen as a by-product or waste of the poultry industry which requires disposal.

***Traditional uses, handling and limitations:***

**Food ingredients**– lower economical efficiency and worse texture

**Feedstuffs** – safety concerns/perception

**Composted or Buried** – concern over environmental impact, animal welfare and the loss of nutrients

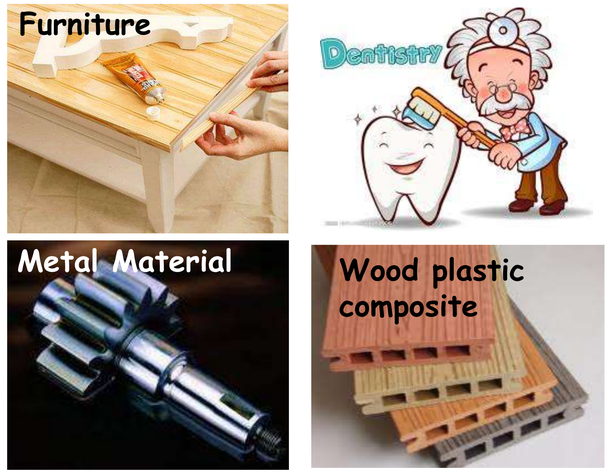
Finding methods of utilization, other than conventional food or feed uses, that could minimize nutrient and biohazard emissions into the environment while yielding residual value to the poultry industry is of great interest.

***Research direction:***

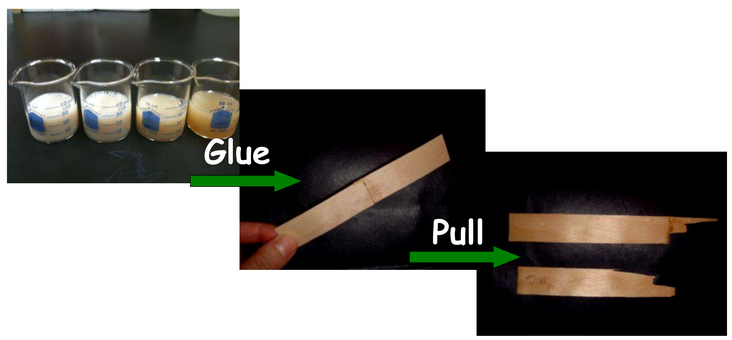
***How*** to improve the strength and water resistance of protein-based wood adhesives?

***How*** to develop economically-viable methods of protein extraction and adhesive preparation?

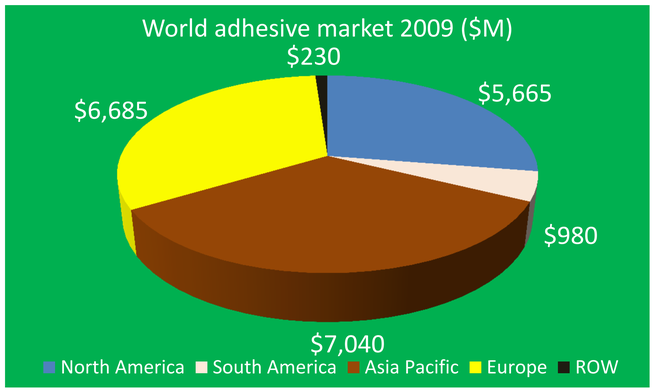
### Potential Application




### Photos of glued wood veneer before and after pull

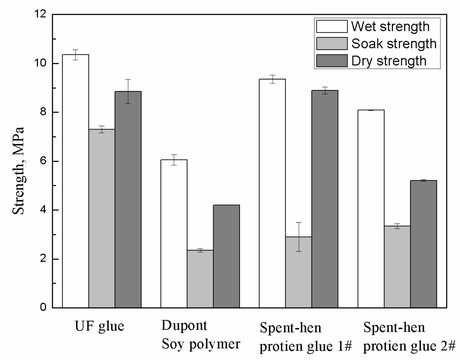



### Long-Term environmentally friendly wood adhesive Potential




## Our Approach

### The strength of the gules




This study reveals that agricultural waste and by-products can be used to create water-resistant wood adhesives through the modification of their proteins.

The protein-based adhesive has compatible properties with the commercial wood adhesives, such as urea formaldehyde (UF) or phenol formaldehyde (PF).

## Our Observation

Protein-based adhesive was successfully developed with improved performance, both in shear strength and water resistance.

Spent hen proteins are superior to soy proteins in preparing adhesive.

Advantages – long shelf life, free of formaldehyde, cost-saving in long-distance transportation.

Can be mixed with curing, modifier and water, and applied to laminate. It can also be mixed with wood fiber/flour to make wood/bio-plastic composite.

## Acknowledgements

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