

## Distillers co-products

- Since industrialized production of ethanol, co-products:
  - Have stimulated many new and unique research interests
    - Resulted in advances in nutritional principles
  - Have become a vital component of the overall P&L profile of ethanol production enterprises
  - Are widely used to improve productivity in meat and milk production systems

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Example of letting market determine price.  
How far off is it?

Corn distillers syrup

Versus

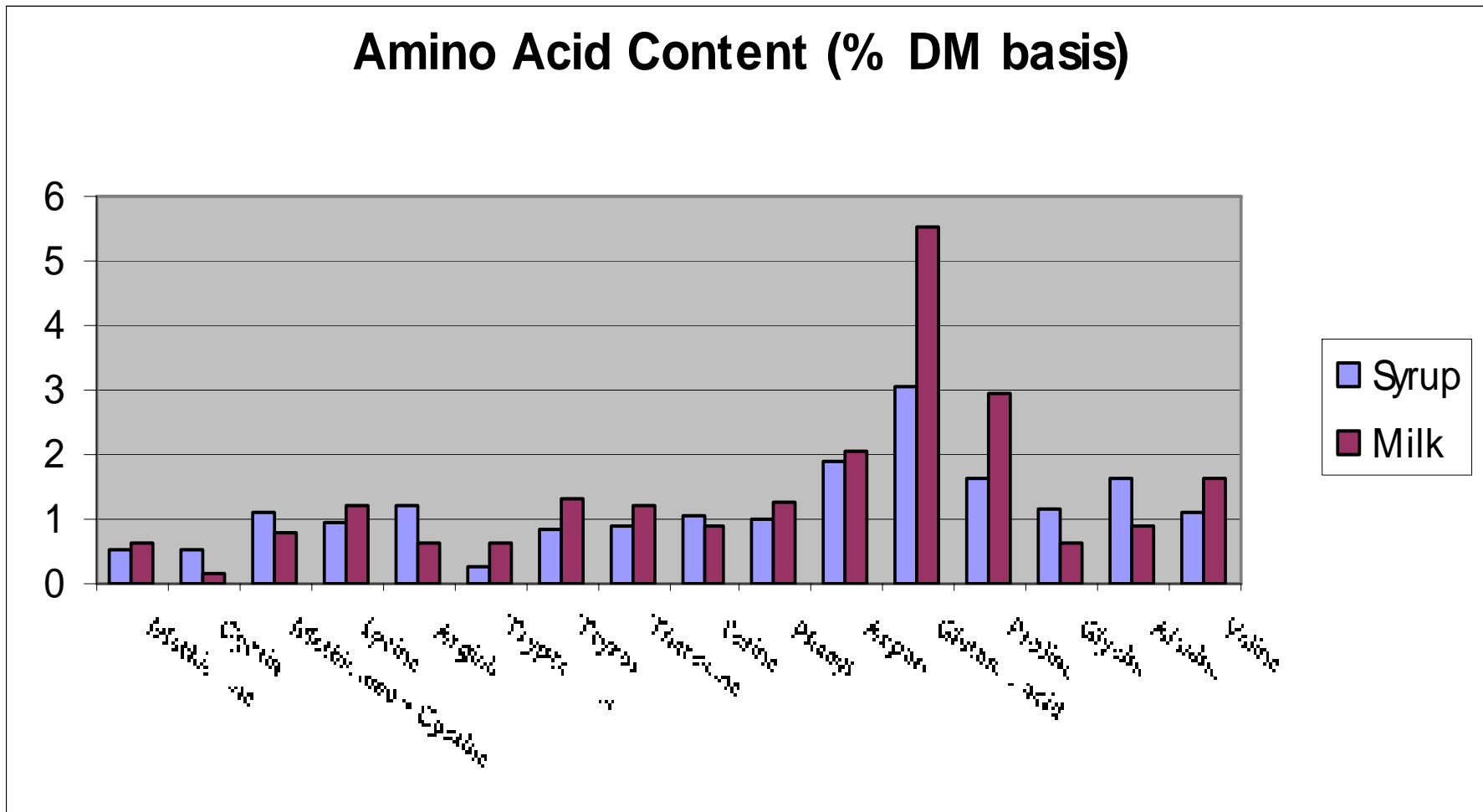
Whole milk



## Corn ethanol syrup example

Product	Amino Acids, % DM	Fat, % DM
Whole Milk	26	27
Corn Distillers Syrup	22	23

## Corn ethanol syrup example



## Biomass co-product

**Starch**

**Cellulose**

**Hemicellulose**

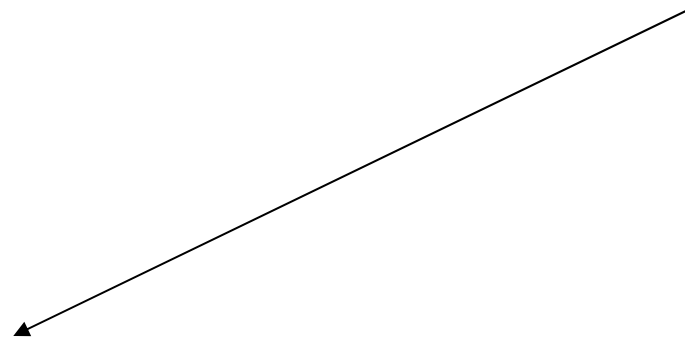
**Oil**

**Protein**

**Lignin**

## Biomass co-product

**Starch      Cellulose      Hemicellulose      Oil      Protein      Lignin**

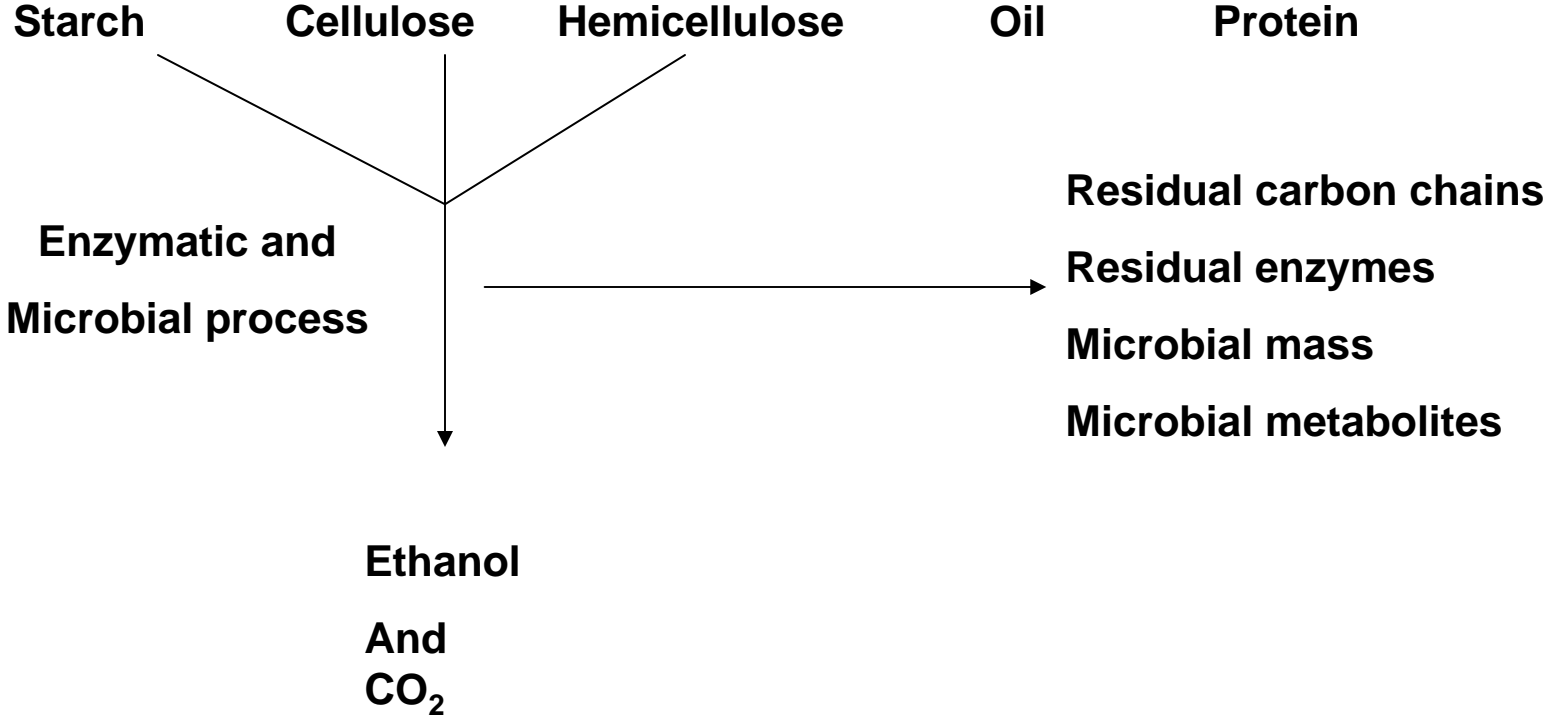


**Concrete binder, cosmetic base, feed pellet binder, suntan lotion**

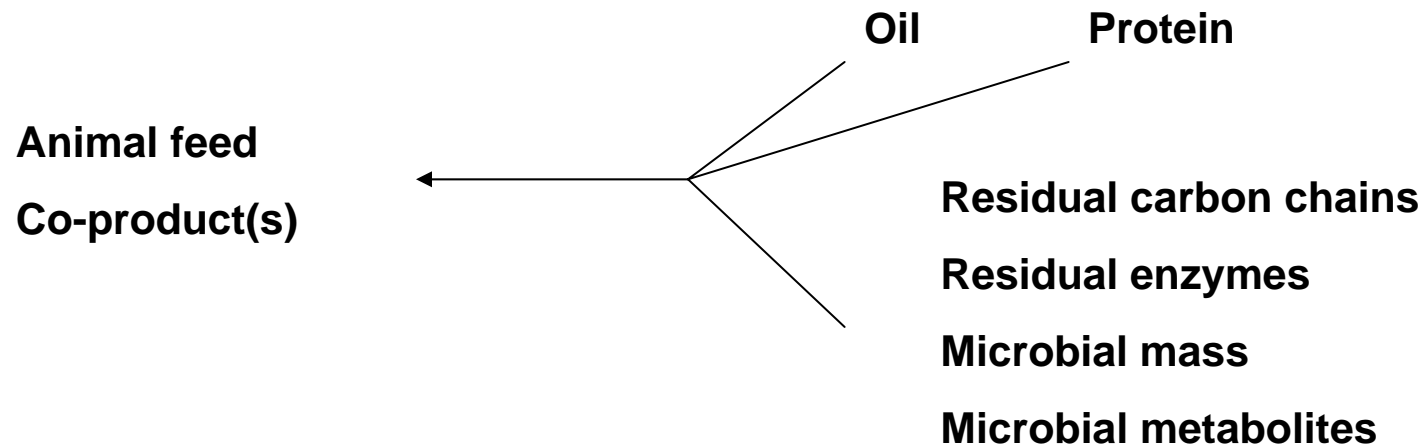
**Lignin value varies depending on use and purity**

**Today's market price for lignin ranges from \$100 to \$400 per ton**

### Biomass co-product



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**Quality – Value will depend on:**

<b>Animal feed</b>	<b>Biomass input quality</b>
<b>Co-product(s)</b>	<b>Residual cellulose, hemicellulose, starch, sugar</b>
	<b>Type of ETOH producing steps selected, enzymatic, microbial or combination</b>
	<b>Amount of microbial mass produced</b>
	<b>Amount and type of microbial metabolites produced</b>
	<b>Process steps that have negative impact on co-product quality</b>

## Biomass co-products - marketing

- Different ways to market biomass based co-products
  - Optimize ethanol production, offer co-products to market and let marketplace determine value
  - Systematically determine best value proposition
    - Identify market opportunities where nutritional attributes fit with market needs
    - Evaluate processing steps that have value impact (enhance value or minimize damage)
    - Economic evaluation of process steps impact on co-product value
    - Develop and implement process controls that will provide consistent quality products to meet market needs



Thank You  
Questions?