



# Use of Rendered Products in Poultry Feed

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# High Quality Protein and Energy Sources

- World is deficient in protein
- Needs for animal products continue to increase both with population and with affluence
- While there have been issues in the past, use in the US and elsewhere is heavy
- Given the paucity of protein sources, rendered product use makes sense
- One of the early practitioners of recycled product use



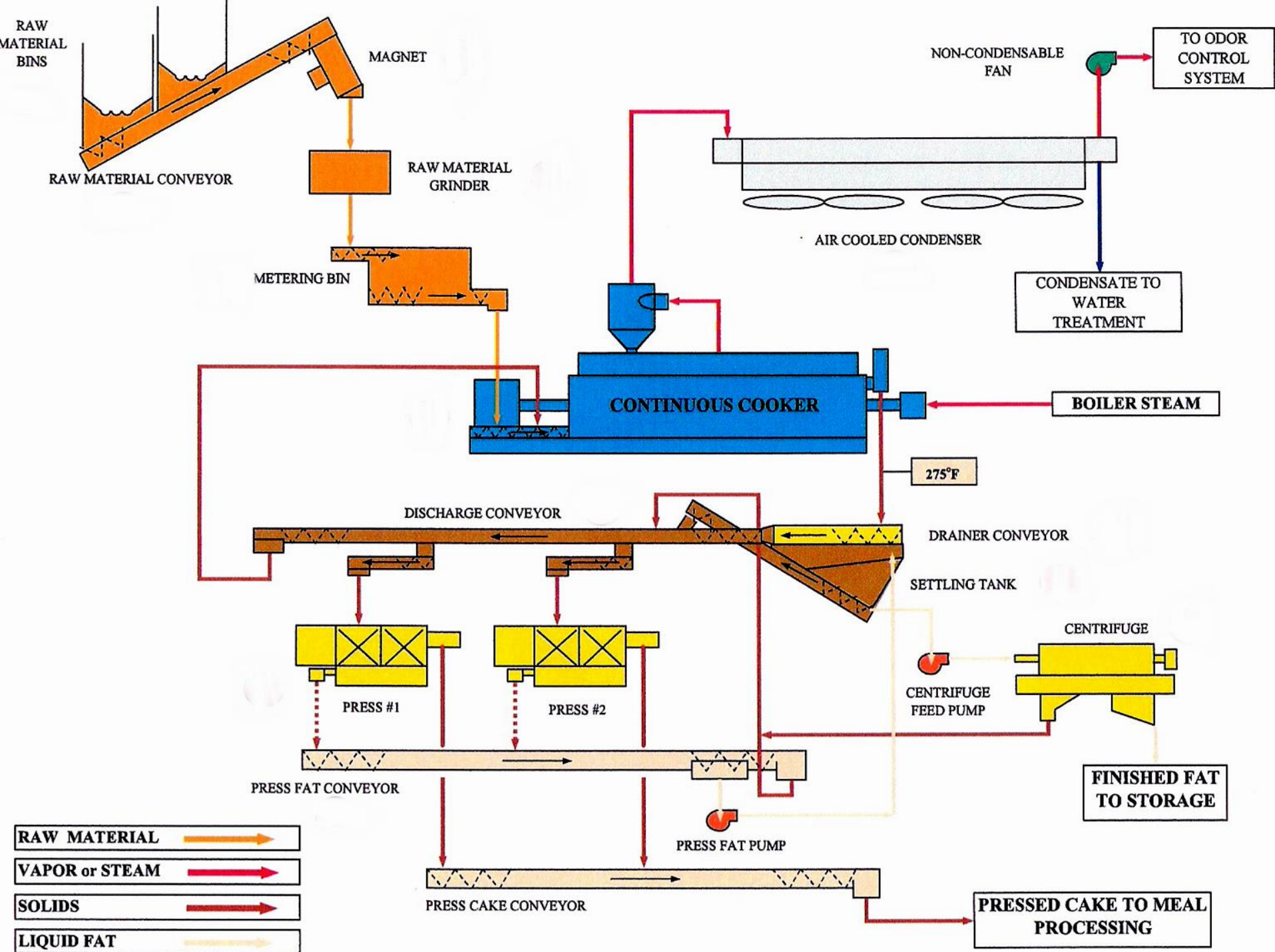
# Introduction: Rendered proteins and fats

- Long history worldwide of use of animal proteins and rendered fats in the poultry industry.
- Products currently being utilized include meat meals from ruminant, swine and poultry, blood meals, fats, feather meal.
- Variety of use, broilers, turkeys, pigs, less use layers.
- Provide nutrients needed at competitive prices
- Animal protein sources may improve performance parameters over corn-soya diets
- While each product has different nutrient contents and potential values, most are excellent sources of high quality protein, highly available phosphorus and other minerals.



# Goals

- Provide an overview of the products
- Basics of production
- Methods and Limitations on their use
- Economics of their use





# Meal Production

- Product is collected at small and large scale plants
- Moved by truck or processed on site
- Heat is sufficient to inactivate micro-organisms
- Product is then packaged or shipped bulk
- HACCP based procedures are followed to avoid any recontamination of product



# Available products

## *Ruminant/porcine meat meals*

- Products from non-edible portion of cattle/pig processing
- Products may vary based on input materials, proportion of bone
- Utilized in the US poultry industry as a protein/AA, calcium and phosphorus source
- Inclusion levels typically limited by price
- 10% of high quality product would be fine
- Can be used in combination with other by-products
- Typically 50-54% CP, 10% fat, 5% avail P



# Available products

## *Poultry By-product meal:*

- By-product of the poultry processing industry
- Consist of the offal and other inedible parts of the chicken
- Differentiation of the products is protein/ash content.
- High ash content less desirable, lower price
- Pet food grade significantly more expensive, now used in aqua feeds
- Inclusion of the product is primarily limited by ash content, but may be something around 10% again.
- 55-64% CP, 10-14% fat, 3-5% avail P





# Available products

## *Blood meal:*

- Blood has foreign material removed followed by a drying process from the blood collected in slaughter plants
- The more sophisticated the drying process, in general the better the product produced, spray drying is generally considered superior
- Blood meal is generally not used in high concentration due to its poor amino acid balance
- May be used as an attractant in some aqua feeds
- Constraints would be at 1-2% of the total ration in poultry, perhaps more in aqua, used as a by-pass protein
- 80-88%CP, 1% fat, 0.3% P



# Available products

## *Poultry Feather meal:*

- Feather meal is the ground and hydrolyzed feather from chicken and turkey processing
- Considered to be low in digestibility and with a poor amino acid balance and is thus not heavily used in the poultry industry
- It is generally economically priced, but will normally be used at 1-3% of the ration
- May be utilized in ruminant rations as a by-pass protein, 3% addition improves milk yield in higher producing dairy cattle
- 80% CP, 7% fat, 0.5% P



# Available products

## *Blended meals:*

- Several commercial blends are available as well as the ability to have products custom blended to customer specifications
- Some products were designed specifically as a replacement for fishmeal for instance
- May increase costs, useful if storage space is lacking or need to simulate fish meal
- Blends were more heavily utilized in the past, before computer formulation, digestible amino acids
- Still have a place in international markets



# Use of animal proteins in feed

- 1. Gather info on your current feeds
- 2. Gather info and pricing on potential products
- 3. Run formulas with products and available prices to determine the feed value in your rations
- 4. Look at use of several products



## Comparison of diets with added MBM at different prices/levels

Level of MBM	Relative Price of MBM	Price of Broiler starter/ ton in USD
0%	NA	322.72
5%	100% of soya	319.39
10%	100%	316.20
5%	110%	321.39
9.8	110%	320.12
5%	90%	317.39
10%	90%	312.23





# Additions of MBM and PBM

MBM Level	PBM Level	Relative price of Prod.	Price of Broiler starter / ton in USD
0%	0%	NA	322.72
5%	5%	100%	313.77
3.8%	10%	100%	308.91
5%	5%	110%	317.77
3.8%	10%	110%	314.45
5%	5%	90%	302.90
3.8%	10%	90%	294.65



# Rendered fat use

- Feeding of fat in poultry and pig rations has a long history in the US and the world.
- Fats are generally included at 1-8% of ration
- Benefits:  Energy,  Feed efficiency
- Concerns: ME, sources, rancidity



# Understanding energy use

Maintenance energy

Energy for  
production

+/-

Changes in  
energy







# Types of fat Available for Use in Rations

- **Tallow: saturated source, used for soap manufacture traditionally**
- **Poultry fat: less saturated, probably source of choice for poultry, but frequently less available**
- **Fish oil: less saturated, other purported benefits, very expensive**
- **Vegetable oils: soy oil, etc, generally good source, expensive**
- **Yellow grease: generally cost effective if available, generally comparable to soyoil**



# Response of broiler breeders to added fat

- |                            | <b>Added Fat %</b> |            |            |            |
|----------------------------|--------------------|------------|------------|------------|
| <b>Production variable</b> | <b>0</b>           | <b>2</b>   | <b>4*</b>  | <b>6</b>   |
| <b>Eggs/hen</b>            | <b>131</b>         | <b>156</b> | <b>162</b> | <b>159</b> |
| <b>Feed/dozen (kg)</b>     | <b>4.1</b>         | <b>3.5</b> | <b>3.3</b> | <b>3</b>   |
| <b>Chicks/hen</b>          | <b>105</b>         | <b>121</b> | <b>132</b> | <b>125</b> |
- **\*Authors recommended 4% level as close to optimum.**
  - **Body weight was increased with each increment of fat.**



# Calorie Cost to Determine Energy Levels

Diet Energy (kcal/kg)	Cost/ton (US\$)	Calorie cost(\$/mcal)	Fat added(%)
2900	246.24	84.90	0
3000	252.14	84.07	1****
3100	262.82	84.78	3.3****
3200	273.46	85.45	5.5
3300	282.10	85.48	7.7
3400	294.76	86.69	10

\*\*\*\*Given the prices used in this scenario, one would choose between the 3000-3100 kcal/kg ration as the most cost effective. In many cases, more fat will help performance so some would feed more than the 1% level seen in this scenario.



# Yellow grease

- Yellow grease is the reprocessed cooking grease from restaurants
- Vegetable oil based product
- Performance is similar to vegetable oil products
- Generally cheapest acceptable source of oil



**Means for Broiler Gain for the 3, 5, and 7 Week  
Growth Period**

<b>Fat Source</b>	<b>0-3 Week (kg/bird/phase)</b>	<b>0-5 Week (kg/bird/phase)</b>	<b>0-7 Week (kg/bird/phase)</b>
Soybean Oil	0.77	1.92	2.85
<b>Yellow Grease</b>	<b>0.76</b>	<b>1.96</b>	<b>2.95</b>
Poultry Fat	0.76	1.93	2.92
Tallow	0.75	1.92	2.99
HAPVA	0.74	1.89	2.96
Lard	0.75	1.88	2.97
Palm Oil	0.75	1.95	2.94



**Means for the Adjusted Feed:Gain Ratios per Bird for the  
3, 5 and 7 Week Growth Period**

<b>Fat Source</b>	<b>0-3 Week (kg:kg)</b>	<b>0-5 Week (kg:kg)</b>	<b>0-7 Week (kg:kg)</b>
Soybean Oil	1.38	1.60	1.87
<b>Yellow Grease</b>	<b>1.38</b>	<b>1.56</b>	<b>1.85</b>
Poultry Fat	1.38	1.58	1.85
Tallow	1.40	1.61	1.83
HAPVA	1.42	1.63	1.86
Lard	1.40	1.52	1.77
Palm Oil	1.42	1.56	1.88



# New concepts in poultry nutrition: Ideal Protein

- Ideal protein is the exact balance of amino acids needed by the bird
- Based on digestible amino acid (AA) levels
- Based on lysine at 100% of the requirement and other AA
- For example if lysine req = 1.00% (100%) and Meth+Cys req = .72%, then the ratio is 72%
- All AA have a ratio to lysine which generally stays similar
- May change over growth periods in turkeys for instance

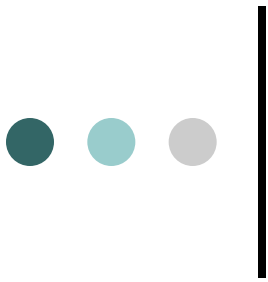


Table 4. Body weight gain and feed efficiency from 3 to 21 weeks of age.

<i>Trt</i>	Gain (kg)							FE (kg:kg)						
	3	6	9	12	15	18	21	3	6	9	12	15	18	21
1	.36	1.86	4.51	7.52	11.3	14.18	19.39	2.15	1.66	1.83	2.07	2.34	2.60	2.70
2	.36	1.86	4.47	7.45	11.26	14.07	19.18	1.95	1.70	1.84	2.12	2.32	2.62	2.70
3	.35	1.83	4.40	7.34	11.08	14.44	19.22	1.97	1.64	1.82	2.08	2.34	2.59	2.68
4	.36	1.87	4.52	7.52	11.23	14.56	19.42	2.06	1.67	1.82	2.08	2.29	2.68	2.75
SE	.03	.006	.09	.16	.21	.28	.24	.07	.02	.01	.02	.03	.08	.06
P value	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05

Different letters indicate significantly different means



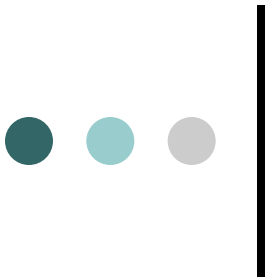


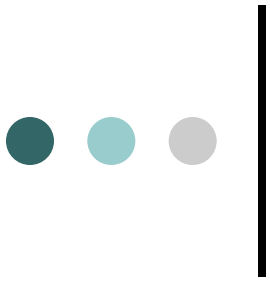
Table 5. Feed cost comparison between diets fed from 0-21 weeks of age (Prices per US ton)

Treatment	Time period fed (wks)						
	0-3	3-6	6-9	9-12	12-15	15-18	18-21
Agristats	311.76	308.12	289.05	278.26	266.59	249.96	240.55
Ideal diet	291.98	283.36	270.63	258.15	243.18	236.25	227.51
Ideal +5%	298.54	289.92	276.30	262.89	247.70	240.51	231.33
Ideal +10%	305.40	295.44	282.06	264.97	251.00	243.86	234.76



# Summary

- Animal by-product feeds are a positive in poultry rations
- Long history of use and safety in the US and worldwide
- Overall fat additions to broiler rations can be a positive addition to the feeding programs worldwide
- High quality at the lowest cost is always the goal



Questions?