

# Innovation in the rendering industry

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# Fats and Proteins Research Foundation

- Founded in 1962
- Direct and manage a research process that results in an enhanced current usage and the development of new uses for rendered animal products
  - Nutrition, biosecurity, food safety, non-feed uses, biofuel
- Completed over 600 projects

# Methods of Engaging Researchers

- “At-large” proposals in response to a broad Request for Proposals (RFP)
- Targeted, negotiated projects from a selected researcher audience
- ACREC research center Clemson University
- Combinations of the above



# Important Areas of Research for the Rendering Industry

- Food safety
- Animal nutrition
- Sustainability
- Plant efficiency
- Novel technologies





# Projects at Many Institutions

- Approx. \$200,000 in “at large” projects at 5 universities, and \$300,000 annually at Clemson
- Traditional “at large” focus on animal nutrition, food safety
- RFPs due twice a year, in March and September
- Current and recent projects...



# Effect of different fat sources and vitamin E status on antioxidant status, carcass characteristics, and meat quality of pigs grown to heavy slaughter

- Merlin Lindemann, University of Kentucky
- Joint project with National Pork Board
- Look at the effect of different fat sources and vitamin E status on antioxidant status, carcass characteristics, and meat quality of pigs grown to a heavy slaughter weight



# Pet Food

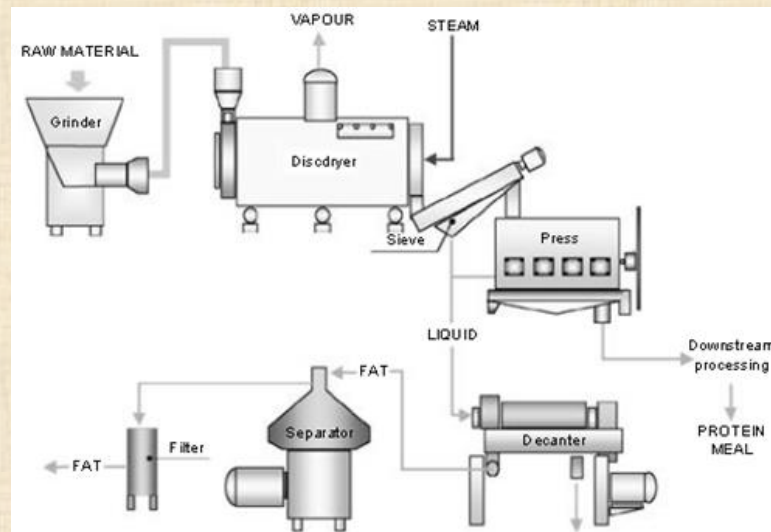
- Greg Aldrich, KSU
- Flow behavior and spray coating efficiency during production of rendered protein meals





# Conditions for *Salmonella* Contamination

- Drs. Jennifer Martin and Dale Woerner, Department of Animal Sciences, Colorado State University
- Determine the location and influence of impurities on *Salmonella* in poultry fat intended for pet food use
- The first FPRF project ever in cooperation with Pet Food Institute





# ACREC



Animal Co-Products  
Research & Education Center



# ACREC Mission Statement

- To advance the science and technology of animal co-products and the rendering process.
- To ensure microbial safety of rendered products for animal feeds and consumer protection.
- Promote environmentally sound practices.
- Develops new market opportunities for the worldwide rendering industry.
- Provides educational opportunities in animal co-product utilization.

# ACREC

- Approximately 60 total since 2004.
- More than 40 researchers from a variety of fields
- Interdisciplinary, innovative projects
  - Chemical engineering
  - Microbiology
  - Materials science and engineering
  - Bioengineering
  - Mechanical engineering
  - Animal science
  - Food science
  - Packaging science
  - Biological science
  - Experimental statistics
  - Chemistry
  - Architecture
  - Environmental engineering
  - Automotive engineering
  - Agricultural engineering
  - Soils
  - Turfgrass
  - Environmental toxicology
  - Horticulture
  - Computer science.

# Optimization and Initial Bioprocess Scaleup of Omega-3 Production From Rendered Fat

- Mark Blenner
- Convert saturated and monounsaturated animal fats into polyunsaturated fatty acids
- New line of work for fats, being done with glucose already





# Odor Elimination

- Daniel Whitehead and Frank Alexis
- Next generation materials for odor control
- Antimicrobial microparticles for rendering applications
- Proved the ability to capture short chain FA pollutants
- Proved the nanoparticles are non-toxic, biodegradable, selective
- Could lead to effective odor control



# Extraction of Keratin

- Ken Tasaki
- Keratin is common but difficult to hydrolyze
- Valuable market for cosmetics and tissue engineering
- Develop a better process for extraction—no chemicals



# Generating Energy Using Wastewater

- Sudeep Popat
- Evaluate the applicability of microbial fuel cells to treat wastewater as a secondary treatment
- MFCs represent an anaerobic wastewater treatment technology in which the energy embedded in the chemical oxygen demand content of the wastewater is recovered as electrical energy using bacteria that respire to electrodes (anodes), instead of producing methane as in the traditional anaerobic digestion process
- This electrical energy can then be used to recover nutrients and/or produce value added co-products such as hydrogen peroxide



# Wastewater Treatment

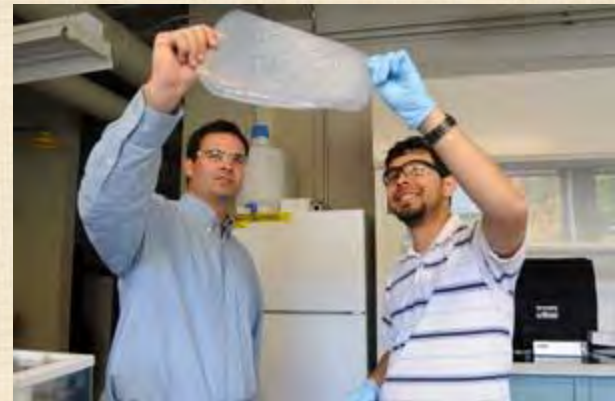
- David Ladner
- Development of a field deployable membrane bioreactor/separator for rendering facility wastewater treatment
- Objectives:
  - Create a prototype field-deployable semi-autonomous lab-on-a-pallet membrane separation unit
  - Operate the lab-on-a-pallet continuously at Clemson University for three months with no maintenance visits during the final month.
  - Deploy the lab-on-a-pallet to a rendering facility and test its performance during a three month trial.





# Conversion of Oils from DAF

- Christopher Kitchens
- Dissolved air flotation
- DAF products can be very high in oil—hard to process
- Developing a new method of extraction



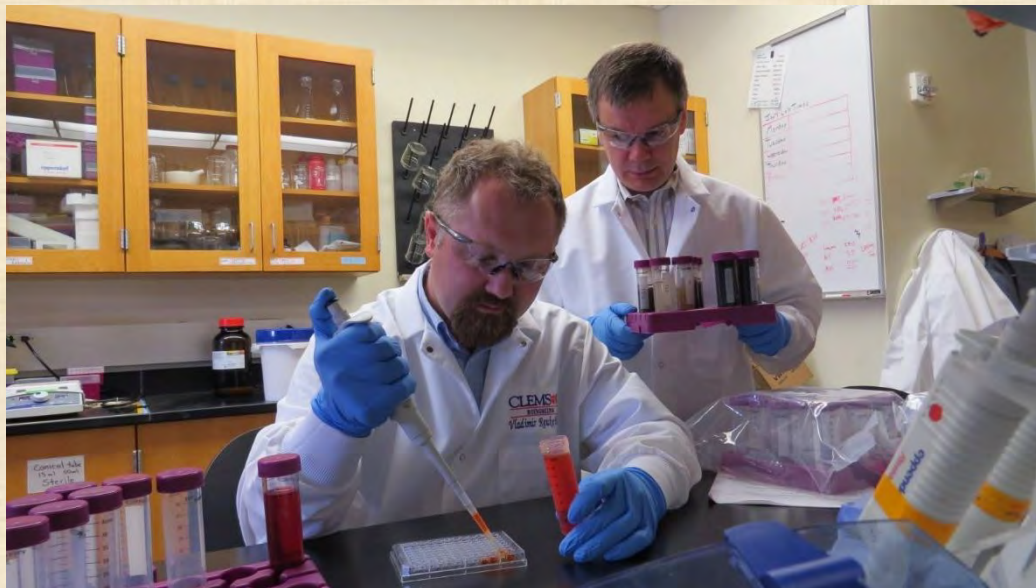
# New Uses for Rendered Product

- Yi Zheng and David Ladner
- Biotransformation of meat and bone meal (MBM) into high-value astaxanthin for animal feed



# Antioxidant Production

- Drs. Vladimir Reukov and Alexey Vertegel, Clemson University Bioengineering Department
- Producing a novel antioxidant that is both natural, effective, and cost-effective
- Potent antioxidant *from animal blood*
- As effective or better than available antioxidants
- Leftover red blood cells being researched for renderable flocculants



# Other Recent Research

- Carbon footprint
- Lifecycle analysis for GHG emissions
- Aquaculture
- Thermal death time





# A New Way Engaging Researchers and Stakeholders

To Better Research Rendered Ingredients  
as Pet Food Ingredients



Colorado  
State  
University

# Functionality of Rendered Products in Pet Food

- While food safety and animal nutrition are very important to the use of rendered products in pet food, the area of pet food functionality deserves its own research emphasis area
  - Fast growing pet food market, high value category
  - Value added opportunities for rendered products
- Functionality opportunities:
  - Control of oxidation
  - Extending shelf life
  - New ingredients extracted from by-products
  - New consumer-friendly ingredient definitions
- First meeting May 17-18, 2017 at CSU



# Mission Statement for the CSU/FPRF Pet Food Alliance

Bring together members of the pet food and rendering industries together to ***collaboratively develop implementable solutions*** for industry challenges and identify opportunities for innovation, growth, and mutual success.



# Key Pillars of the Pet Food Alliance

- **Focus on uniting** members of the pet food and rendering industries
- **Engage a with and encourage widespread** participation from additional industry members
- Facilitate **research guided by industry input** to address real-world industry challenges
- **Establish multidisciplinary collaborations** with academia and industry
- Proactively **engage in building industry sustainability**, across all efforts







# Alliance Working Groups for 2018

- Oxidation and Maintenance of Product Quality
- Salmonella and Other Threats to Product Safety
- Consumer Perception
- Industry Sustainability



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# Alliance Action Items for 2018

- Oxidation and Maintenance of Product Quality
  - Determine why PV is utilized and what threshold is used
- Salmonella and Other Threats to Product Safety
  - Develop RFP around industry practices
  - Develop GMPs around transportation and storage
  - Gather info about human supply chain—do they follow the same rules?
  - Develop RFP regarding mitigants of Salmonella in pet food
- Consumer Perception
  - Engage AAFCO to set the stage for change
  - Invite more pet food companies to PFA Meetings
  - Begin pet food focus groups to better understand the market
- Industry Sustainability
  - Generational Engagement
    - \* Alliance housed structure for undergraduate fellows/interns (2019)
    - \* Develop projects, identify institutions and develop budget (2018)
  - Identify model for bridging generations and transitioning into new eras



# Information

<http://nationalrenderers.org/>



<https://fprf.org/>



<http://fprfalliance.agsci.colostate.edu>



# Contact

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# RENDERING: THE GREENEST OPTION

A Comparison Of 3 Alternatives For Large Scale Processing of Meat and Meat By-Products

GREENHOUSE GAS PRODUCED  
\*Per 1000 kg of meat and meat by-products processed

END USES

BIOSECURITY & REGULATION

ENVIRONMENTAL SUSTAINABILITY

## RENDERING

200 kg GHG\*

\*Greenhouse Gas

RENDERING avoids at least 90% of potential greenhouse gas emissions compared with industrial composting

Converts **99%** of meat & meat by-products into ingredients for animal feed, biofuel, fertilizer, industrial and consumer products

Recovered resources have a **HIGH ECONOMIC VALUE** \$\$\$\$

Established Industrial Process operating under and controlled by a **CODE OF PRACTICE** in line with federal regulations to control pathogens & ensure animal food safety

Regulated to ensure safety of employees, the public, & the environment by **STATES & the FDA, EPA, & USDA**

Although fossil fuel can be required to produce steam for heating, many renderers use their fat products to fuel boilers, **increasing energy independence.**

Nearly all **CARBON IS RETAINED** within rendered products and reused rather than becoming GHG



## INDUSTRIAL COMPOSTING

2500-4000 kg GHG\*

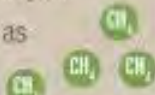
**SMALL FRACTION** of meat and meat by-products can be recovered as fertilizer

**DIFFICULT** to destroy pathogens



requires training and labor

Low energy requirements but, **45-75%** of the carbon in meat by-products is released as CO<sub>2</sub>, and **4-20%** is released as **METHANE** (with 25X the global warming potential of CO<sub>2</sub>)



## ANAEROBIC DIGESTION

60-500 kg GHG\*

Recovered resources have relatively **LITTLE ECONOMIC VALUE**

**METHANE FUEL GAS**  
**FERTILIZER**

To destroy pathogens requires **STRICT TIME & TEMPERATURE CONTROL** without this control, pathogens and environmental problems increase **DRASTICALLY**

### REGULATIONS

in composting & anaerobic digestion vary from state to state  
**NO CONSISTENT FEDERAL REGULATIONS** on air emissions or wastewater

**SEEPAGE CAN HARM** people, animals, and plants



Low energy requirements **BUT** if digestate slurry is stored in open tanks greenhouse gas emissions are multiplied by 10x

# Questions?

