Accomplishments (continued)

- Developed technology for using poultry blood as a biobased flocculant
- Developed animal protein-based substitute feedstocks for industrial fermentations
- Improved technology for ash-protein fractionation of meat & bone meal (MBM)
- Demonstrated susceptibility of prions to inactivation by processing
- Surveyed engineering properties of MBM produced nationwide
- Rhamnolipid biosurfactant production by non-pathogenic organism in an energy-saving process
- Developed novel rapid and specific PCR methods to detect, clone and characterize genes for bioplastic synthesis and degradation
- Developed the use of inexpensive and surplus glycerol, soy molasses and other coproducts for the production of bioproducts
- Novel oleochemicals and tailor-made functional fluids from renewable microbial biosurfactant
- Methods of improving shrink-resistance of natural fibers, synthetic fibers, or mixtures thereof, or fabric or yarn composed of natural fibers, synthetic fibers, or mixtures thereof (U.S. Patent 7,090,701)
- Methods of inhibiting the burning of natural fibers, synthetic fibers, or mixtures thereof, or fabric or yarn composed of natural fibers, thereof, and products produced by such methods (U.S. Patent 7,264,637)
- Chemical and enzymatic modifications of wool keratin
- New keratin products from wool

ARS Mission

The Agricultural Research Service conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to

- ensure high-quality, safe food and other agricultural products;
- assess the nutritional needs of Americans;
- sustain a competitive agricultural economy;
- enhance the natural resource base and the environment; and
- provide economic opportunities for rural citizens, communities, and society as a whole.

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Biosurfactants/Biopolymers Research

CRIS Project: 1935-41000-090
Production and Value Enhancement of Biosurfactants and Biopolymers Derived from Agricultural Lipids and Coproducts
Lead Scientist: Daniel Solaiman

Research Program:
- Microbial biobased products
  - Ecologically sound biosurfactants (rhamnolipids, sophorolipids)
  - Biodegradable polymers (cyanophycin, poly-γ-glutamic acid, poly(hydroxyalkanoates))
  - Value-added derivatives (novel polyols, oligoamides, “clickable” fatty acids, estolides, “Hi-Sol” sophorolipids)
- Fermentation feedstocks
  - Animal fats (tallow, lard, chicken fat, yellow grease)
  - Plant oils (soybean oil, sunflower oil, “new-crop” oils - *cuphea, lesquerella*)
  - Coproducts (bioglycerol from biodiesel, soy molasses, meat & bone meal, cellulosics)
- Multidisciplinary technology platform
  - Molecular biology (genetic cloning, modification, expression, knock-out)
  - Microbiology (feedstock manipulation, Response Surface Methodology optimization)
  - Chemistry (“clickable” chemistry, biomolecule conjugates)

Hides and Leather Research
(supported by on-site tannery)

CRIS Project: 1935-41440-019
Environmentally Friendly Processes and New Applications for Animal Hides and Leather
Lead Scientist: Cheng-Kung Liu

Research Program:
- Removal of manure using recycled crude glycerol and biobased surfactants
- Unhairing of hides without sulfides
- Mechanism of tanning
  - Molecular modeling of collagen-I
  - Finding new chrome-free tannages
- Enzymatic and chemical crosslinking
  - New applications for collagenous tannery waste
    - fillers, coatings
- New products derived from hides
  - Films, air filters, and green composites
- Airborne ultrasonics for nondestructive testing

Wool Research

CRIS Project: 1935-41440-020
Wool and Keratin from Wool for Biobased Value-Added Products
Lead Scientist: Jeanette Cardamone

Research Program:
- Chemical and Enzymatic Modifications of Wool Keratin
  - Biopolished, washable wool
    - ARS Process (U.S. 7,090,701)
    - Fiber surface alteration
    - Flame retardancy (U.S. 7,264,637)
- Keratin product development
  - Extraction and derivatization
  - New product development
  - Keratin protein applications
    - powder
    - microfiber
    - brushes
    - scaffold
    - microemulsion
    - sponge

Animal Byproduct Proteins Research

CRIS Project: 1935-41440-021
Characterization, Processing and Novel, Non-Feed Uses for Proteinaceous Rendering Byproducts
Lead Scientist: Rafael Garcia

Research Program:
- Animal processing byproducts
  - Protein meals, unprocessed blood

- New applications
  - Flocculants
  - Erosion control
  - Paper slurry dewatering
  - Mine tailings treatment
  - Industrial fermentation feedstock
  - Oil-producing algae and fungi
  - Biopolymer-producing bacteria