

# VIRGINIA SEAFOOD AGRICULTURAL RESEARCH AND EXTENSION CENTER

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**VIRGINIA SEAFOOD AGRICULTURAL  
RESEARCH AND EXTENSION CENTER**  
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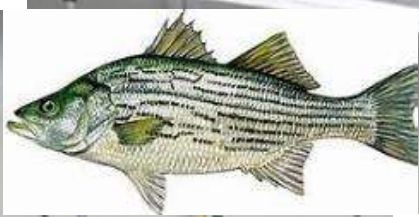


# VSAREC Sustainable Aquaculture



Lead – Dr. Michael Schwarz





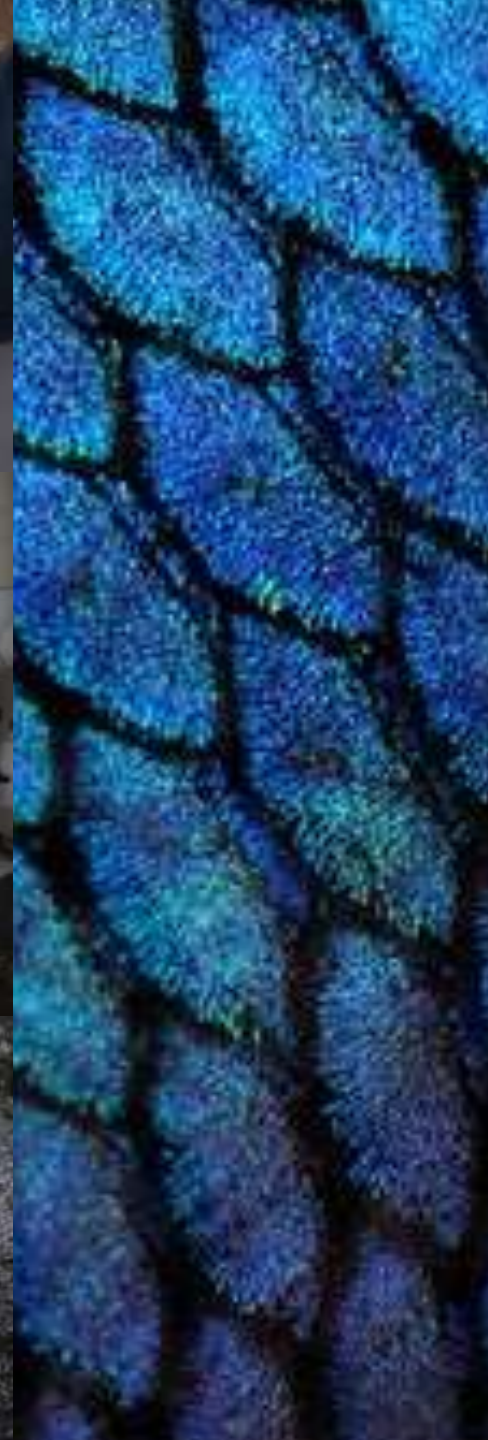






## Adapting RAS in Response to Evolving Industry Needs

- Evolving initiative to enhance climate resilience in VA shellfish sector
- Fluctuating water quality and other environmental factors disrupting oyster seed production
- Industry and research partners:
  - Oyster Seed Holdings
  - Virginia Sea Grant
  - VIMS & VIMS Eastern Shore
  - And new partnerships
- RAS allows greater control of growing conditions compared to industry standard flow-through systems





## Commercial Enhancement of Bivalve Hatchery Sustainability Through Applied Technology Application



- Oyster Seed Holdings, LLC
- Recirculating Aquaculture system:
  - 1) K1 carrier elements to provide high surface area to support biofilm growth by bacteria and protists
  - 2) Tank with heterotrophic filter
  - 3) Tank with autotrophic filter

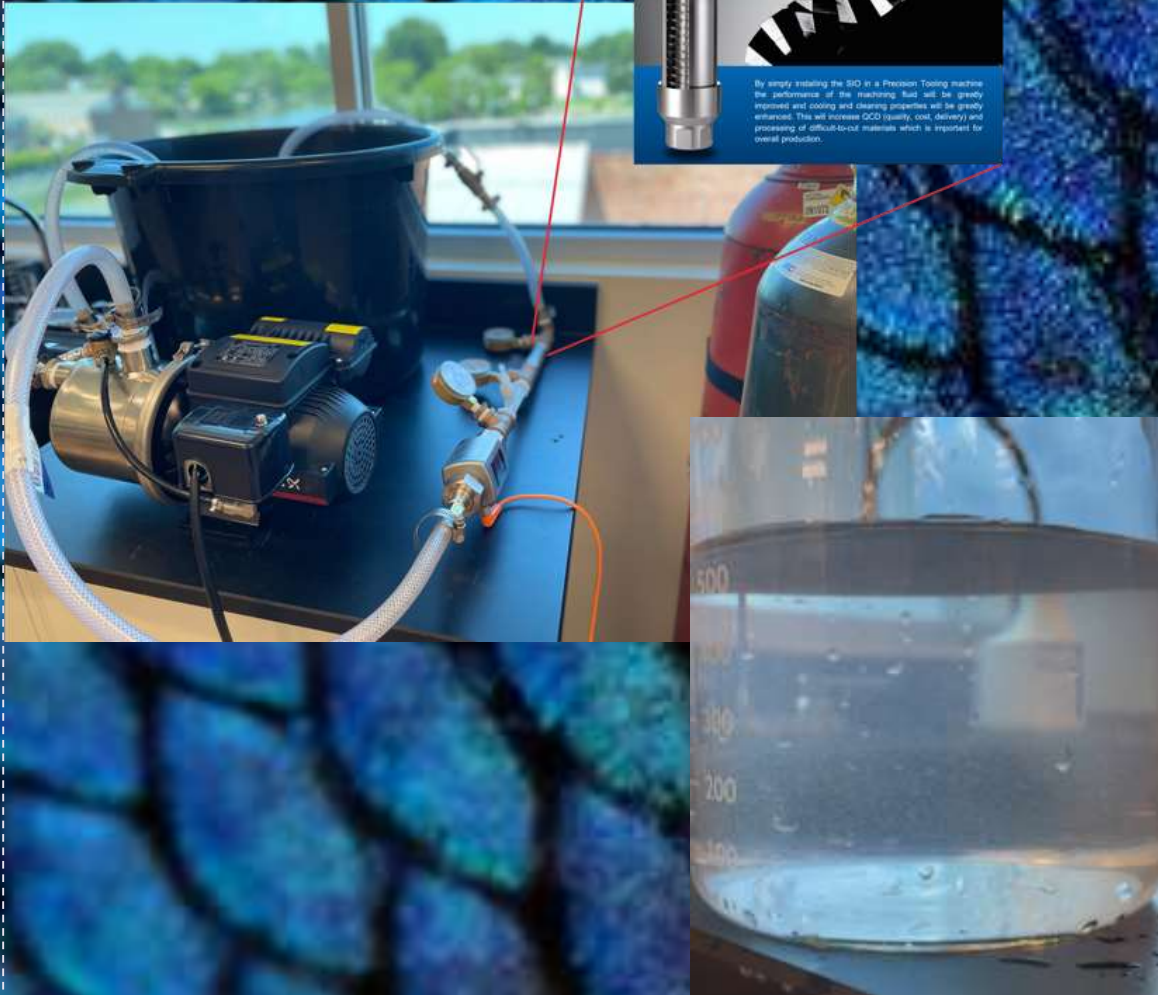


- Weekly microbial analysis of both tanks
- Sequencing analysis



# Reducing Surface Bacterial Contamination with Nanobubbles to Enhance Sanitation In Dairy Processing Facilities

- Micro/nanobubble (MNB) Technology
- SIO nanobubble generator
- Dairy facility surfaces sanitation
- MNBs promote biofilms/bacteria removal







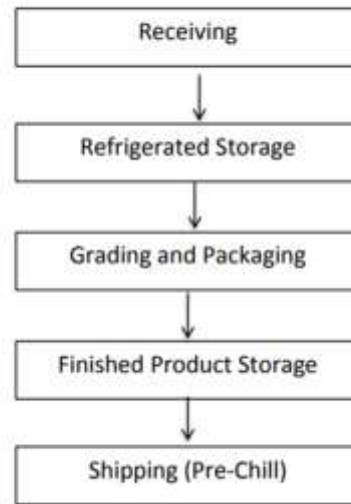
# Seafood Quality, Safety, and Consumer Education







## Oyster Shellstock Process Flow Chart



## Technical Assistance

- Support the industry with the development of new seafood products
  - Smoked trout
  - Sushi
  - Farmers market online
  - Others
- Development and implementation of Seafood HACCP, corrective actions and monitoring records
- Microbiological analyses
  - Aerobic plate count
  - Indicator microorganisms

### HACCP Plan Form – Reshipper

VA \_\_\_\_\_ RS

Firm Name: \_\_\_\_\_ Product Type: Oysters, clams, mussels  
 Firm Address: \_\_\_\_\_ Processing Method: Receiving and storing of whole and shucked shellfish

(1) Critical Control Point (CCP)	(2) Significant Hazards	(3) Critical Limits for each Preventive Measure	Monitoring				(6) Corrective action	(7) Verification	(8) Records
			(4) What	(5) How	(6) Frequency	(7) Who			
Receiving Shellfish:	Shellfish may contain pathogens, marine bacteria and toxic chemicals if received from growing waters closest to shellfish harvesting.	(1) Receive shellstock or shucked shellfish from a dealer who has identified the shellfish with a tag or label and transaction record. (2) Shellstock is shipped adequately cold, or in a conveyance all at below 45°F (ambient or temperature); or (3) Shellstock is shipped adequately cold, or in a conveyance all at below 45°F (ambient or temperature); or (4) Shellstock is shipped adequately cold, or in a conveyance all at below 45°F (ambient or temperature); or (5) Shellstock is shipped adequately cold, or in a conveyance all at below 45°F (ambient or temperature).	Shellstock tag or label and transaction record.  Presence of ice or conveyance ambient or temperature or Shellfish temperature.	Visual check	Upon receipt of each shipment	Plant personnel as assigned	(1) Reject any shellstock that are without an identifying tag or shucked shellfish without a label. (2) Shellstock temperature is above 45°F internal temperature or conveyance temperature is above 45°F, place under 45°F immediately if the receiving date is the nearest date. If the receiving date is affected from the nearest date reject shipment. (3) Reject shucked shellfish and crushed product not cold or in a conveyance above 45°F ambient air temp. Discontinue use of the supplier until evidence is obtained that shipping practices have changed.	Monitor weekly review of shellfish receiving records and corrective action records by a HACCP trained individual.  Monthly calibration of thermometer against NIST certified thermometer or applied ice slurry or NIST certified thermometer with a valid certificate.	Shellfish Receiving Record  Corrective action record  Thermometer calibration record

Signature of Company Official: \_\_\_\_\_ Date: \_\_\_\_\_ Page # 1





Source: <https://adams.mt/5-things-you-should-know-about-dry-aged-fish/#:~:text=Small%20fish%20are%20typically%20dry,flavour%20and%20a%20firmer%20texture.>



## Food Safety Research

- Fish Dry-Aging
  - Create standard processing parameters
  - Determine food safety parameters
    - Microbiology
    - Chemical
    - Physical
  
- Blue catfish and new products
  - Fatty acids level
    - Hypothesis: higher levels compared to other catfish
  - Add value to catfish products
  - Develop new products



# Processing, Validation, and Engineering (Green Industry)

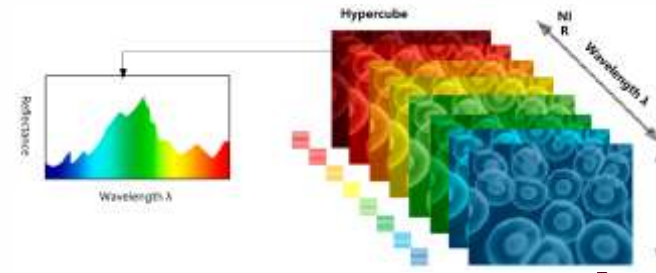


Dr. Yiming Feng



# Hyperspectral imaging-based technology for seafood quality & safety

## Smart Manufacture & Industry 4.0



Imaging processing

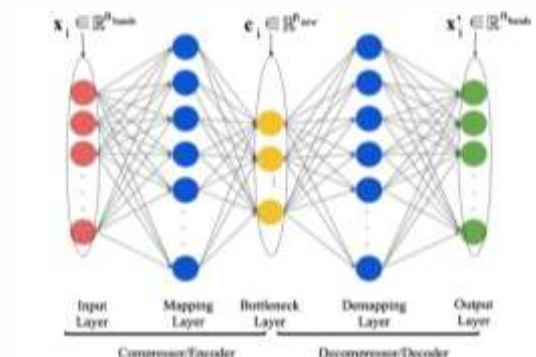
Predictive algorithm

Microplastic detection

Nutrition (omega-3) prediction

Freshness (TVB-N) prediction

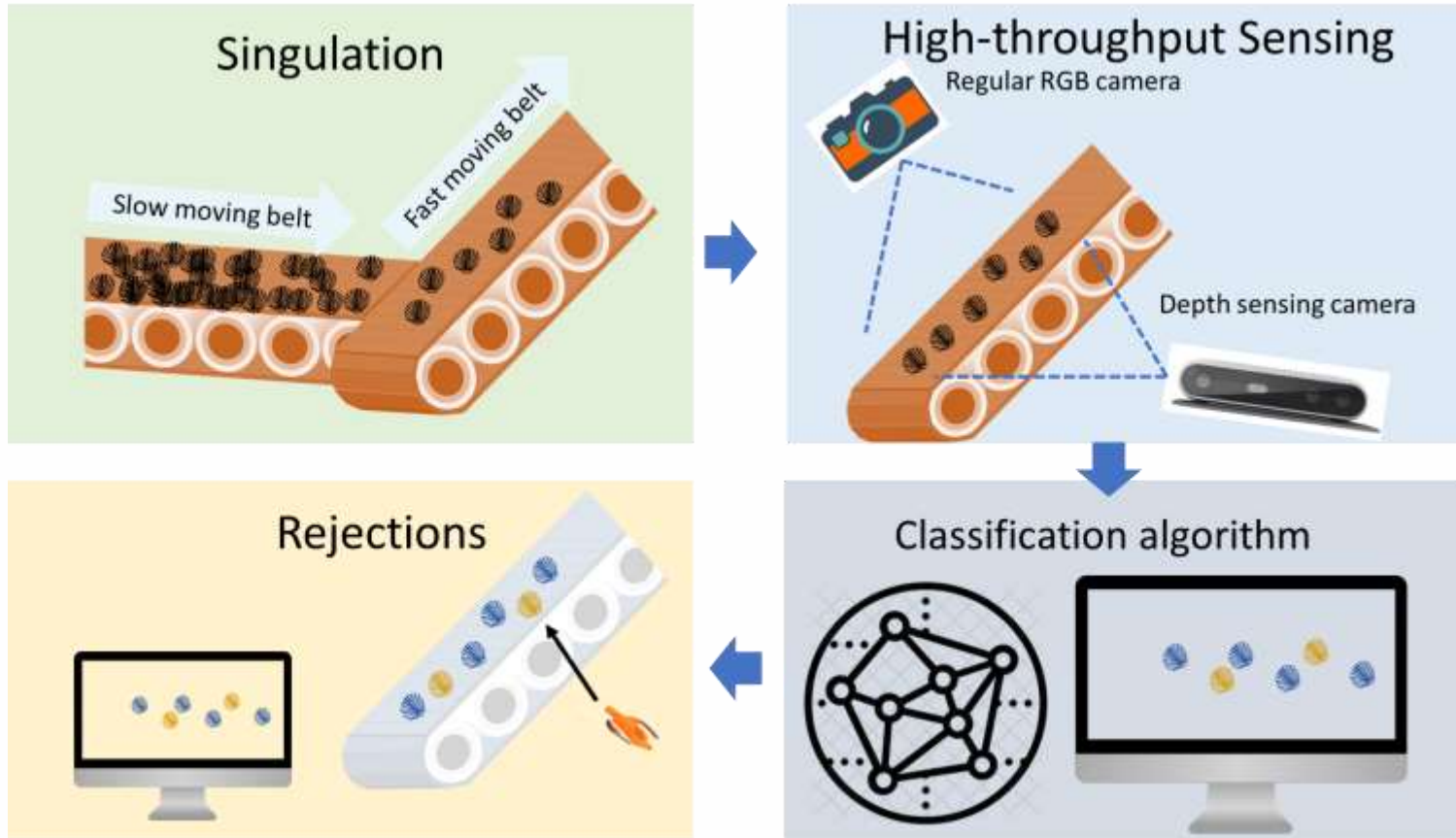
Safety assessment (Total viable count)



Crab meat from Chesapeake Bay processing facility



# Processing, Sorting, Validation, and Engineering



## Food Production/Processing Smart Technologies

- Sorting of bycatch for the clam industry
- Waste management and upcycling
- Thermal process validation & simulation
- Data science in food supply chain





## Processing, Validation, and Engineering (Green Industry)

### Food Production/Processing Smart Technologies

- Sustainable food safety and security
- SmartFarm Innovation Network
- Trucker and carrier transportation (FSMA)



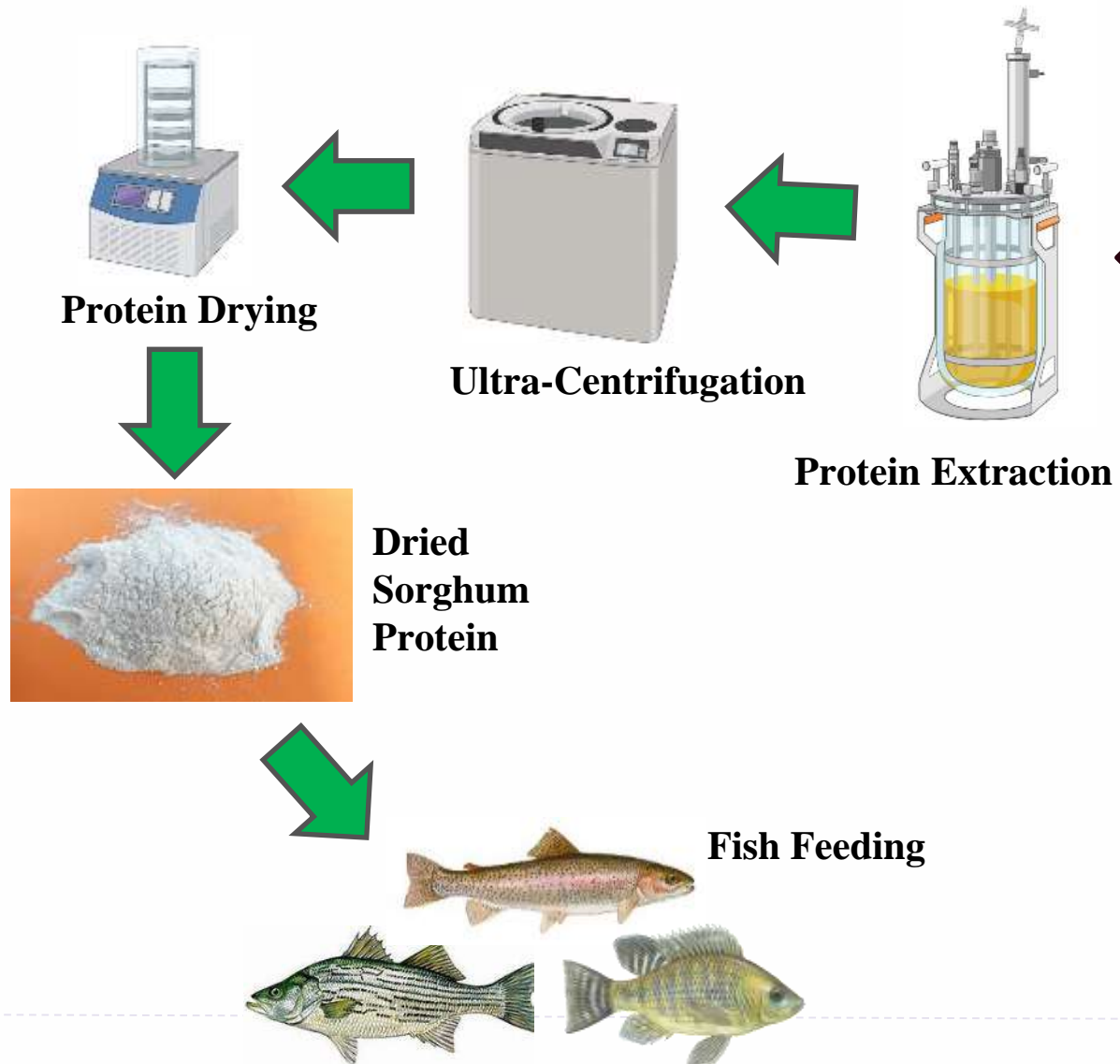
## Aquaponics/hydroponics (CEAIEC, under CAIA)

- Sustainable food safety and security
- SmartFarm Innovation Network





## Sorghum Protein Concentrate (SPC) Production



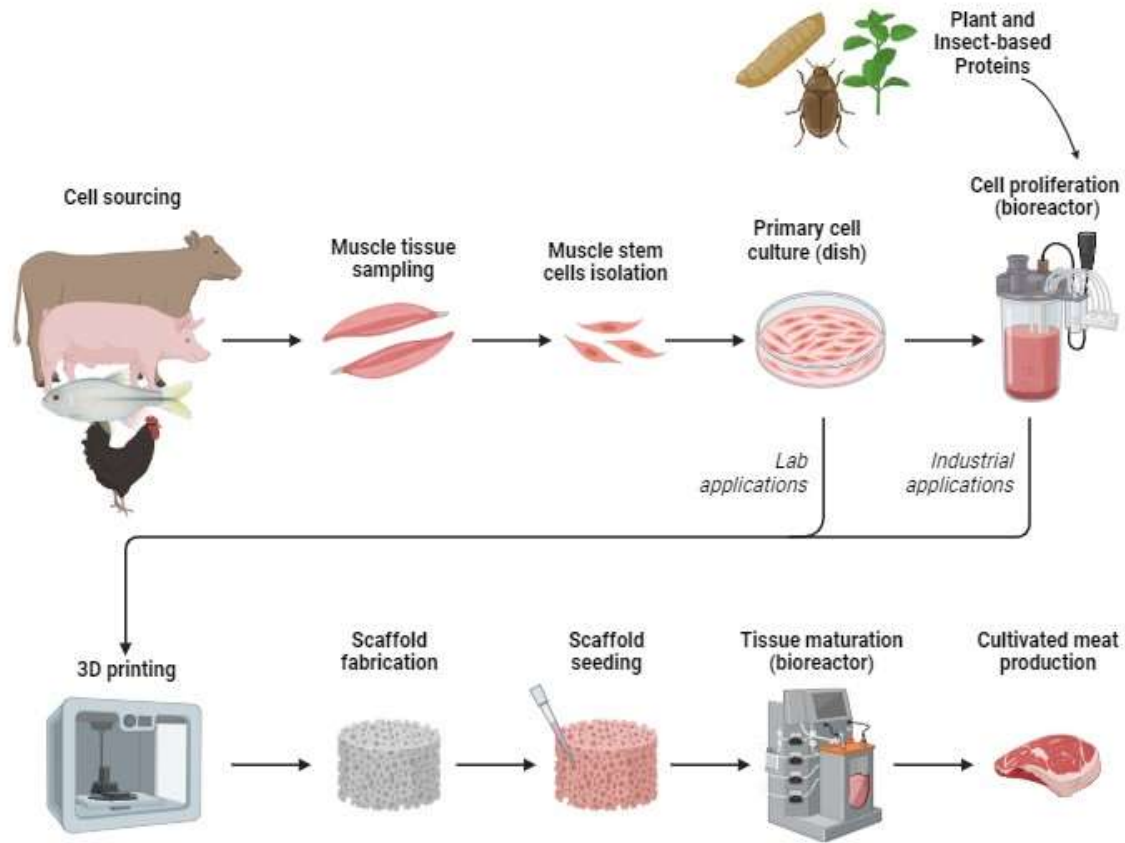
## Sorghum Protein Concentrate (SPC) Production



**Sorghum**



## Low-Cost Medium for Cultured Seafood



## Cultivated Meat Production



Insects



Hemp Seed



Mung Bean



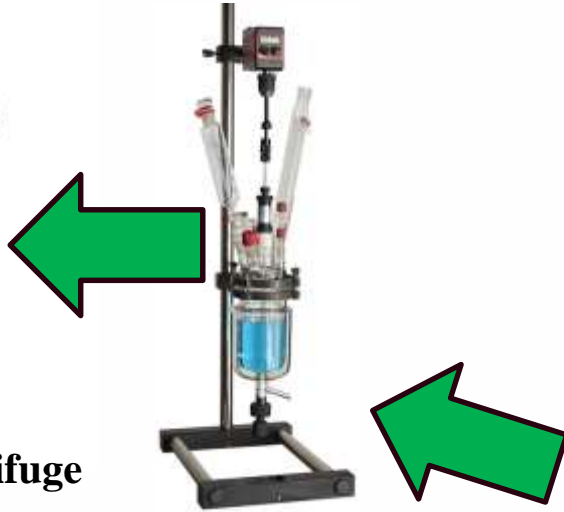
Algae



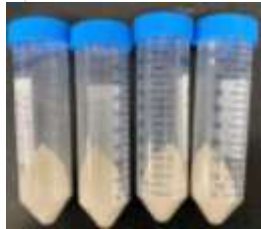
## Sustainable Bioplastic Development



Ultracentrifuge



Protein Extraction



Isolated Proteins



Insect Bioplastics



Whey Bioplastics

## Sustainable Bioplastic Development



Insects



Soybean



Whey Protein



# *Seafood Economic Analysis & Marketing Research*



Lead – Dr. Jonathan van Senten





THANK YOU



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