Understanding the respiratory microbiome of commercial poultry

Ohio State University and University of Minnesota
PRD-CAP

Overall goals

- Comprehensively define core baseline respiratory microbiota in commercial broilers, layers, and turkeys.
- Define how the respiratory microbiota changes over time.
- Associate respiratory microbiota with susceptibility to disease.

Year 1

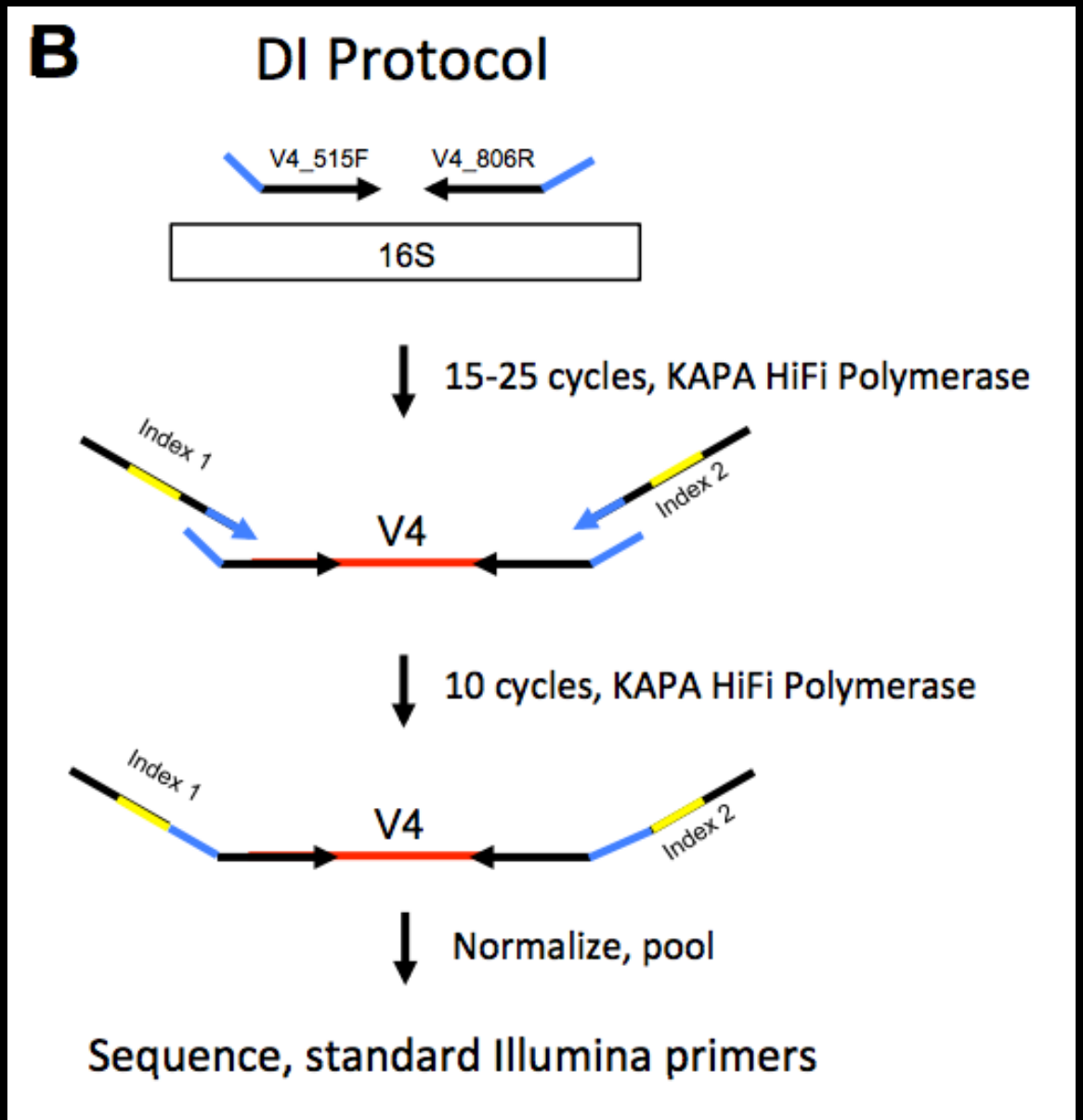
- Identify flocks in Minnesota and Ohio for turkeys and layers.
- Develop methods for collecting biological materials from upper respiratory tract.
- Begin baseline sampling for bacterial and fungal populations.

Approach

- Samples are collected in MN and OH
- DNA is extracted using common protocols
- DNA shipped to UMN
- Optimized PCR and library creation at UMN
- Sequenced using Illumina Miseq
- Data immediately deposited on shared server
- Analyzed collectively in QIIME

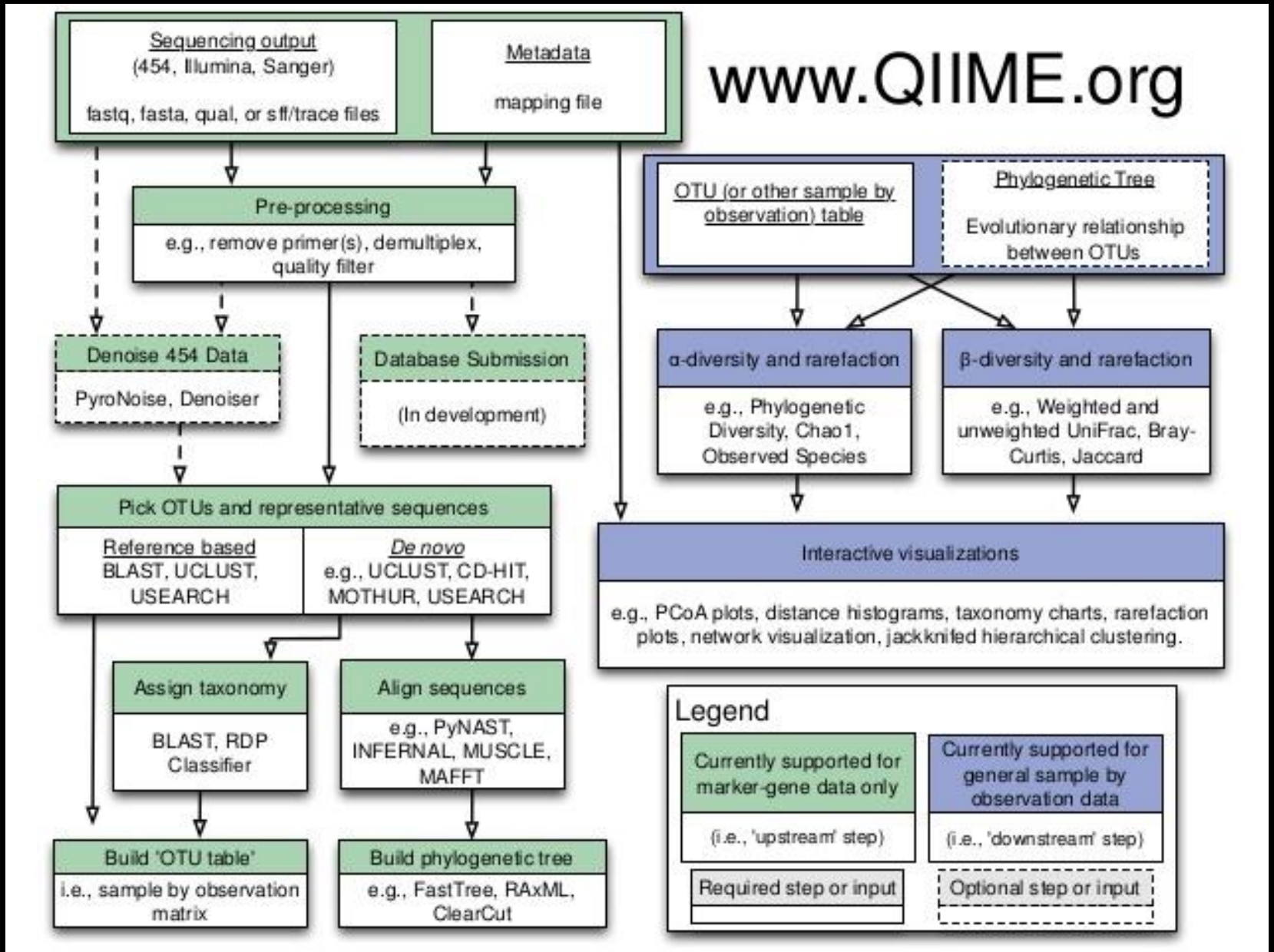
Optimized PCR to minimize bias

16S rRNA = V4
Fungal = ITS1



Grohl et al., UMN, unpublished data

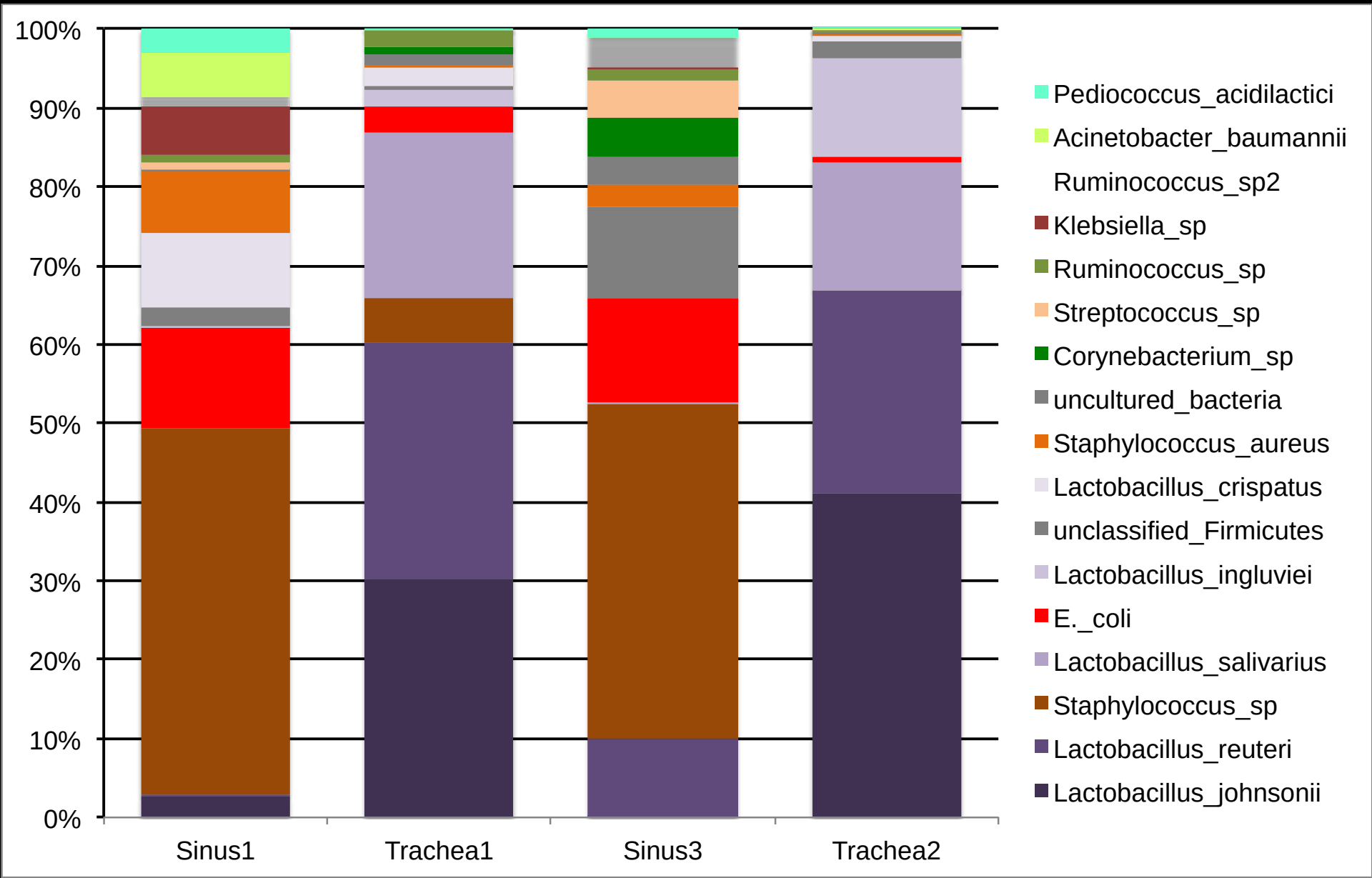
QIIME workflow



Pilot sampling

- Commercial turkeys
- Sinus cavity and trachea aseptically collected
- Washed in 10mL PBS
- Centrifuged to pellet cells
- DNA extracted from pellet

Pilot data – trachea and sinus



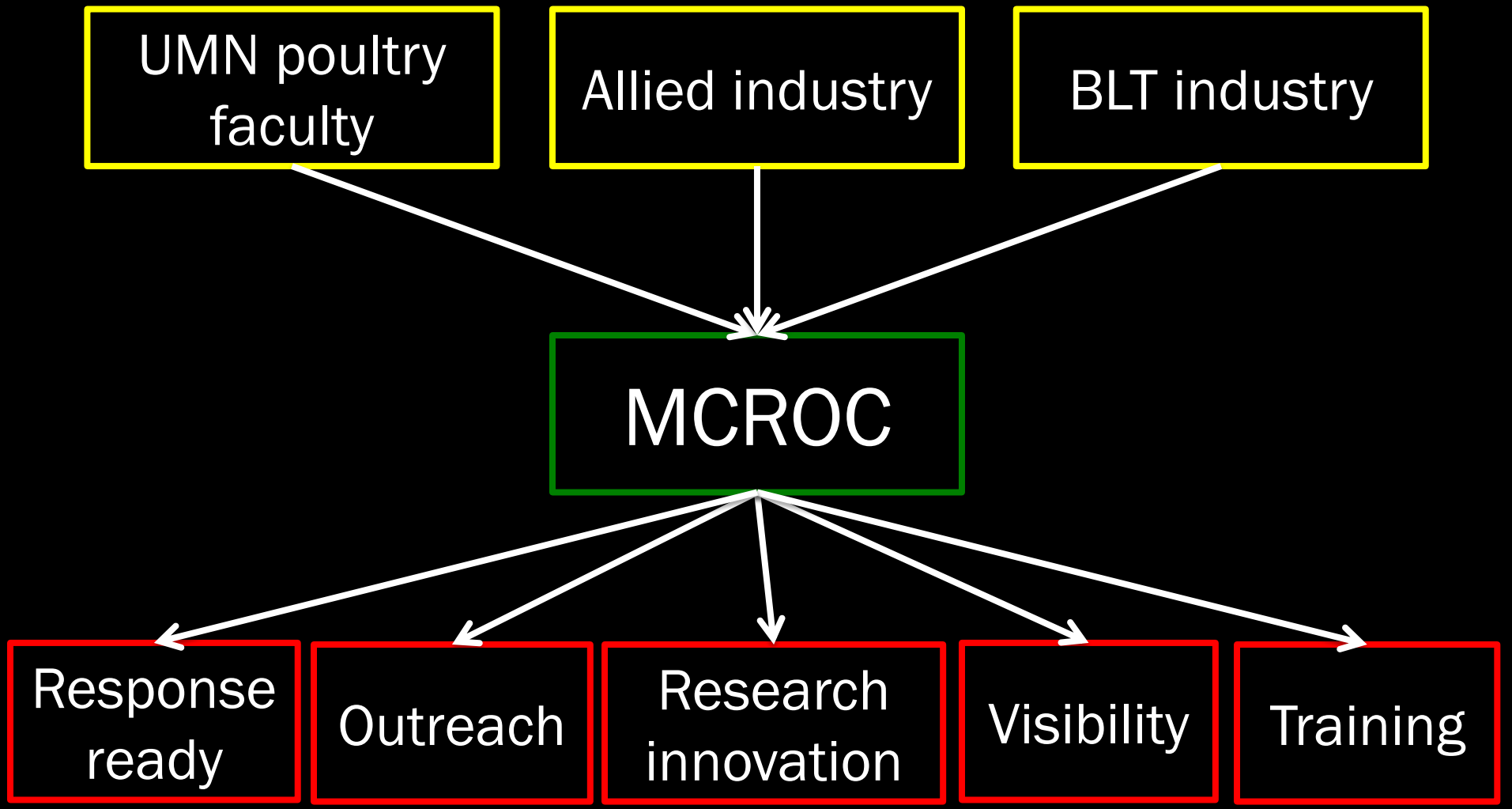
Mid-Central Research and Outreach Center (MCROC) Lab

- Willmar, MN
- Newly renovated BSL-2 laboratory
- Offices and space for UMN faculty and staff
- Two full-time personnel, two more being hired
- Research-service model
- Mission: enable industry-academia relationships through direct connection, favorable budget model, IP benefits


PLEASE
NO FOOD OR DRINK ALLOWED
AUTHORIZED PERSONNEL ONLY
BIOHAZARD
University of Minnesota
Veterinary Research Lab
Avian disease researcher Dr. Carol Cardona, veterinary and biomedical sciences professor and Ben Pomeroy Chair in Avian Medicine
Mid-Central Research and Outreach Center
University of Minnesota
Driven to Discover
150


ART
eppendorf


WEAR SAFETY
GLASSES


UMN poultry faculty
Allied industry
BLT industry
MCROC
Response ready
Outreach
Research innovation
Visibility
Training

MCROC sustainability

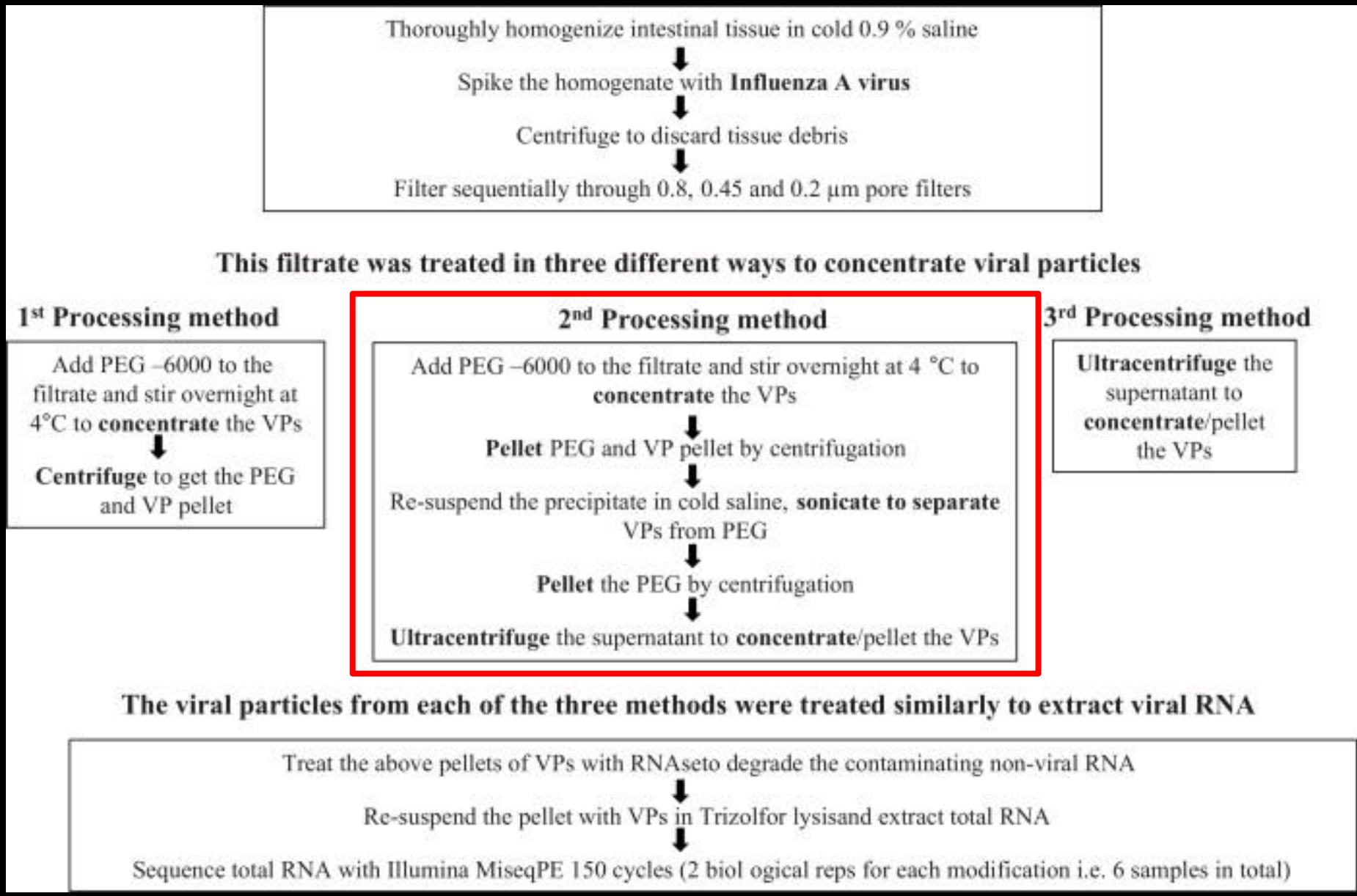
Sampling in OH/MN (Years 1-3)

- MN Turkey partner = Willmar Poultry Company
- MN Layer partner = Sparboe
- OH has identified 2 farms each for turkey and layer
- Flocks will be followed temporally
  - Turkeys: weeks 0, 1, 2, 3, 4, 5, 8, 10, 15
  - Layers: weeks 0, 1, 2, 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 45
- Samples collected: sinus, trachea, ileum, ceca, spleen
- Tissue archive

Microbiome in response to challenge (Years 4-5)

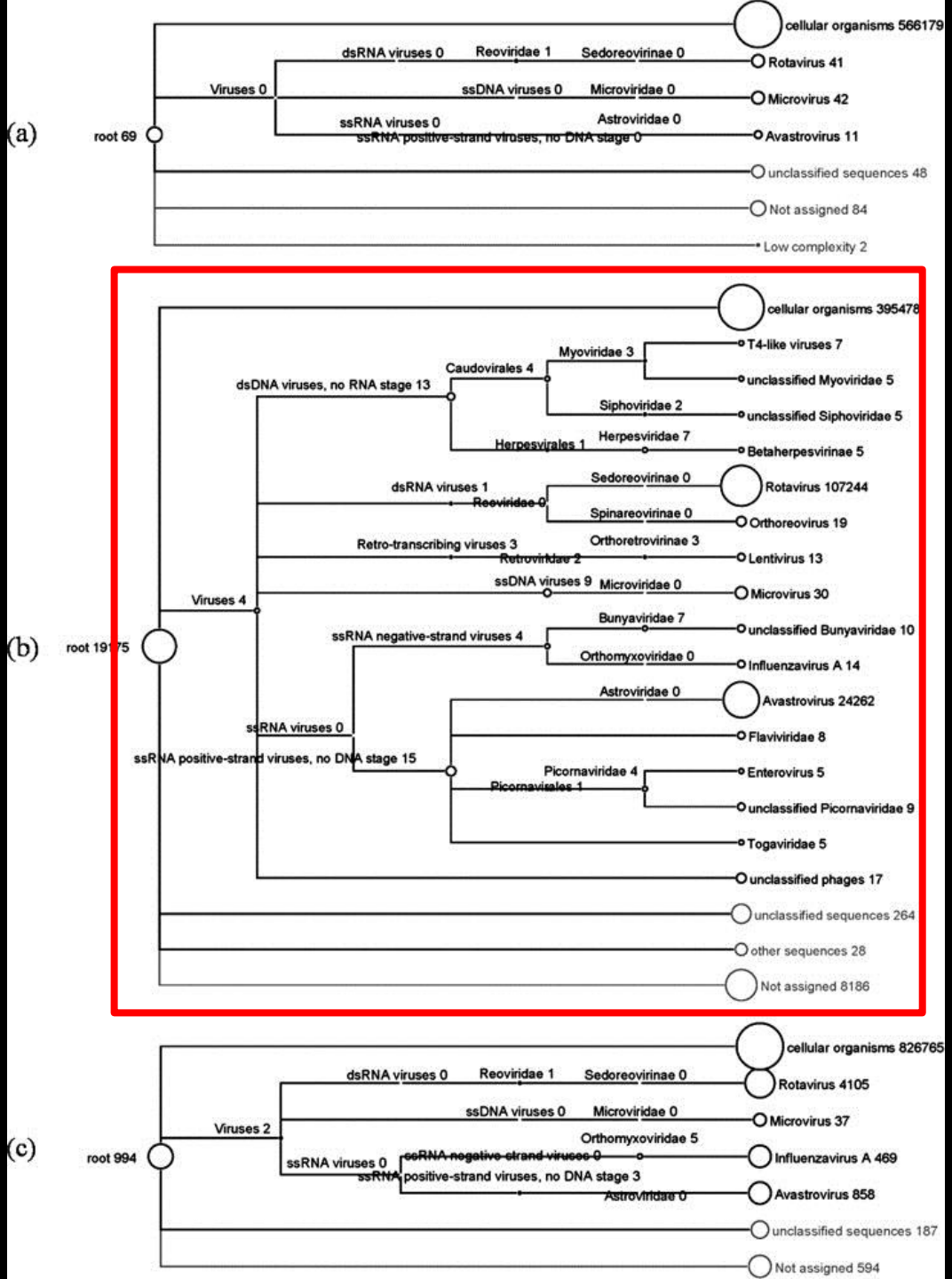
- PIs from PRD-CAP performing challenge studies
- Partner to collect respiratory and gut tissue
- Identify shifts in response to challenge
- Identify predictors of disease susceptibility
- OH has sent samples from SPF flock with/without dexamethasone treatment

Viral sampling



Shah et al., Journal of Virological Methods, Volume 209, 2014, 15–24

Viral shotgun analysis



Percentage of reads by taxon node