Effective Scientific Advances and Promising Research to Reduce the Need for Antimicrobials: Animal Health Perspective

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Disclaimers:

1. There is no single replacement for antibiotics
2. I am not endorsing any products
The Nurmi culture, 1973
Common alternative approaches to antibiotic use

Caly et al., 2015 Frontiers in Microbiology 10.3389/fmicb.2015.01336

Other products: oregano, saponins, garlic, thyme, organic acids, cinnamaldehyde, carvacrol, etc.
Case example
Fermented products (prebiotic): XPC
Case example
Subunit vaccines based on iron receptor proteins

Cholera in chickens

Reproductive health in chickens

Mastitis in cows

Urinary tract infection in humans (mouse model)
Case example
Autogenous vaccination tied with pathogen ecology
Case example
Autogenous vaccination tied with pathogen ecology
Custom-tailored *Bacillus* probiotics

**Necropsy Sessions**
- 3 hens/flock
- 2 flocks - early, mid, late lay
- 10 DOH chicks/flock corresponding flocks to hens

**Plate for *E. coli***
- Pick 5 colonies/bird

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**RAPD PCR**
- How are the APEC isolates related?

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**Isolate DNA**

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**Characterize APEC populations**

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**Multiplex PCR**
- Are the *E. coli* isolates avian pathogenic *E. coli* (APEC)?
  - If virulent, proceed
Custom-tailed \textit{Bacillus} probiotics

\begin{itemize}
  \item \textbf{APEC Indicator}
  \item Add \textit{Bacillus} supernatant and APEC to the plate
\end{itemize}
Probiotic application – a cautionary message

Time zero

3 years
Gut health and the microbiome

Chicken ileum samples by age

PC2

PC1

Age
D0
D07
D14
D21
D28
D35
D42
Gut health and the microbiome

Chicken ileum by treatment

Treatment

- T01
- T02
- T03
- T04
Day 6

Samples by Treatment D06

Treatment
- BMD_Antibiotic
- FM-B11
- GroGel_Control!
- Negative_Control
- Turkey-Specific

Host ileum gene expression
- 1,072 genes
- 5 genes
- 289 genes
Knowledge Gaps

• The “how” behind the efficacies
• Many product classes, many possible combinations
• Turkey $\neq$ Chicken $\neq$ Pig $\neq$ Cow
• Hybrid Turkey $\neq$ Nicholas Turkey
• MN Turkey $\neq$ NC Turkey
• Timing and challenges very poorly studied
Thank you:
Jennie-O-Turkey Store
Epitopix
CEVA
Agro Biosciences
Diamond V
Willmar Poultry Company
Butterball
Pilgrim’s Pride