



Functional Feeds



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The Challenge

- **Double production with:**
 - **$\leq 12\%$ more arable land**
 - **Less water**
 - **Dwindling petroleum supplies**

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Functional Foods

- **Provide benefits beyond bioavailable nutrients**

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Functional Foods

- **People**
- **Animals (feeds)**

Functional Foods

- People
 - Long-term
 - Diseases of aging
- Animals (feeds)
 - Short-term
 - Infectious diseases (enteric)

Functional Foods

- **Animal origin**
 - Se
 - CLA
 - n-3 fatty acids
 - Other

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Market Opportunities

- **Functional foods**
- **Production technology**
- **Food safety perceptions**
 - **Antibiotic use**
 - **Functional feeds**

Role of Functional Feeds

- **Purposes**
 - **Improve health**
 - **Improve performance**

Mechanisms

- **Alter microbial populations in the digestive tract**
- **Immune effects**
- **Others?**

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Examples

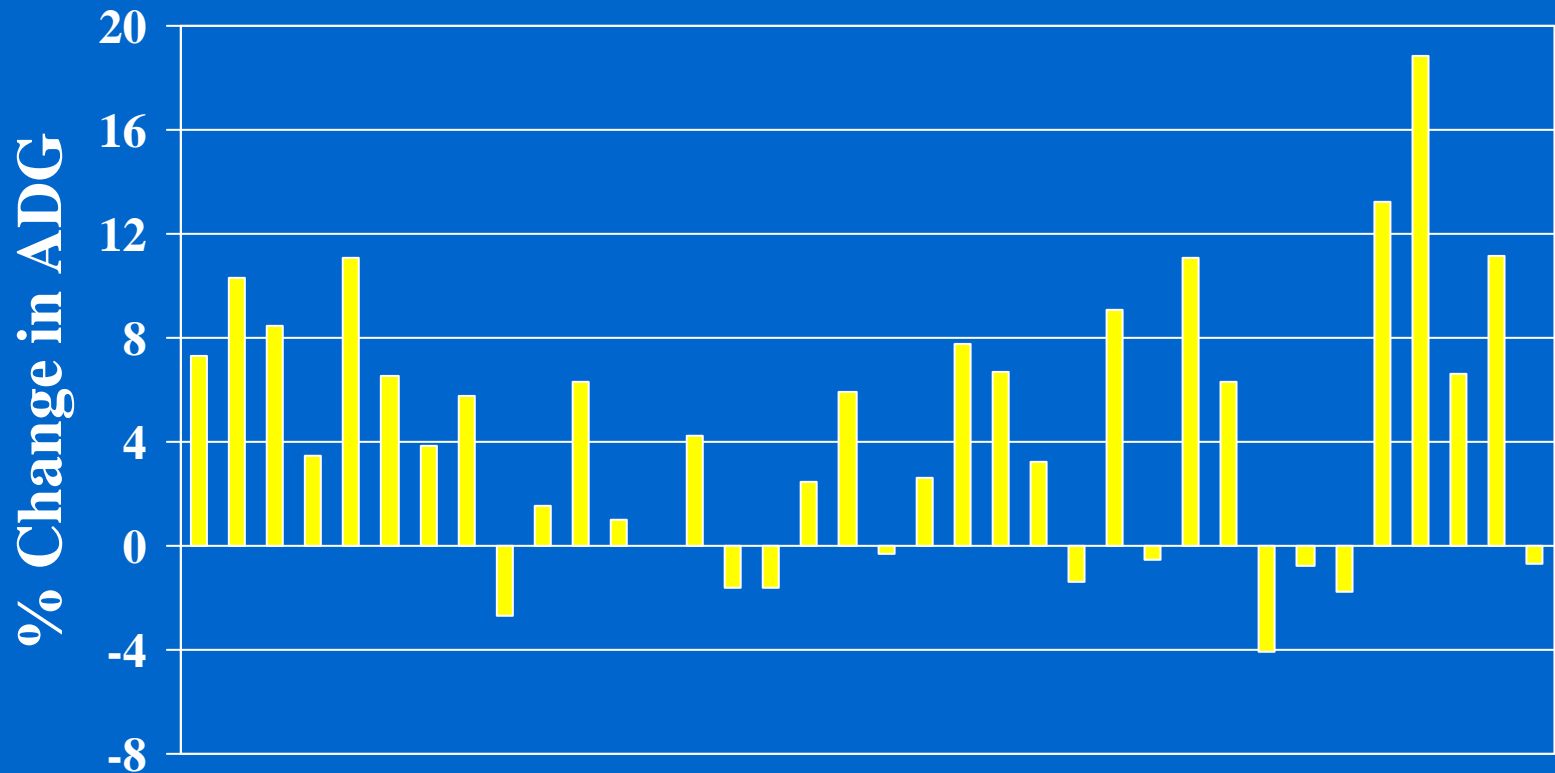
- **Mannan oligosaccharide**
- **Immune egg products**

Mannan Oligosaccharide

- Made from yeast cell wall
- Contains mannose

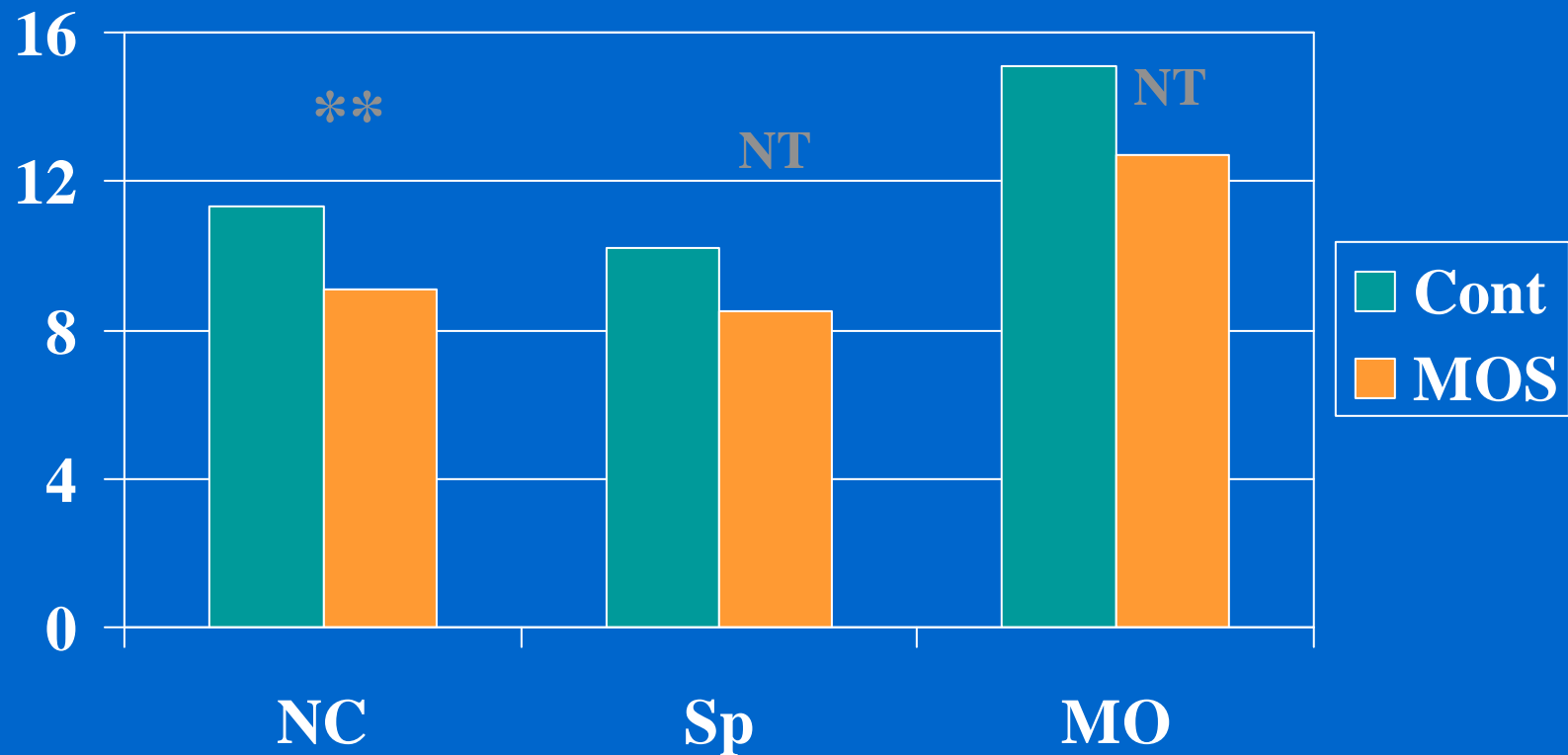
MOS - Starting Pigs

Mean=4.4%; P=0.00003

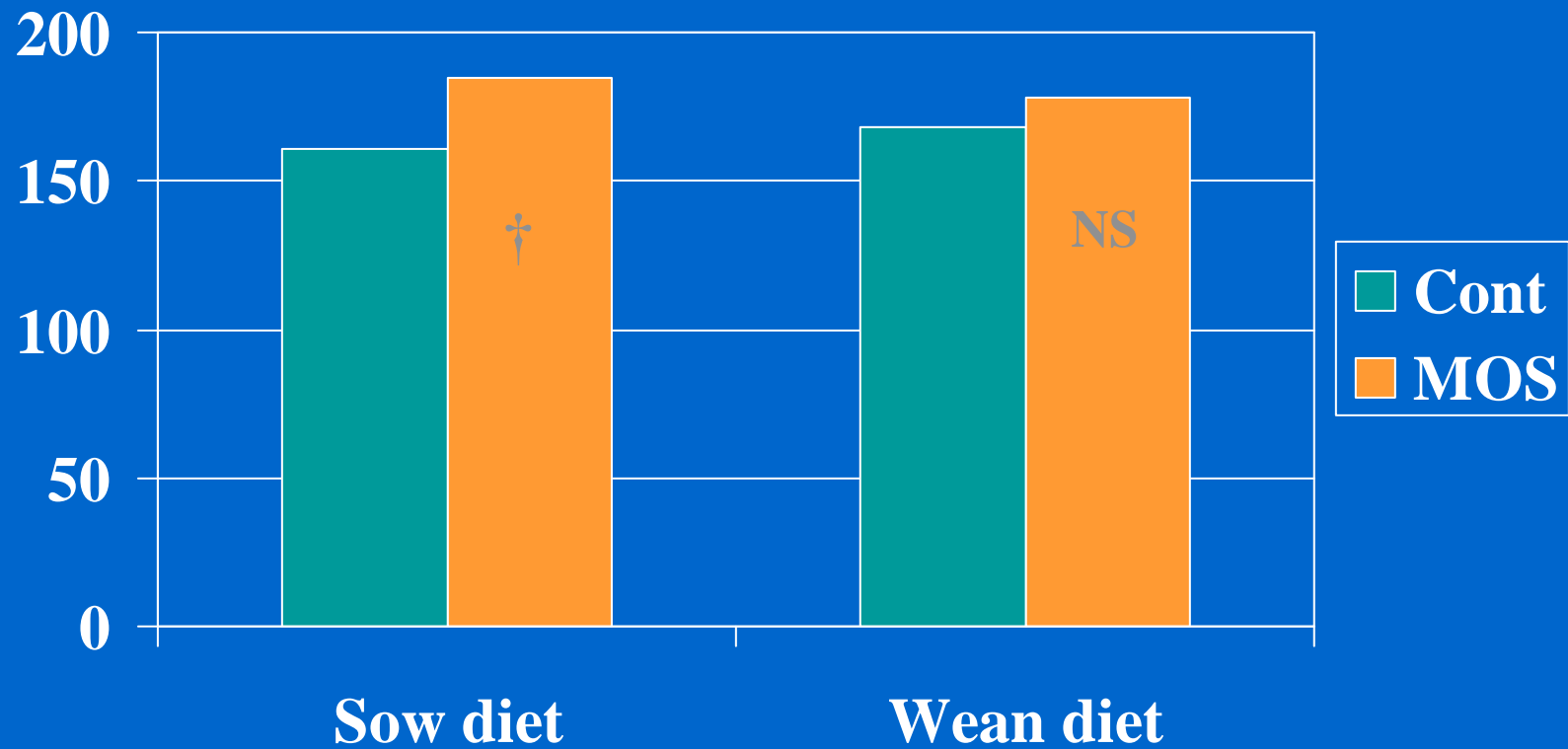


Miguel et al., 2004

Preweaning Mortality, %



Postweaning Growth, g/d



• • • **Proposed Modes of Action**

- **Alters gut bacterial populations**
- **Affects immune system**

Mannan Oligosaccharide (MOS)

- **Improves growth performance of young pigs**
- **Improves sow performance**
- **Changes microbial populations**
- **Affects immune system**

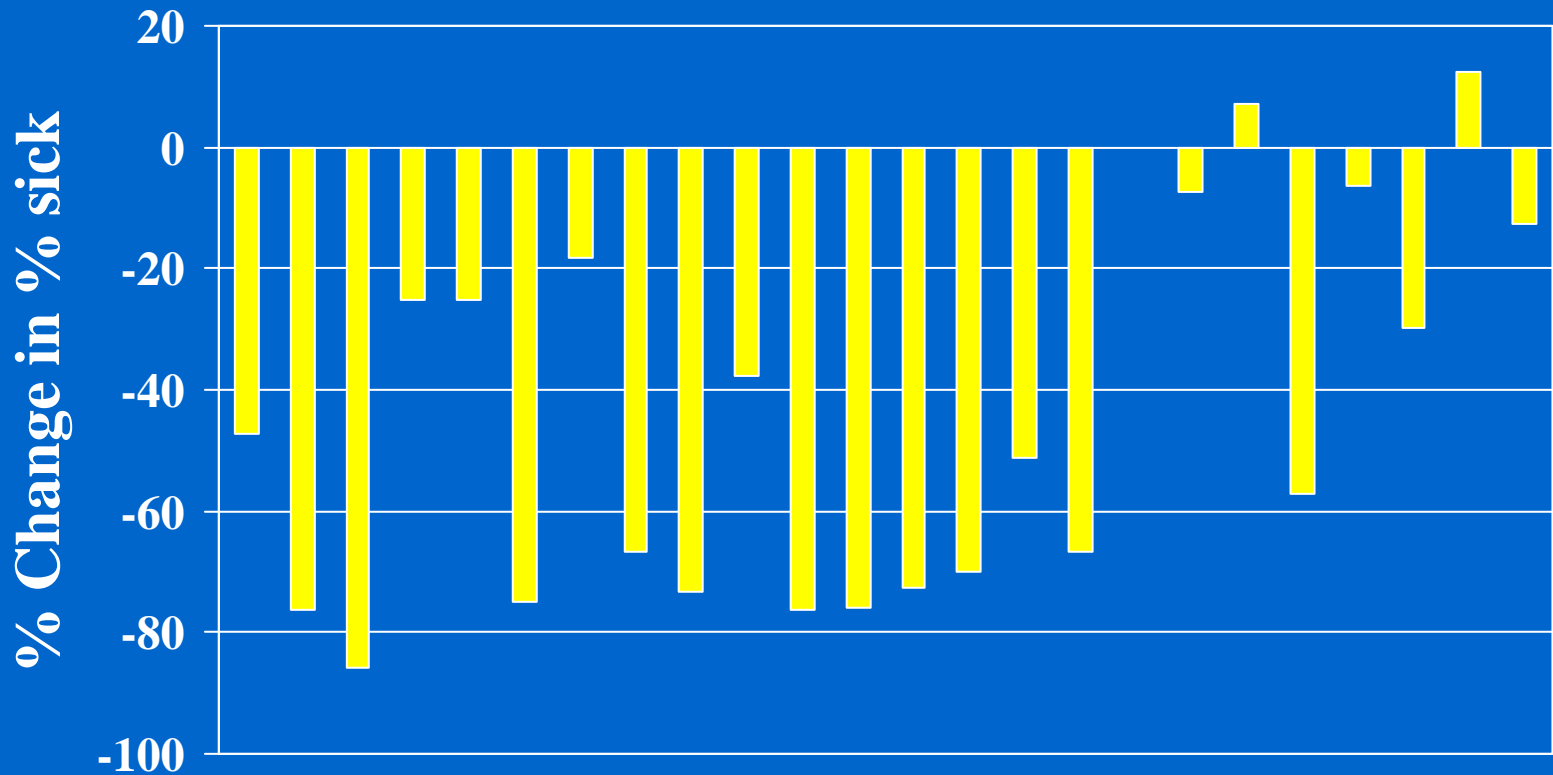
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Immune Egg Products

- Immunize hens against pig pathogens
- Provide passive immunity to pigs

Immune Egg Products

E. Coli infection; Mean=-42.4%



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Dietary Factors

- Energy & protein sources
- Additives
- Feeding management

Energy & Protein Sources

- Spray-dried plasma
- Fibrous ingredients
- Rice
- Milk protein products
- Lactose
- Egg products, conventional

Additives (1)

- **Mannan oligosaccharides**
- **Zinc & Copper**
- **Immune egg products**
- **Acids**
- **Fructo-oligosaccharides**
- **Other oligosaccharides**
- **Direct-fed bacteria (probiotics)**

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Additives (2)

- **Yeasts/yeast products**
- **Essential oils**
- **Bacteriocins**
- **Bacteriophage**
- **Enzymes**
- **Nucleosides**
- **Glutamine**

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Feeding Management

- **Low-protein diets**
- **Restricted feeding**
- **Fermented liquid feed**

Summary

- Focus on food production
- Rich supply of functional feeds
 - Alter bacteria & immune function
 - Increasing evidence of benefits
 - MOS, immune egg products, etc.