Dietary Effects on Air Emissions: Beef Cattle

N. Andy Cole, PhD, PAS
USDA-Agricultural Research Service
Conservation & Production Research Laboratory
Bushland, Texas

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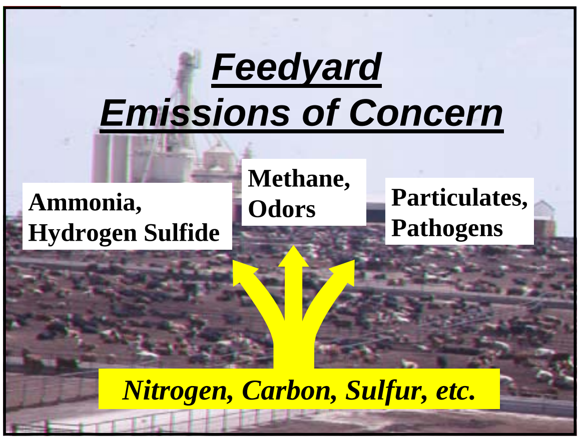
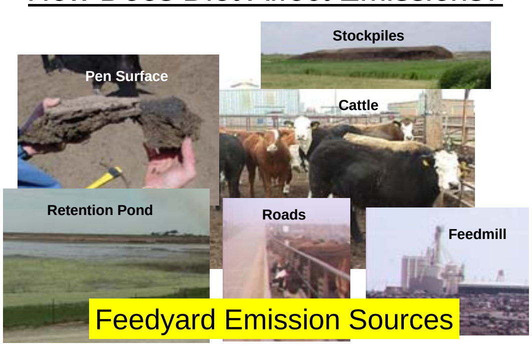


How Does Diet Affect Emissions?



Diet & Particulates

- To our knowledge – no studies
- Does supplemental fat in diet decrease?
- PM emissions - affected by pen surface moisture
  - > As the organic matter content of the pen surface manure increases, the quantity of moisture required to control dust may increase (Miller & Woodbury, 2003)
  - > Ammonia – a precursor of $PM_{2.5}$

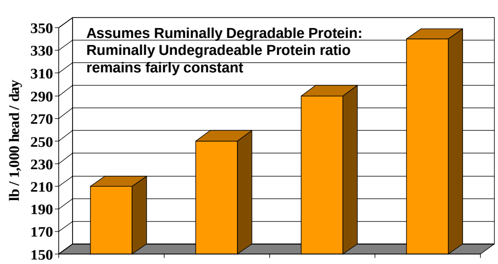
Ammonia Losses

Most ammonia is produced rapidly from urine spots on the pen surface

Possible Exception - "burst" during warm-up after an extended cold (< 45^{O} F) period

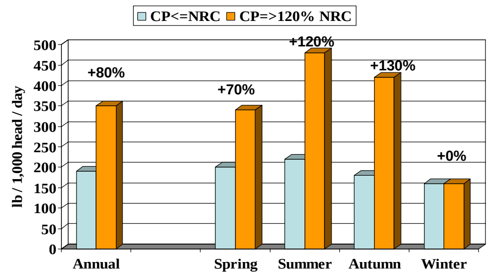
Emissions increase with days on feed (increased urinary N)

Dietary Crude Protein (CP) Effects on NH_3 Emissions (Cole & Todd, preliminary data)



Note: These values should not be used to calculate emission factors

Seasonal Effects of Dietary CP on Ammonia Emissions (Todd & Cole, preliminary data)



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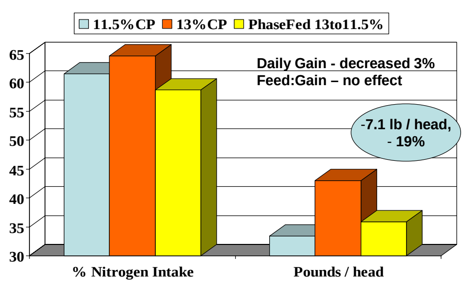
Phase Feeding & Nitrogen Emissions

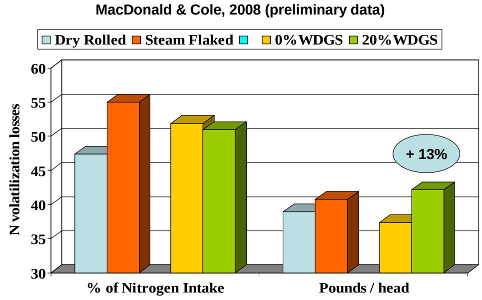
Cole et al., 2006



Note: Similar results in Nebraska studies

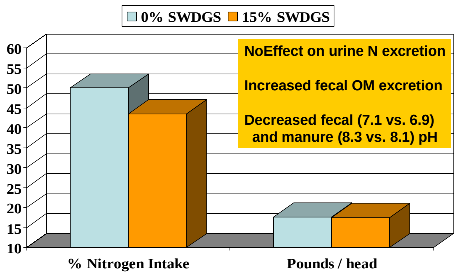
Steam Flaking & Wet Distiller's Grains with Solubles: N Volatilization Losses

MacDonald & Cole, 2008 (preliminary data)



Sorghum Wet Distiller's Grains with Solubles: N Volatilization Losses

Brown & Cole, 2008 (preliminary data)



NH_3 : Summary

- **Daily ammonia emissions from beef feedyards may be decreased by**
  - Decreasing dietary crude protein concentration
  - Limiting Ruminally Degradable Protein (i.e. urea) percentage
  - Phase feeding of protein

NH_3 : Summary

- **Effects of feeding Distiller's Grains**
  - In general – NH_3 losses increase with increasing diet crude protein
  - May be affected by
    - Dietary concentration of distiller's grain (DG)
    - DG grain source (corn vs. sorghum)
    - Season
    - Grain processing method
    - Crude protein of forages fed
      - Alfalfa vs. grass hay vs. silage?

Hydrogen Sulfide and Odors

Most odorous compounds (Volatile organic compounds – VOC) are produced by anaerobic fermentation of carbohydrates and proteins

Hydrogen sulfide (H_2S)– from dietary sulfur sources

Dietary Sulfur Sources

- Forages and grains (mostly amino acids)
  - Sulfur fertilization effects?
- By-products (amino acids & sulfates)
  - Distiller's grains
  - Gluten feed
- Mineral sources (sulfates)
- Water (sulfates)

Distiller's Grains (WDG) & Feedlot H_2S Concentrations (Benson et al., 2005)