



# NATIONAL BIOSOLIDS WORKSHOP \_ REVIEW OF PART 1 - SATURDAY

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# BACTERIA and their CONCERNS

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- Overview of bacteria of concerns
  - Concept of beneficial vs pathogenic bacteria
  - Potential new indicators – clostridial spores
  - Sludge treatment – anaerobic digestion – 99% removal
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# BACTERIAL CONCERNS

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- Salmonella
  - Campylobacter
  - E. coli 0157:H
  - Helicobacter
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# BACTERIAL FAKE CONCERNS

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- Staphylococcus aureus
  - Transfer of drug resistance genes
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# BACTERIAL CONCERNS

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- E.coli and Shigella more associated with animal manures
  - Regrowth issues
  - Test unstabilized biosolids at time of use rather than time of manufacture
  - Positive roles of bacteria in biosolids
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# VIRUSES and their CONCERNS

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- Overview of viruses
  - Enteric viruses
  - Enteroviruses-polio, coxsackie, echo
  - Hepatitis A and E
  - Adenovirus
  - Rotavirus
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# VIRAL CONCERNS - CALICIVIRUS

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- Newly discovered
  - Cannot be cultured
  - Main cause of gastroenteritis worldwide
  - Includes Norwalk, Norwalk-like and small round viruses
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# VIRAL CONCERNS

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- Cause adverse affects to all parts of the human body
  - Children, elderly and immunocompromised at greatest risk
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# VIRAL CONCERNS

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- Anaerobic digestion – 90% removal
  - Aerobic digestion – 90% removal
  - Composting, Air drying, Lime stabilization, 99.9% removal
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# VIRAL CONCERNS – RESEARCH NEEDS

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- Methods for emerging pathogens
  - Treatment of emerging pathogens
  - New indicators
  - Survival and transport of viruses from within biosolids
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# PARASITES AND THEIR CONCERNS

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- Cryptosporidium
  - Cyclospora
  - Toxoplasma
  - Microsporidia
  - Balantidium
  - Giardia
  - Helminthes
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# PARASITES AND THEIR CONCERNS- Issues

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- Survival in biosolids and after land application
  - Routes of exposure?
  - Methodologies
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# ODOR CONCERNS

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- Huge problem with the public
  - Odors as a health problem as well as a nuisance problem
  - Documented – ammonia, dimethyl sulphide etc
  - Influence of mixtures of chemicals
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# ODOR - CONCERNS

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- Penn State Study – odor index
  - PADEP – mobile analytical units
  - Aromascan – fingerprints of specific odors ( not compounds)
  - Fine tuning human recognition thresholds specifically for biosolids
  - Problems of head space analyses overestimating problems
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# EPA CONCERNS

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- Response to NAS Report
  - Interim Statement
  - More detailed plan due January 2004
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# EPA RESEARCH

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- Odors
  - Knowledge workshops
  - Exposure studies on odors
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# EPA - ISSUES

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- NAS Report
  - Odors
  - Biosolid Data Management System
  - State and municipal programs
  - Selling biosolids?
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# SLUDGE STABILIZATION – ENGINEER'S PERSPECTIVE

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- Reduce pathogens
  - Reduce offensive characteristics
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# SLUDGE STABILIZATION

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- Aerobic and anaerobic digestion
  - Air drying
  - Composting
  - Lime stabilization
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# SLUDGE STABILIZATION

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Pathogens can be reduced

Problem is that it still stinks!

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# RISK ASSESSMENT

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- Attempts to give estimate of probability for land application problems



# RISK ASSESSMENT

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- Hazard identification
  - Exposure
  - Dose response
  - Risk characterization
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# RISK CHARACTERIZATION

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- Significance of identified hazard
  - Pathogens- probability of infection
  - Concept of safety
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# RISK PROBLEMS

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- Regional vs national aspects
  - Complex mixtures
  - Variability vs uncertainty
  - Risk communication between assessors and affected population
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# USES OF RISK ASSESSMENT

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- Setting standards
  - Treatment requirements
  - Cost / benefit analysis
  - Quantify safety
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# FATE AND TRANSPORT

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- Major routes of exposure
    - Bioaerosols
    - Contamination of ground water
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# FATE AND TRANSPORT- BIOAEROSOL-ISSUES

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- Lack of data
  - Dowd / Pillai paper
  - Ongoing current studies
    - Millner / Walker
    - Pepper / Gerba
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# TRANSPORT - ISSUES

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- Transport of pathogens from biosolids
    - Methods
    - Transport of viruses
    - Environmental factors
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# TREATMENT AND SURVIVAL – BIOSOLIDS CRITERIA

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- Stabilized
- Non-infectious
- Non hazardous
- Meet physical/chemical/biological criteria

Reviewed with particular emphasis to  
parasites

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# REGULATORY AND STAKEHOLDER CONCERNS

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- Odors
  - Treatment reliability
  - Vector reduction
  - Monitoring and enforcement of regulations
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# MAJOR ISSUES FOR LAND APPLICATION OF BIOSOLIDS

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- Documentation of off site pathogen exposure –bioaerosols and contamination of ground water
  - Odors
  - Emerging pathogens
  - Local biosolids
  - Community communication and relations
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# MAJOR ISSUES

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- Consistency of product
  - Enforcement of regulations – enhanced EPA funding
  - Interpretation of NAS Report
  - Updating of data
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