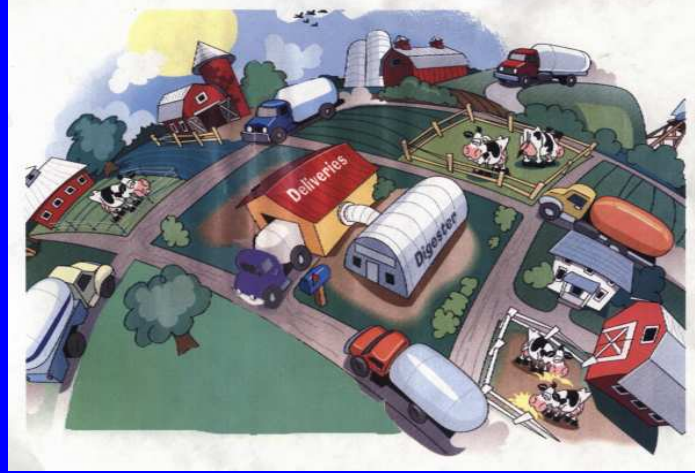


Anaerobic Digesters 101- Pathogens

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Manure is recognized as a means of transmitting some domestic disease agents of bio-security concern in cattle

Interest in adoption of anaerobic digesters is increasing

**AD's have been shown to reduce
the level of pathogens by
as much as 98 %**

Reductions range from 1- 2 log₁₀ for
mesophilic AD
to >4 log₁₀ for thermophilic AD

**While reductions in pathogens have been
demonstrated with ADs.....**

...what risks are associated with community ADs.....

Particularly when liquid or solid manure fractions are
returned to participating dairies.....

.....herd to herd transmission.....

Risks

Purchased animals

Custom heifer raising

Use of manure solids as bedding

Use of liquid manure as fertilizer/irrigation

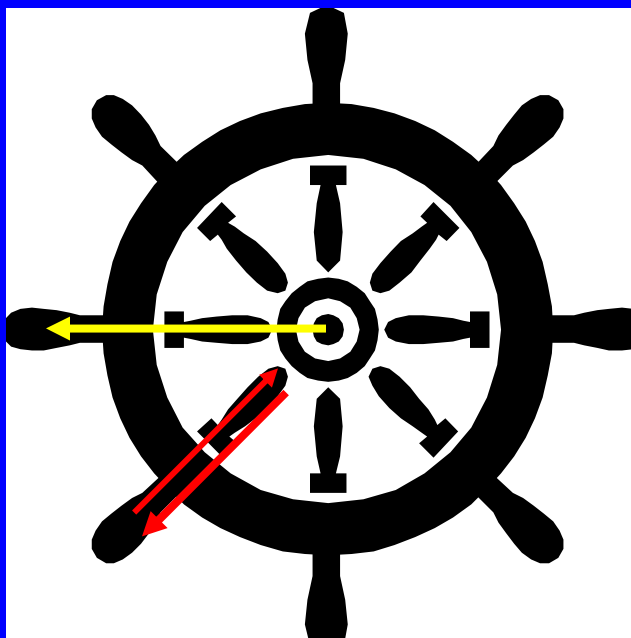




Exporting solids to reduce nutrient loading

	Lb./cow-year (3.5 ton/cow)		
	N	P	K
Avg. separated solids ¹	17.1	3.0	6.5
Cal-Gon's separated solids	22.4	8.4	13
Cal-gon's lagoon solids	31.1	14.6	9.4

¹ Average of 51 separators, Willamette Valley, 1995



Pilot Study - 2004

- Two operating anaerobic digesters in Oregon were the source of pre- and post AD samples.
- The sampling period was bi-weekly, on two consecutive days, for six sampling events.
- The samples were obtained from: manure prior to the AD system, and solids and liquids post AD.
- The design of the two digesters was different, with one being a plug-flow and the other, a continuous feed.

Specific organisms selected for evaluation were:

- *Salmonella*,
- *Generic E. coli* (including O157:H7),
- enterococci,
- salmonella,
- enterovirus, and
- *mycobacterium paratuberculosis* (Johnes).

Generic E. coli was selected because high concentrations are dependably present in bovine fecal waste, and, because of its relatively low thermotolerance

Enterococci were selected because they are dependably present in bovine fecal waste, and, because of their relatively high thermotolerance

Salmonella and *Mycobacterium paratuberculosis* were selected because they are themselves important biosecurity agents, because they occur frequently enough in dairy herds that a good chance exists of finding them (at least in pre-digestion samples), and because they are environmentally resistant to a lesser (*Salmonella*) or greater (*Mycobacterium*) degree

Enteroviruses were selected because they occur ubiquitously in cattle populations at a high prevalence and they have a similar level of environmental resistance as certain viruses with biosecurity implications.

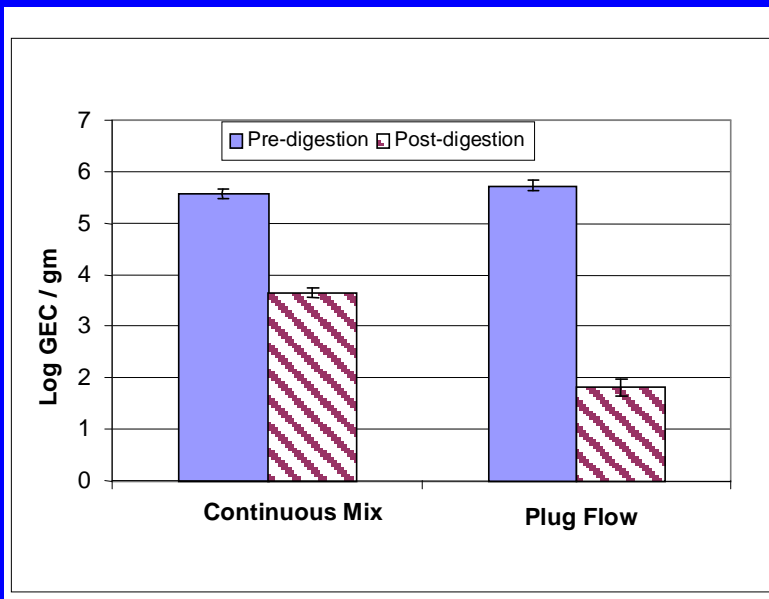


Figure 1. Generic E.Coli concentration in anaerobic digester samples

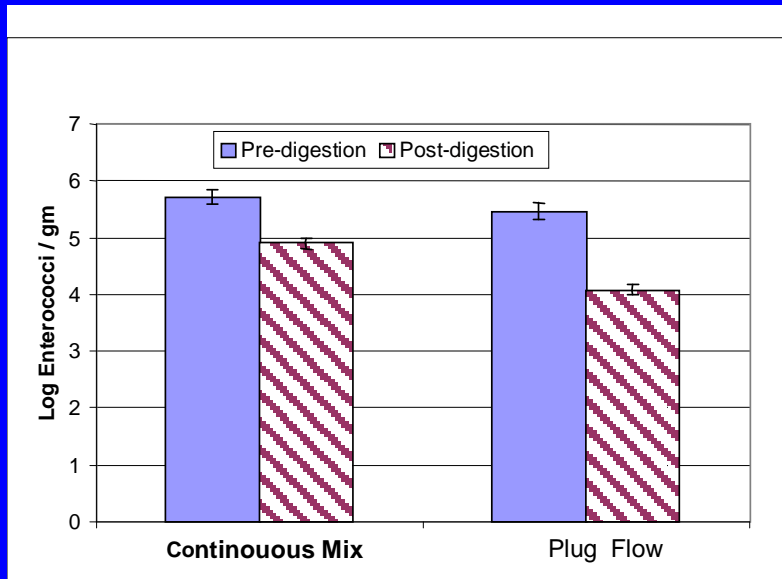


Figure 2. Enterococci concentration in anaerobic digester samples.

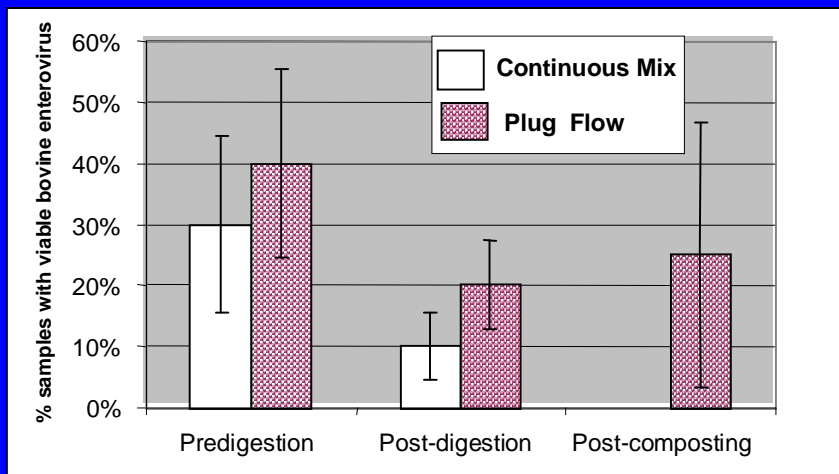


Figure 3. Enterovirus concentration in anaerobic digester samples.

Table 1. Summary of anaerobic digester samples for *Mycobacterium paratuberculosis*.

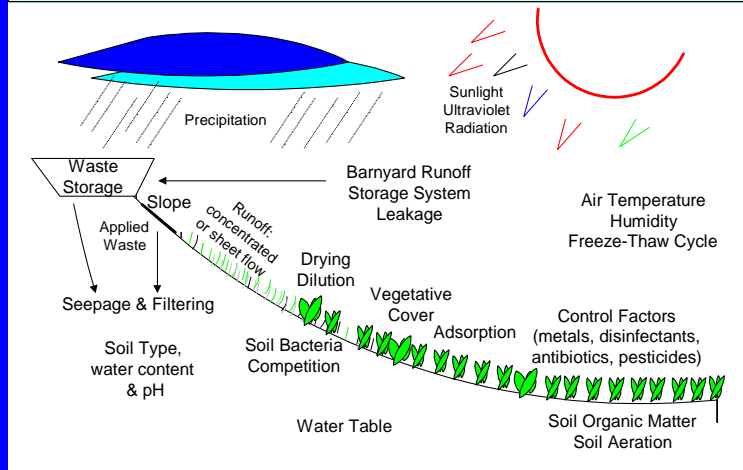
		Pre-digestion	Post-digestion	Post-composted solids
Continuous Mix	Number of samples	10	30	NA
	% Samples with <i>Mycobacterium paratuberculosis</i>	80	40	NA
Plug Flow	Number of samples	10	30	4
	% Samples with <i>Mycobacterium paratuberculosis</i>	90	63.3	0

The overall data suggest that
AD treatment of dairy manure
would not remove all
bio-security hazard.

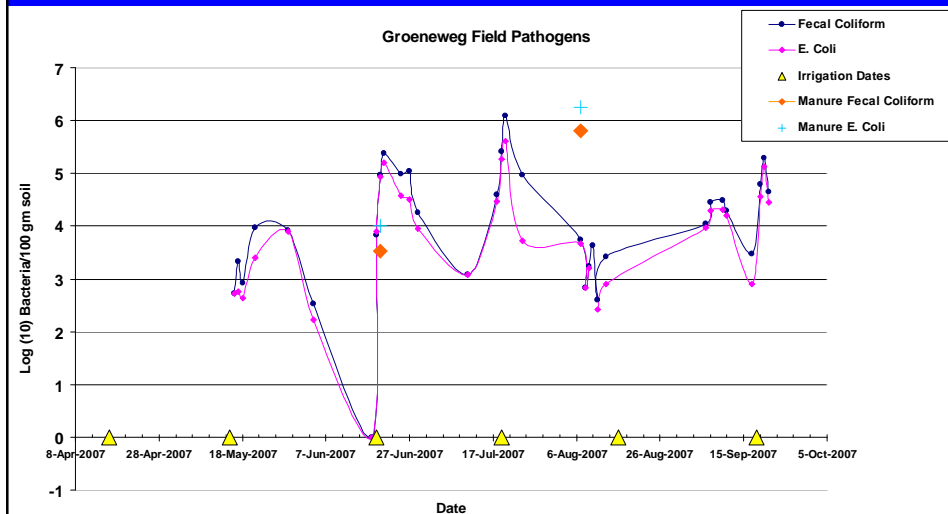
Ongoing Research

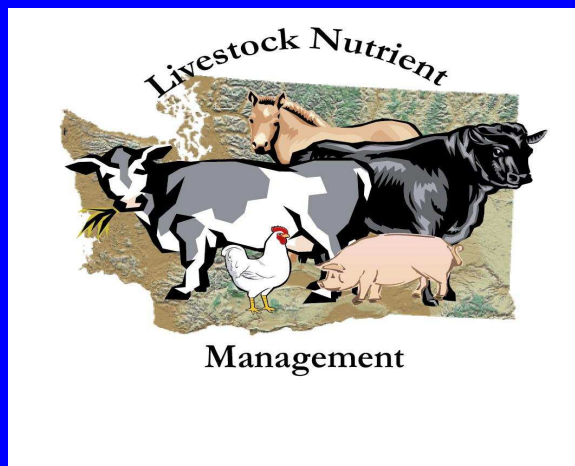
Anaerobic Digesters and Pathogens

Factors affecting the viability of pathogens along transport pathways



Bacterial Survival Curves after Manure Application





Questions ?