Persistence and Leaching Potential of Microorganisms and Mineral N in Animal Manure Applied to Intact Soil Columns - DTU Orbit (03/12/2018)

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Pathogens may reach agricultural soils through application of animal manure and thereby pose a risk of contaminating crops as well as surface and groundwater. Treatment and handling of manure for improved nutrient and odor management may also influence the amount and fate of manure-borne pathogens in the soil. A study was conducted to investigate the leaching potentials of a phage (Salmonella enterica serovar Typhimurium bacteriophage 28B) and two bacteria, Escherichia coli and Enterococcus species, in a liquid fraction of raw pig slurry obtained by solid-liquid separation of this slurry and in this liquid fraction after ozonation, when applied to intact soil columns by subsurface injection. We also compared leaching potentials of surface-applied and subsurface-injected raw slurry. The columns were exposed to irrigation events (3.5-h period at 10 mm h⁻¹) after 1, 2, 3, and 4 weeks of incubation with collection of leachate. By the end of incubation, the distribution and survival of microorganisms in the soil of each treatment and in nonirrigated columns with injected raw slurry or liquid fraction were determined. E. coli in the leachates was quantified by both plate counts and quantitative PCR (qPCR) to assess the proportions of culturable and nonculturable (viable and nonviable) cells. Solid-liquid separation of slurry increased the redistribution in soil of contaminants in the liquid fraction compared to raw slurry, and the percent recovery of E. coli and Enterococcus species was higher for the liquid fraction than for raw slurry after the four leaching events. The liquid fraction also resulted in more leaching of all contaminants except Enterococcus species than did raw slurry. Ozonation reduced E. coli leaching only. Injection enhanced the leaching potential of the microorganisms investigated compared to surface application, probably because of a better survival with subsurface injection and a shorter leaching path.

General information
State: Published
Organisations: National Veterinary Institute, Division of Poultry, Fish and Fur Animals, Section of Poultry Diseases, Aarhus University, Geological Survey of Denmark and Greenland, University of Copenhagen
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Pages: 535-542
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Applied and Environmental Microbiology
Volume: 79
Issue number: 2
ISSN (Print): 0099-2240
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.99
Web of Science (2017): Impact factor 3.633
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.08
Web of Science (2016): Impact factor 3.807
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.14 SJR 1.891 SNIP 1.308
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.02 SJR 1.857 SNIP 1.384
Web of Science (2014): Impact factor 3.668
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.25 SJR 1.899 SNIP 1.414
Web of Science (2013): Impact factor 3.952
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 4.29 SJR 1.975 SNIP 1.429
Web of Science (2012): Impact factor 3.678
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 4.12 SJR 1.914 SNIP 1.455
Web of Science (2011): Impact factor 3.829
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.887 SNIP 1.436
Web of Science (2010): Impact factor 3.778
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.972 SNIP 1.528
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.156 SNIP 1.572
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.043 SNIP 1.647
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.054 SNIP 1.602
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.074 SNIP 1.653
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.108 SNIP 1.648
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.097 SNIP 1.821
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.046 SNIP 1.754
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.989 SNIP 1.736
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.957 SNIP 1.758
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 2.3 SNIP 1.732
Original language: English
DOIs:
10.1128/AEM.02506-12
Source: dtu
Source-ID: n:oai:DTIC-ART:highwire/376936036::24091
Research output: Research - peer-review › Journal article – Annual report year: 2013