



## Decrease Water Pathogens with Light Tilling

**The Ohio State University finds no-till farmers can limit illness-causing parasites from entering the water system by lightly tilling around drains.**

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Excess runoff on farmland can remove important nutrients from the soil while encouraging the presence of Cryptosporidium, a parasite that causes illness in humans. Farmers who apply manure fertilizers to no-till fields can limit environmental and health hazards by decreasing the amount of pathogens that flow into runoff, an Ohio State University study shows. All it requires is following a few recommendations.

OSU scientists studied the transport of Cryptosporidium, a parasite present in animal waste, through no-till and tilled fields. They found that a greater amount of the parasite moved with excess water through no-till fields and into tile drains than in tilled fields, especially during rain.

Cryptosporidiosis, caused by Cryptosporidium, is a waterborne disease that can cause intestinal illness in humans.

Warren Dick, an OSU soil microbiologist, says Cryptosporidium moves more readily through no-till fields because of the presence of macropores created by either earthworms or plant roots.

"We found that the macropores extend from the soil surface right down to the tile drains, so the parasite has a conduit from the manure directly to a water source," Dick says.

Dick and his colleagues found that some tillage seems to keep Cryptosporidium in the soil.

To test the effect of tillage and rainfall on parasite transport, the researchers treated 12 plots—six undisturbed no-till plots and six no-till plots tilled on the surface—with liquid manure containing Cryptosporidium oocysts.

"Even before any artificial rain was applied, almost 30 percent of the liquid manure moved through the no-till soil, but none moved through the tilled blocks," Dick says. "During the rain event, a greater number of Cryptosporidium moved through the no-till blocks compared to the tilled blocks."

As a result, the researchers found that the number of oocysts recovered from the tilled blocks was greater than from the no-till blocks.

"If no-till growers can do just a little light tillage right over the drain tiles, it can have a tremendous impact on the movement of pathogens and nutrients from the soil surface to the field drain tiles, with potential decreases in the transport of oocysts up to 80 percent," Dick says. "Tilling disturbs the macropores and disrupts the direct link from the soil surface to the drain tiles."

In addition to tillage, rainfall timing and rainfall intensity impact the transport of Cryptosporidium. To lessen the impact, researchers recommend farmers apply manure at least 48 hours prior to anticipated rainfall.

"This study is in no way advocating that no-till is a bad management practice. As a whole, no-till has a multitude of environmental and crop-production benefits," Dick says. "But any production practice can be improved upon, and this study demonstrates that there are ways of making no-till better for both people and the environment."

The study, "Effect of Tillage and Rainfall on Transport of Manure-Applied Cryptosporidium parvum Oocysts Through Soil," was published in the Journal of Environmental Quality. It is one of the few studies available demonstrating the transport of manure pathogens through no-till soils.

Fertilizer chemicals and nutrients also are readily transported through no-till soils via macropores from the surface to drain tiles. The results from this study suggest that tilling directly over the drain tile lines could produce similar results in reducing movement of these materials from the field.