

## Research Shows Manure Injection Increases Greenhouse Gas Emissions

The Province of Manitoba has imposed a requirement on hog operations that field applied hog manure must be either injected beneath the soil surface or incorporated (through tillage) into the soil shortly after surface application. At the same time, through the Alberta Environmentally Sustainable Agriculture (AESAs) Program, the Province of Alberta is undertaking a series of studies on manure incorporation/injection in Leduc and Wetaskiwin Counties and near Red Deer.

The stated reason for requiring manure to be injection or incorporated is due to the fact that typically the ammonia in livestock and poultry manure will volatilize (evaporate into the air) more rapidly if it is broadcast (surface applied) on a field than if it is placed below the soil surface. Yet, relatively little attention seems to be paid to the quality of the manure that is being field applied, whether it be broadcast or incorporated.

The majority of manure in Canada is not treated before it is field applied, which, by default, usually results in it being in an anaerobic state (also known as a state of putrefaction). In this condition it emits foul smelling ammonia and hydrogen sulphide gases, as well as methane (an odourless gas that is several times a more potent greenhouse gas than carbon dioxide).

In contrast, when manure is transformed to an aerobic state, ammonia in the manure is converted to ammonium (a more stable form of nitrogen and one of the two plant-available forms of nitrogen) and little or no odour or harmful gases are emitted. Not only is ammonium far less likely to volatilize and therefore be more acceptable for surface application, but it is also less prone to harm water sources through runoff or leaching. Furthermore, if not readily used by plants, ammonium will become fixed to clay and/or organic soil particles until it is used by plants in the future or converted to nitrate (the other plant-available form of nitrogen).

An aerobic process refers to decomposition in the presence of oxygen. It is the normal manner in which living matter breaks down or decays in nature. Anaerobic, as indicated, refers to a putrefaction process that takes place in the absence of oxygen and can be toxic to plants (and plant roots) and can lead to pest infestation and the spread of pathogenic compounds in the soil. [Note: refer to the table called: [Decomposition and putrefaction – the great adversaries](#), on the Resource Centre section of this website for a comparison/contrast between aerobic and anaerobic processes.]

Whereas, agricultural practices in Europe have come to understand the difference between aerobic and anaerobic processes, as far as both solid and liquid manure treatment is concerned; that message has still not fully gotten through in North America. For instance, the Manitoba Clean Environment Committee, which in December 2007 released an extensive review of called [Environmental Sustainability and Hog Production in Manitoba](#) recommending a moratorium on industry expansion and that all hog manure be incorporated. Yet, in their 190+ page report not once do they even mentioned the term “aerobic”, let alone discuss investigated its merits.

A University of Saskatchewan study by Joy Agnew, P Eng found that injecting manure actually increased greenhouse gas emissions by more than 40 percent versus surface application. She postulated that this was “probably” due to the anaerobic conditions underneath the soil. Ms. Agnew noted that microbes that degrade the manure beneath the soil actually emit more toxic greenhouse gases than the aerobic microbes that degrade the manure on the surface. To read more go to: <http://www.thepigsite.com/swinenews/16032/research-shows-manure-injection-increases-greenhouse-gas-emissions>.

[Note: Both **penergetic g** (for slurry/liquid manure) and **penergetic k** (for solid manure/compost) activate an aerobic process in the manure which has the effect of reducing greenhouse gas emissions and overcoming the other problematic characteristics associated with anaerobic manure.]

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