

Microorganisms Isolated from Chicken Gut Can Effectively Detoxify DON and Other Trichothecene Mycotoxins

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Background

Mycotoxin contamination of feed has been a serious threat to the swine and feed industries for a long time. The most significant contaminants in Canadian grains are the trichothecene mycotoxins produced by species of *Fusarium*. Despite a plethora of information regarding the biochemistry, toxicity, and modes of action of mycotoxins, there still remains no viable solution for either pre- or post- harvest control/eradication of these toxins. The industries are facing an even greater challenge in 2007 due to high incidence of *Fusarium* ear rot of corn harvested in 2006. Therefore, effective methods to detoxify mycotoxin-contaminated grains are urgently needed.

It has been known for some time that trichothecene mycotoxins can be degraded into much less toxic compounds (i.e. detoxified), such as vomitoxin or DON being degraded to DOM-1. Recently, our group has studied the potential of detoxifying trichothecene toxins by biological degradation, and confirmed that the degradation could be achieved by microorganisms from chicken guts (Gong *et al.* 2003; Zhou *et al.* 2005).

Objectives

- 1) To isolate microorganisms capable of degrading DON into its less toxic derivative;
- 2) To characterize the identified microorganisms.

Results

- 1) Several single microbial colonies with capability of degrading DON to DOM-1 were successfully isolated from microorganisms originated from chicken gut by a series of selections. The degradation efficacy of these isolates varied, however, at least one of the isolates converted DON to DOM-1 completely.
- 2) The active isolates were identified by using molecular techniques, and were found belonging to different bacterial genera/species. One of the active isolates was further characterized.
- 3) Effectiveness of the isolate: The selected isolate completely degraded DON into DOM-1 in a solution with initial DON concentration at 1000 µg/ml (ppm) after 24-hour incubation.

- 4) Consistency of the isolate: The isolate still showed full activity to degrade DON to DOM-1 after 10 consequent subcultures, proving that the degradation capability of the selected isolate is consistent.
- 5) Initial concentration required for complete degradation: the results from the test with 100 µg/ml DON and 24 hour incubation showed that the minimum initial concentration were 1×10^5 bacterial cells/ml.
- 6) Degradation of trichothecenes other than DON: The selected isolate also degraded another eleven trichothecene mycotoxins tested, including 3-acetyldeoxynivalenol, 15-acetyldeoxynivalenol, 4-diacetoxyscirpenol, fusarenon X, HT-2 toxin, 15-monoacetoxyscirpenol, neosolaniol, nivalenol, T2 toxin, T-2 triol and verrucarol. The resulting degradation occurred either by deepoxidation and/or deacylation. The route depends upon the presence and position of acyl functionalities (Young *et al.*, 2006).

Conclusions and Take Home Messages

Bacterial isolates with capability of degrading trichothecene mycotoxins have been successfully isolated from chicken gut contains. One of the active isolates has been identified and characterized, and is effective in degrading various trichothecene toxins, especially DON. This microbial degradation technology shows promise in the detoxification of trichothecene-contaminated grains; studies to determine its potential applications in swine industry are underway.

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