

## ENGINEERING

- A nano-based adsorption process utilizing TiO<sub>2</sub> and ZnO nanoparticles was found to be an effective option for simultaneous removal of ammonia (NH<sub>3</sub>) and hydrogen sulfide (H<sub>2</sub>S) from gaseous streams to mitigate these gaseous emissions from swine production facilities.
- Control experiments with each type of nanoparticle demonstrated that NH<sub>3</sub> had higher affinities for TiO<sub>2</sub> nanoparticles while H<sub>2</sub>S had higher affinities for ZnO.
- Equilibrium adsorption capacity for hydrogen sulfide increases with increase in temperature while there is a decrease in adsorption capacity for ammonia when temperature is increased.
- Treating gases emitted from stored swine manure in a semi-pilot scale adsorption system utilizing both TiO<sub>2</sub> and ZnO led to complete elimination of both NH<sub>3</sub> and H<sub>2</sub>S from the swine manure gas.
- Application of an air filtration-circulation system with a packed-bed of TiO<sub>2</sub> and ZnO nanoparticles during agitation of manure collected in the underfloor pit of a pig room led to removal efficiencies in the range of 67-100% and 50-100% for H<sub>2</sub>S and NH<sub>3</sub>, respectively.
- Experiments using activated carbon as adsorbent for removal of antibiotics (lincomycin and tetracycline) in aqueous solutions showed more uptake occurred for both lincomycin and tetracycline either individually or combined together in a binary system with increase in temperature.
- Controlled experiments demonstrated that the adsorption capacity for both antibiotics combined in a binary system is lower compared with the results obtained from single-solute system with individual antibiotics. Additionally, the maximum adsorption capacity of activated carbon for tetracycline was greater compared to lincomycin at all temperatures.
- Magnetized activated carbon was developed using a co-precipitation process that deposited iron oxide nanoparticles onto activated carbon powder, with the aim to introduce sufficient magnetic power to the resulting adsorbent to be able to separate the exposed magnetic adsorbent from contaminated aqueous solution using a simple magnet. Results from initial adsorption experiments with antibiotics in aqueous solution showed that although the adsorption capacity of magnetic activated carbon is slightly decreased after the applied magnetization procedure, it still has a high adsorption capacity for tetracycline.



- Initial experiments with activated carbon adsorption of antibiotics in swine manure slurry showed that tetracycline concentration in the manure slurry decreased with time. The required concentration of activated carbon to remove tetracycline in the manure was 1.5 g L<sup>-1</sup>.
- Evaluation of a developed electrostatic precipitator (ESP) system for removing dust, gases, and bacteria in a livestock production room showed that the ESP system was able to remove 75% of total airborne dust and 33% of gaseous NH<sub>3</sub> compared to an identical room with no ESP installed (Control). Ozone and bacterial concentrations between the treatment and control rooms were not markedly different.

## NUTRITION

- Supplemental threonine increased growth performance in pigs fed high-fibre diets or challenged with Salmonella. The response to supplemental threonine was reduced when both Salmonella challenge and dietary fibre were present, indicating an additive effect of these two factors on threonine requirements.
- Feeding diets containing 3 or 5 ppm DON reduced growth performance and feed intake in finisher pigs (75 – 120 kg). Growth performance and feed intake had recovered after four weeks of consumption of DON-contaminated diets, indicating that pigs are capable of adapting to DON-contamination. There was no effect of consumption of diets containing 1 ppm DON on performance.
- There was no effect of intake of DON-contaminated diets on indicators of kidney or liver function/health or on feed efficiency. This suggests that the effects of mycotoxin on growth performance are largely related to feed intake.



## ETHOLOGY

- Urea flux into the intestinal tract occurs in the pig in both the small intestine and caecum and known transporters of urea are present in the small intestine (aquaporins) and large intestine (UT-B). Urea flux was not affected by known inhibitors of urea transport, indicating that urea recycling in the pig may be unregulated or dependent on other factors.
- The threonine requirement for maximum nitrogen-balance was estimated at 0.68, 0.64, 0.72, and 0.68% SID for Low DF-Low IP, Low DF-High IP, High DF-Low IP, and High DF-High IP fed pigs, respectively, indicating an increased threonine requirement in high DF (dietary fibre) diets and decreased requirement with greater IP (indigestible protein).
- High indigestible protein increased and high dietary fibre decreased digesta ammonia concentration indicating reduced fermentation of dietary protein with addition of dietary fibre.
- Both high dietary fibre and indigestible protein affected markers of gut barrier function.
- Multi-carbohydrase enzymes (xylanase, cellulase, amylase, glucanase and invertase) fail to improve energy content of diets with a 30% millrun inclusion.
- The inclusion of xylanase to a high wheat diet reduced the degree of polymerization of oligosaccharides (broken to small units) in the ileum and improved energy digestibility.
- Xylanase improved the energy digestibility in wheat, but not corn, based diets in the finisher phase of growth.
- Studies were done comparing stress levels in piglets castrated with pain control (ketoprofen), castrated without pain control and 'sham' castrated pigs (handled only). Piglets castrated with no pain control had higher cortisol concentrations at 45 minutes after treatment compared to pigs that were sham castrated, and piglets castrated with pain control were intermediate.
- Comparing cortisol responses in pigs castrated at 3 and 10 days of age, older pigs showed lower cortisol levels overall and greater benefits of pain control on reducing cortisol levels. Because older piglets showed a clearer response when given pain control than young piglets, they may be useful as a model for evaluating pain control options.
- Providing pain control 1 h before castration resulted in significantly lower cortisol levels compared to pigs that did not receive analgesia. Providing analgesia immediately before castration was significantly better than providing no analgesia at all, but was not as effective as giving analgesia 1 h before treatment.
- Although Meloxicam is the only drug in Canada labelled for pain control in pigs at castration, we concluded that the analgesic, ketoprofen, is also effective for reducing pain following castration when given 30 minutes to 1 h before the procedure. Drug provision immediately before castration also appeared to be better than providing no pain control.
- In studies examining the motivation of stall-housed sows to exit their stalls, both sows and gilts were motivated to exit the stall and showed similar levels of motivation (measured in button presses to gain the reward). The motivation of sows to exit their stall was also influenced by their level of satiety. Sows fed to satiety were less motivated to exit the stall than sows that were limit fed, indicating that hunger increases the motivation to leave the stall. These findings will be considered when making Code revisions related to the management of stall-housed sows.



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