

A multi-agency team of researchers is investigating the potential of essential oils or compounds as alternatives to antibiotics in swine production.

The team, consisting of researchers from Agriculture and Agri-Food Canada, the University of Guelph, the Public Health Agency of Canada and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), was led initially by Joshua Gong and then Qi Wang, and includes R. Cao, T. Zhou, R. Friendship, C.F.M. de Lange, C. Poppe, R. Johnson, M. Clunies and W. Du.

Essential oils which help fight foodborne

by TREENA HEIN

Research has uncovered that a number of essential oils have strong antimicrobial properties that do not interfere with beneficial bacteria

This research project began in 2005 with testing of 66 essential oils (including geraniol, eugenol, carvacrol, cinnamon oil, clove oil and thymol) for their ability to inhibit the growth of certain types of salmonella and E. coli.

Sixteen out of the 66 were found to have strong antimicrobial properties. Nine were then further studied to measure the degree of antibacterial effects and stability at low pH (the acidity level found in pig stomachs), and to determine whether they had any negative effect on the growth of beneficial gut bacteria.

"Most of these selected essential oils demonstrated high efficacy in vitro against the pathogens, with little inhibition towards beneficial bacteria – lactobacilli and bifidobacteria," says Gong. "These compounds were also tolerant to low pH

found in the animal gut environment."

Pig infection experiments have demonstrated the promise of some oil compounds for future application. "Further investigation is required to deliver the oils effectively to pig guts and other issues regarding field use," Gong notes.

Although this research has shown that some essential oils can be developed into substitutes for dietary antibiotics in controlling both human and swine bacterial pathogens, there are still many challenges to overcome. The team's recent work, for example, has demonstrated that the interaction between

pig feed and essential oils significantly limits the antimicrobial activity before the oils reach the desired gut region. Therefore, Wang says,

"an effective and practical delivery of essential oils is critical in maximizing their antimicrobial effect."

One of the few options open to explore in the effort to stabilize essential oils and protect their antimicrobial activity before they reach the desired region of the pig digestive tract is the use of microencapsulation techniques (delivery of the essential oils in capsule form). The researchers examined two encapsulation techniques – co-extrusion and single extrusion – and found that single extrusion offers better stability and higher loading efficiency.

Microcapsules prepared through single extrusion remain intact in the pig's stomach with minimal release of essential oils, which prevents the oils from interacting with feed components. Experiments showed that the oils were rapidly released upon reaching the small intestine, which is the desired action site for inhibiting the pathogen growth.

The researchers have also compared different forms of essential oils – dry powder and liquid suspension – and have found dry powder preferable as it is easy to store, handle and distribute. Using dry powder also makes it easy to control the dosage and, in addition, it can be applied to a premix, then added to feed.

This year, the research team will carry out tests on the antimicrobial activity of their developed essential oil capsules when they are mixed with feed and exposed to simulated digestion. The team will also strive to improve the current encapsulation formula and develop new ones which will achieve better release in the pig's digestive system.

Animal tests will be planned if the in vitro study offers positive results.

Joshua Gong

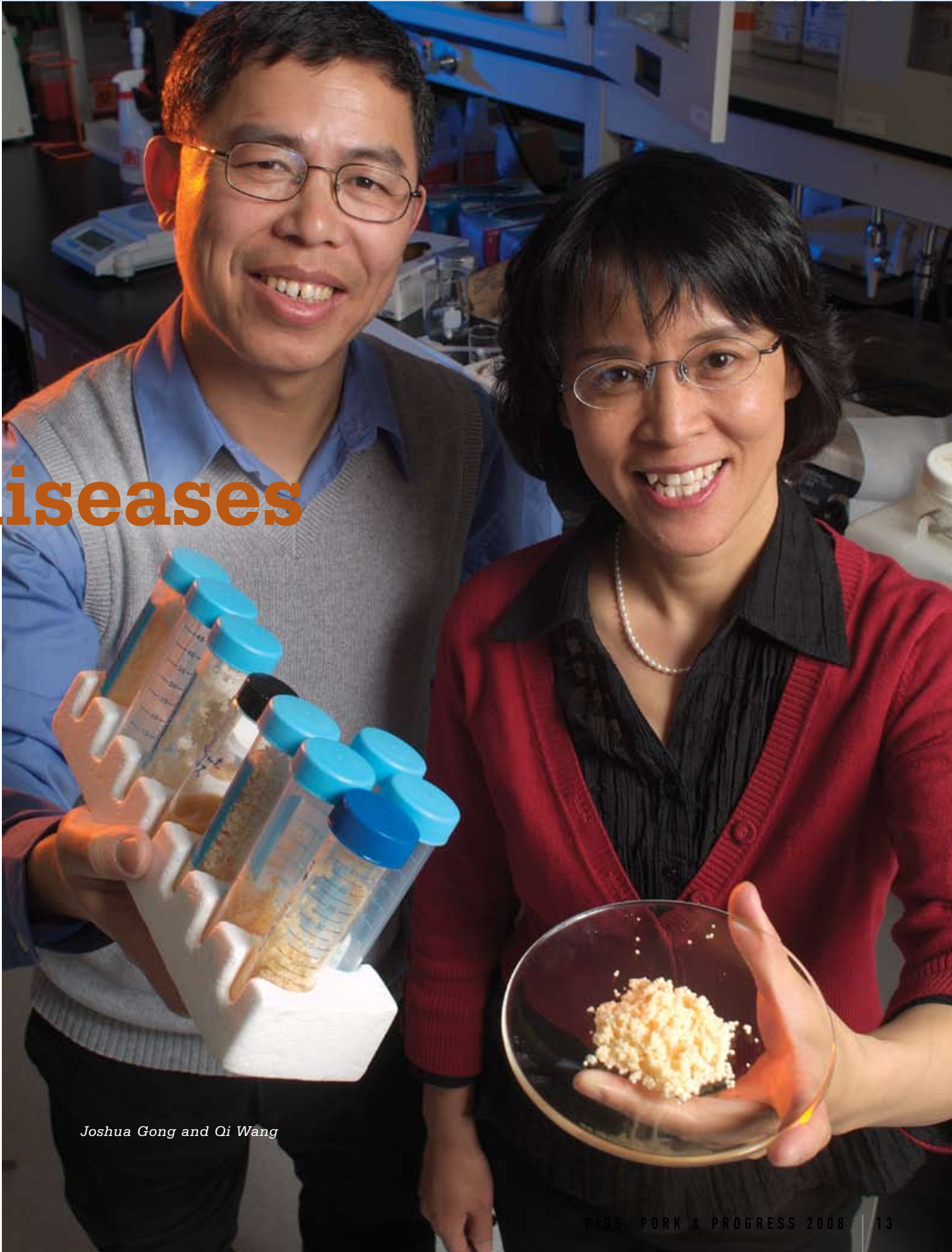


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diseases



Joshua Gong and Qi Wang