

by TREENA HEIN

The well-known Enviropig project at the University of Guelph is taking significant steps on the road to commercialization.

The Enviropig is a genetically enhanced pig with the capability of producing the enzyme phytase in the salivary glands. In the mouth, this enzyme mixes with cereal grains being consumed and, once in the stomach, it digests the phosphorus present in the feed into phytic acid, releasing phosphate that is readily absorbed in the small intestine.

These pigs are, therefore, able to use more of the phosphorus present in a standard diet of corn, barley, wheat and soybean meal. This, says project leader Cecil Forsberg, emeritus professor in the University of Guelph's Department of Molecular and Cellular Biology, circumvents the need to add either supplemental phosphorus or commercially prepared phytase to the diet, which must be done to balance the phosphorus levels in standard pig diets.

"A modest cost savings results," Forsberg notes, "but the key feature of these pigs is the reduced phosphorus content in their manure, which could be a definite advantage in areas of intense hog production."

Manure with a lower phosphorus content is obviously better suited for long-term repetitive application to agricultural land.

MARTIN SCHWALBE



Applications to the United States Food and Drug Administration and Canadian authorities for approval of the Enviropig™ for human consumption are exciting media interest here and in the U.S.

# Next on the Enviropig™ agenda – regulatory approval

Forsberg and his colleagues have shown that phosphorus in feces from one line of weanling Enviropigs, not supplemented with phosphate, was reduced by 75 per cent compared to standard weanling pigs. A more realistic measure is the total excretion in the manure consisting of both feces and urine. On this basis, unpublished data has shown that finisher Enviropigs™ excrete 35 per cent less total phosphorus than phytase-supplemented standard pigs.

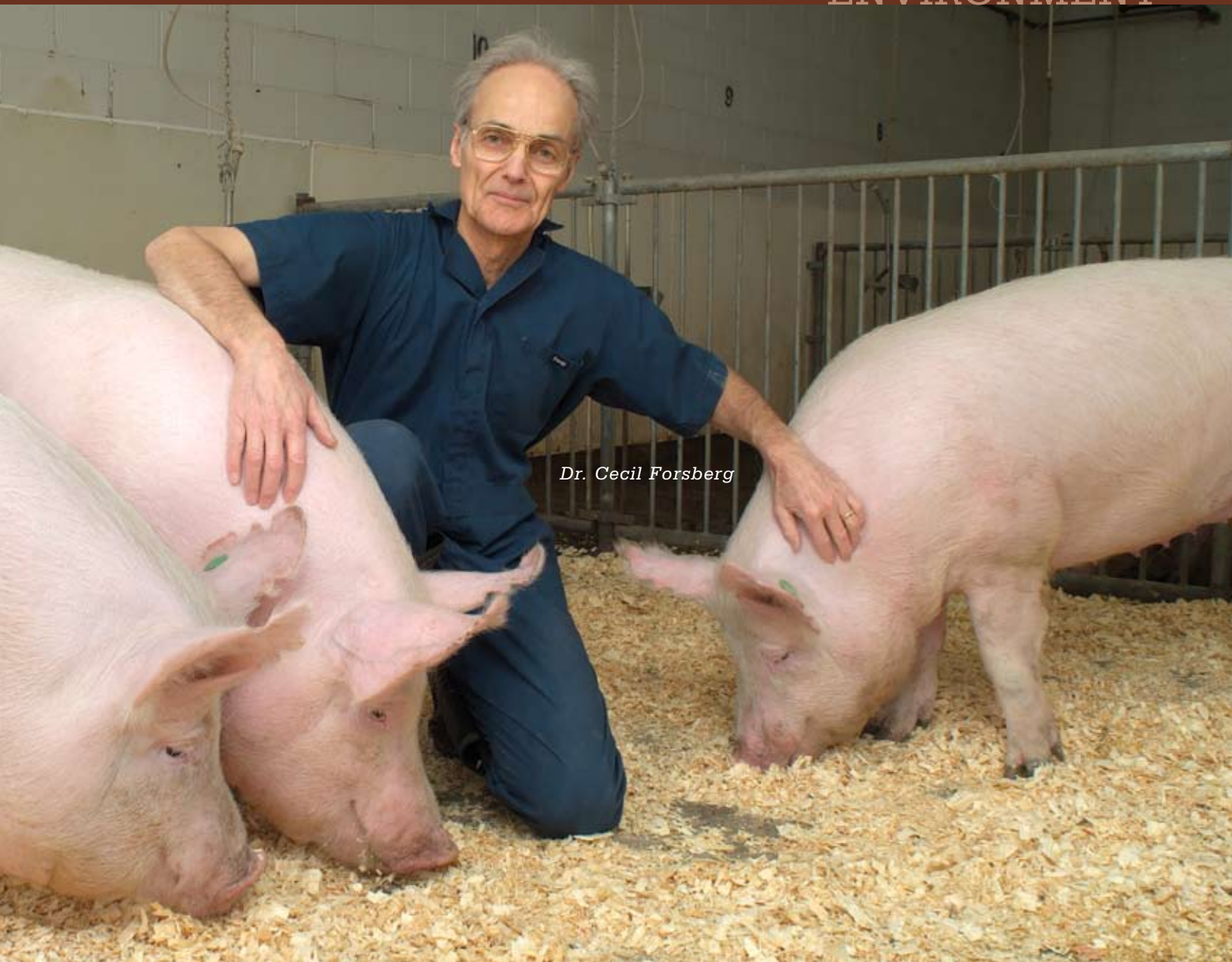
Since the present line of Enviropigs was created in 1999, seven generations of these animals have been studied intensively. All physiological indicators tested – including growth rate, litter size, meat cuts and much more – show that these pigs are identical to all other pigs except for production of phytase. Forsberg notes that "breeding indices of these pigs have been achieved which are equal to that of the best breeding

stock in the university's Yorkshire swine herd."

Over the years, the researchers have isolated and sequenced the introduced gene, analyzed health status data and conducted comparative chemical composition studies on edible tissues. They have also done tests to determine any potential to cause allergic reactions. They have ongoing collaborative projects to assess the environmental impact of manure from the Enviropigs.

All this data is being used now in the project's latest step forward. Recently, the University of Guelph Enviropig research group submitted an application for regulatory approval of the Enviropig for human food consumption to the U.S. Food and Drug Administration (FDA). "At the same time," Forsberg says, "we have begun preparing a separate application to the Canadian regulatory authorities, including Health Canada, the

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*Dr. Cecil Forsberg*

# in Canada and the U.S.

Canadian Food Inspection Agency, and the 'New Substances Division' of Environment Canada."

When the FDA will make a determination on the application is not known at this time. Forsberg says that, since the Enviropig is one of the first transgenic food animals being considered by the Agency, the assessment may be very lengthy.

Regulatory submissions must include details of the sequence of the transgene integrated into the animal chromosome, an indication of whether insertion of the new gene affects any other gene functions in the animal, and information on animal health/welfare and meat composition. Applicants must also provide a description of the location, quantity and potential for allergic reactions from the new protein produced, as well as a description of efficacy – does the animal function as intended? – and potential environmental impact.

The announcement of the regulatory submission has rekindled interest in the Enviropig. Articles have recently appeared in the *Toronto Star*, *Detroit Free Press* and *Des Moines Register*. Forsberg has also received inquiries from *Scienceline*, American Public Radio 'Environmental Report' and several local newspapers such as the *Guelph Mercury*. He and his collaborating colleague, Prof. John Phillips, expect more calls to come.

Compared with standard pigs, Enviropigs provide greater ability for diet manipulation and improved flexibility in manure handling and distribution with the same performance and superior genetics. If the human population continues to grow, meat production must become more efficient in order to sustain the environment in its current state. The Enviropig offers one avenue to achieve that efficiency.