

Plant anti F4 antibodies extend passive immunity of piglets after weaning against ETEC diarrhea

Description

Enterotoxigenic *E. coli* (ETEC) that express F4 (K88) fimbriae are an important cause of diarrhoea in recently weaned piglets. The F4 fimbriae are long proteinaceous appendages mainly composed of several hundreds identical FaeG subunits. They enable the bacteria to adhere to F4-specific receptors (F4R) on the intestinal epithelium and subsequently to colonize the small intestine. Diarrhoea is caused by the production of enterotoxins (LT, STa and/or STb) by the F4⁺ ETEC. F4⁺ ETEC are present worldwide. In Belgium, more than 65% of all pigs are infected leading to important financial losses for the farmer (reduced growth, increased feed conversion and excessive use of antibiotics). Due to increased problems with antibiotic resistance the use of antibiotics has to be strongly limited resulting in an urgent need for valuable alternatives.

We have developed anti F4 antibodies (F4 Abs) that can be produced in plant (*Arabidopsis* seeds). These antibodies are able to block the attachment of F4⁺ ETEC to the intestinal villi which could thus avoid colonization leading to the development of diarrhoea. Including the plant based F4 Abs into the feed of the pig(let) can thus lead to passive immunization and protection against the development of diarrhoea.

Principal investigators

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Plant based F4 antibodies block attachment of F4⁺ ETEC : Proof of Concept

- The inhibiting effect of F4 Abs on the attachment of F4⁺ ETEC to porcine small intestinal villous enterocytes was investigated using an in vitro villous adhesion inhibition assay (Coddens et al. 2009).
- In this assay, F4⁺ ETEC is pre-incubated with plant anti-F4 Abs for 1 hour and subsequently incubated with isolated pig intestinal villi.
- The adherence of F4⁺ ETEC to isolated pig intestinal villi is examined by light microscopy and quantified by counting the number of adhering bacteria per 250 μm villus.
- Plant F4 Abs reduced attachment of F4⁺ ETEC to the villi with 75% and were equally effective as classical monoclonal anti F4 antibodies.

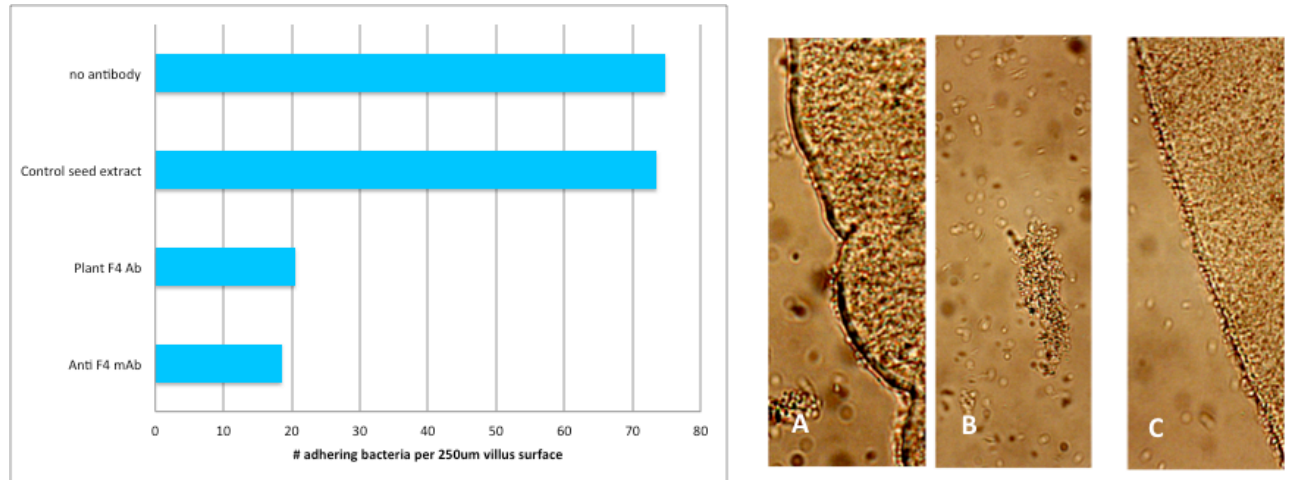


Figure 1 : Plant made F4 Abs inhibit the bacterial adhesion to the villi surface (graph and panel A) equally effective as classical monoclonal antibodies (Anti F4 mAb) and agglutinate the bacteria (panel B). Panel C shows F4 positive bacteria adherent to the villi surface in absence of the protective antibody (negative control).

Reference

Coddens, A., M. Diswall, et al. (2009). "Recognition of blood group ABH Type 1 determinants by the FedF adhesin of F18-fimbriated Escherichia coli." *The Journal of Biological Chemistry* **284**(15): 9713-9726.

Benefits and value

- Plant F4 Abs can **provide passive immunity** to pigs and protect them against infection with F4⁺ ETEC and development of diarrhoea
- The technology can easily be transferred from Arabidopsis to other crops that are suitable **feed ingredients** (e.g. soybean).
- Plant based F4 Abs can thus provide a valuable **alternative for antibiotics** and avoid huge financial losses for the farmer.

Collaboration type

We are looking for a partner that is interested in the development and/or commercialization of anti F4 antibodies in feed ingredients (e.g. soybean) for passive immunization of pigs against F4⁺ ETEC.

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