

Lactogenic Immunity in Swine through Oral Immunization with Plant Vaccine of 987P FasG

: Hyang Keun Lee¹, Ae Rin Jeon¹, Ham In Ki², Sung Hoon Kim³, In Be Kim³,
Cheol Ho Hwang^{1*}

¹Dankook University, ²Chungcheong Nam-Do Agricultural Research and Extension Services, ³Sunjin

Objectives

We had developed carrot-derived vaccines of Pilin and FasG from enterotoxigenic *E. coli* K88ac and 987P, respectively and their efficiency as vaccines had been evaluated successfully by applying to mouse and piglet. The results suggested a possibility of the transgenic carrot as vaccine against enteric diseases. Due to the practical difficulties in oral immunization against the enteric pathogens in newborn animals, a lactogenic immunity is explored to test the passive immunization to protect new born mammals against pathogens by active immunization of their mother.

Materials and Methods

○ Materials

- plant : *Daucus carota* L. (Mansan5chon), vector: pGAfasG

Swine : A total of 15 of pregnant swines, 81 specific pathogen free of 6 days-old pigs

Bacteria : enterotoxigenic *E. coli* 987P

Feedstuff additive : 200 g freeze-dried transgenic (987P FM3-1) & nontransgenic carrot,
200 g freeze-dried nontransgenic carrot with 987P recombinant protein (1 mg)

○ Methods

- Five group of 3, 3~4 parity of sows were fed, on days 45, 31 and 17days before farrow of the experiment. The piglets of 6 days old were orally challenged with 4 ml of 987P (1.0×10^8 cfu/ml).

Results and Discussion

The pregnant swines were applied orally with carrot vaccine along with feed at a 2 weeks interval for 3 times until 10 days before delivery. The piglets delivered from the orally immunized swines were challenged with pathogenic 987P ETEC, and fecal excretion of 987P was analyzed at 12 hour intervals for 6 times. The piglets grouped as the transgenic carrot vaccine showed a decrease in diarrhea occurrence to 20% and 5 time less in occurrence of 987P bacteria in fecal excretion comparing to control piglets receiving non-transgenic carrot.

The results indicated that an active immunization of the female parent through oral delivery of vaccine plant could induce a passive immunization of the offsprings. It appears that the antibodies produced in mother are successfully transferred to the newly-born offsprings through lactation and protect the animal from a challenge of the pathogen.

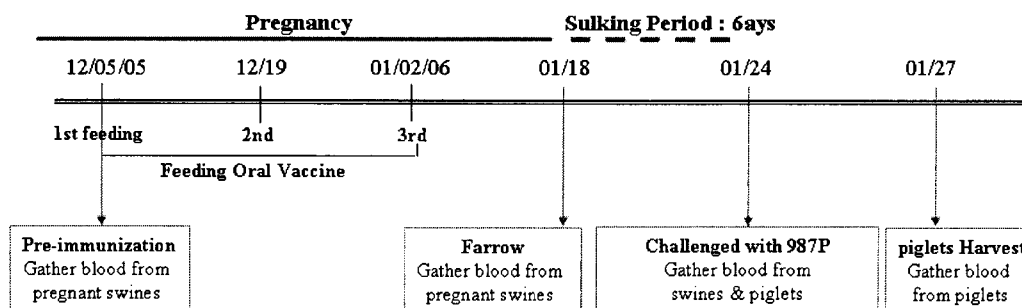


Figure 1. Diagram showing passive immunization of swine pups through oral immunization of dams with a plant-derived vaccine.

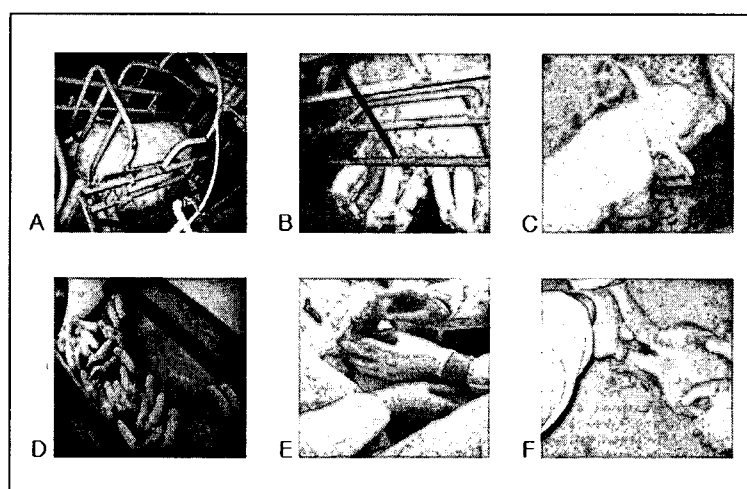


Figure 2. The pictures showing the piglet experiment. A, Pregnant sows; B, Sows after farrow; C, Experiment on 6 days-old piglet; D, A cage contained seven ~ twenty five piglet as one treatment; E, Challenged with 987P (987P); D, Serum(IgG) was obtained from oral vaccine carrot-administrated piglet by neck intravenous injection.

Table 1. Clinical response of early-weaned pigs after challenge with ETEC 987P¹

Item ²	No. of pigs	No. of pigs with diarrhea on 3days (Average of FC score ³)	CR ⁴	CCR ⁵
A : 987PTC	19	7(0.42)	36.84%	3.51
B : NC	25	13(0.60)	52%	18.67
C : R987PP	7	4(0.71)	57.14%	23.81
D : Con	15	9(0.80)	60%	26.67
E : C	15	5(0.33)	33.33%	

¹At day 12 after the beginning of the experiment, all pigs were challenged orally with ETEC 987P at a dose of 1×10^8 CFU/ml 4ml.

²987PTC, 987P transgenic carrot; NC, nontransgenic carrot; R987PP, recombinant protein; Con, challenge with ETEC 987P; C, challenge without ETEC 987P.

³FC score is the mean fecal consistency score: 0, normal; 1, soft feces; 2, mild diarrhea; 3, severe diarrhea. Values in brackets represent mean fecal score.

⁴CR (challenge response) : test number of diarrhea / test number of Total \times 100 (%)

⁵CCR = CR_{ABCD}-CR_E (test of non challenge with ETEC 987P)