豚の下痢症由来大腸菌における線毛抗原Att25(FY)の検出

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Detection of Pilus Antigen Att25 (FY) on *Escherichia coli* from Porcine Colibacillosis

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An essential event in the development of diarrhea by enterotoxigenic *Escherichia coli* (ETEC) which causes neonatal diarrhea (ND) of animals seems to be colonization on small intestine of the host. ETEC possess pilus antigens which display the attachment to intestinal mucosal epithelium of host where the ETEC produce enterotoxin. ETEC strains of newborn calf origins possess various pili such as F41, FY and Att25 in addition to the common K99. FY was described in France by Girardeau *et al.* [4] and Att25 was described in Belgium by Pohl *et al.* [8], but both pili were considered to be identical [5, 8]. And this pili has not until now been detected in ETEC strains of porcine origin.

In this paper, we describe the detection of pilus antigens, especially Att25, and toxin production concerning the strains originated from feces of pigs.

Total of 213 *E. coli* strains used in this study, 54 strains were isolated from 9 pigs suffering from ND and 159 strains were isolated from 35 pigs suffering from postwearning diarrhea (PWD). These *E. coli* strains were examined for pilus antigens by slide agglutination using K88, K99, 987P, F41 and Att25 antisera. K88, K99 and 987P antisera, testified to their specificities in our laboratory, were made by Denka Seiken Co., Ltd., Japan. F41 antiserum was prepared by the method of Orskov *et al.* [7] using strain B41MC (0101; F41). B41MC was kindly supplied by Dr. J. A. Morris of Central Veterinary Laboratory, New Haw, Weybridge, U. K. Att25 monoclonal antibody (4A3) was kindly supplied by Dr. P. Pohl of National Institute of Veterinary Research, Belgium. Heat-stable enterotoxin (ST) and heat-labile enterotoxin (LT) were assayed by infant mouse test [2] and Y-1 adrenal cell assay [3], respectively. The sterile culture filtrates used for toxin assays were prepared from overnight shaking culture at 37°C using CAYE medium [6].

Table 1. Detection of Att25 in *E. coli* strains from porcine neonatal diarrhea (ND) and postwearning diarrhea (PWD)

Origin	No. positive/tested pig	No. positive/tested strain
ND	2/9	5/54
PWD	0/35	0/159
Total	2/44	5/213

Detection of Att25 on 213 *E. coli* strains from 44 pigs are shown in Table 1. Att25 was detected on 5 strains from 2 pigs (pigs A and B) died of ND followed by septicemia, but no Att25 positive strain was found among the strains from PWD cases.

Pilus antigens and enterotoxins of *E. coli* isolated from these 2 pigs are shown in Table 2. In the case of pig A, four of 8 strains proved to be $K88^+$ and LT^+, and three strains were $987P^+$, $F41^+$, $Att25^+$ and ST^+. Neither pilus antigen nor enterotoxin was detected in the remaining one. In the case of pig B, three of 5 strains were found to be $K88^+$ and LT^+, and two strains were only $Att25^+$.

The data showed that not only bovine ETEC strains but also porcine strains possess Att25 pili. Contrepois *et al.* speculated that FY (Att25) in bovine strain reinforced the attachment of the organism to intestinal mucosal epithelium [1].

Table 2. Pilus antigens and enterotoxins in *E. coli* strains from 2 pigs in which $Att25^+$ strains were detected

Pig	Number of strains	Pilus antigen					Enterotoxin	
		K88	K99	987P	F41	Att25	ST[a]	LT[b]
A	4	+	−	−	−	−	−	+
	3	−	−	+	+	+	+	−
	1	−	−	−	−	−	−	−
B	3	+	−	−	−	−	−	+
	2	−	−	−	−	+	−	−

a) Heat-stable enterotoxin assayed by suckling mice.
b) Heat-labile enterotoxin.

However, in this study, Att25$^+$ strains isolated from pig A also possessed the well known adhesins, K88, 987P and F41, and moreover, Att25 mono-pilus strains isolated from pig B lacked ST and LT. Therefore, the question remains if Att25 plays an important role in porcine colibacillosis. Experiments to test its possible role in colonization phase in the disease are now in progress.

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要　約

豚の下痢症由来大腸菌における線毛抗原 Att25（FY）の検出（短報）：池　和憲・蛭間正巳・井出誠弥（北里研究所附属家畜衛生研究所）—— 哺乳豚の下痢症（ND）由来54株（9頭）および離乳豚の下痢症由来159株（35頭）の計213株の大腸菌について線毛抗原 Att25（FY）の検出を試みたところ，ND 後に敗血症で死亡した2頭由来の5株から，従来牛由来株でのみ報告されていた Att25 が検出された．