NOTE

Fimbriae and Hemagglutination in the *Bacteroides fragilis* group

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Sixteen strains of *Bacteroides fragilis* were examined for the presence of fimbriae and hemagglutinability. All of the strains had fimbriae. No strains agglutinated guinea pig, rabbit or sheep erythrocytes and only 3 strains agglutinated chicken erythrocytes. The hemagglutinating ability was inhibited by heating at 80°C for 20 min and by homogenizing with a high-speed homogenizer, while it was unaffected by either the presence of mannose and other carbohydrates or treatment with trypsin, EDTA or periodate.—*Key words:* *Bacteroides fragilis*, Fimbriae

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The *Bacteroides fragilis* group is the predominant bacteria of the intestinal flora in man and animals. It is clinically important, as it could be causative agent of endogenous infection as its member. Fimbriae have hitherto been demonstrated in *Bacteroides asaccharolyticus*, but not in species of the *B. fragilis* group. Previously, the authors detected fimbriae in *Fusobacterium necrophorum*, which is also a Gram-negative, non-sporeforming anaerobic rod. Then an attempt was made to detect fimbriae in species

of the *B. fragilis* group and examine these species for hemagglutinability.

The materials used were 16 strains of 5 species. They were *B. fragilis* NCTC Nos. 9343 and 9344, Nos. 2271, 3676 and 6869; *B. vulgatus* ATCC 8482, E₁(1), F-92 and AM-45a; *B. distasonis* ATCC 8503 and E-32; *B. ovatus* ATCC 8483; *B. thetaiotaomicron* NCTC 10582, E-50 and E₁(7) supplied by Dr. H. Beerens of the Institute Pasteur de Lille, France, and *B. thetaiotaomicron* ATCC 12290 supplied by Dr. M. Kanoe of the

Fig. 1. Fimbriae of strain ATCC 8482, shadowed. Bar=500 nm.

Fig. 2. Fimbriae of strain NCTC 10583, negative stain. Bar=1 μ m.

Table 1. Fimbriae and hemagglutinating activity of the *Bacteroides fragilis* group

Species	Strain	Presence of fimbriae	Hemagglutinability			
			Chicken	Guinea pig	Rabbit	Sheep
<i>B. fragilis</i>	NCTC 9343	+	—	—	—	—
	NCTC 9344	+	—	—	—	—
	2271	+	—	—	—	—
	3676	+	+	—	—	—
	6869	+	—	—	—	—
<i>B. vulgatus</i>	ATCC 8482	+	—	—	—	—
	E ₁ (1)	+	—	—	—	—
	F-92	+	+	—	—	—
	Am-45a	+	+	—	—	—
<i>B. distasonis</i>	ATCC 8503	+	—	—	—	—
	E-32	+	—	—	—	—
<i>B. ovatus</i>	ATCC 8483	+	—	—	—	—
<i>B. thetaiotaomicron</i>	NCTC 10582	+	—	—	—	—
	ATCC 12290	+	—	—	—	—
	E-50	+	—	—	—	—
	E ₁ (7)	+	—	—	—	—

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Fimbriae were examined by electron microscopy using shadowing and negative staining methods previously described [1]. The hemagglutination test was performed in the same manner as described previously [3] using erythrocytes of chicken, guinea pig, rabbit and sheep.

All the strains used had numerous fimbriae (Figs. 1 and 2). Of these strains, three, *B. fragilis* 3676, *B. vulgatus* F-92 and AM-45a,

agglutinated chicken erythrocytes, but the remainder did not (Table 1). No strains examined agglutinated erythrocytes of guinea pig, rabbit or sheep. The hemagglutination inhibition test was also carried out with the hemagglutinating strains. Hemagglutinating activity was inhibited by heating at 80°C for 20 min and by homogenizing with a high-speed homogenizer (Nihon Seiki Co., Tokyo). Hemagglutinating activity was unaffected by the presence of D-glucose (0.5%),

D-lactose (0.5%), D-mannose (0.5%) or D-raffinose (0.5%), or by treatment with trypsin (0.1%), ethylenediaminetetraacetic acid (EDTA, 0.1%) or periodate (0.25 mM/ml). The supernatant derived from the hemagglutinating strains treated with the high-speed homogenizer agglutinated chicken erythrocytes.

All the strain, except three, that were used in the present study failed to agglutinate erythrocytes of any animal species in spite of possession of fimbriae. The presence of fimbriae did not correlate with hemagglutinating activity either in *B. asaccharolyticus* [4] or *F. necrophorum* biovar B [3]. The results of present study suggested that hemagglutinin of the strains used might be a heat-labile cell-surface substance readily separated from the bacterial cell, and that it might be fimbriae.

Further studies are necessary to elucidate the condition for the hemagglutination test and the adhesion of these strains to intestinal epithelial cell or the brush border. It is also indispensable to clarify the function of fimbriae in the intestinal infection.

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要 約

Bacteroides fragilis 群の纖毛と赤血球凝集性 (短報): 新城敏晴・清山絃子 (宮崎大学農学部家畜微生物学教室)——*Bacteroides fragilis* 群の纖毛と, ニワトリ, モルモット, ウサギおよびヒツジの赤血球に対する凝集性をしらべた。供試した 5 菌種 16 株のすべてに纖毛が確認され, 3 株がニワトリ赤血球のみを凝集した。