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PLASMIDS IN *Vibrio salmonicida* ISOLATES FROM THE FAROE ISLANDS

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Vibrio salmonicida, the causative agent of cold-water vibriosis (Egidius *et al.* 1986) is a very homogeneous species (Holm *et al.* 1985, Wiik and Egidius 1986, Wiik *et al.* 1989). So far, the only characteristic which makes it possible to differentiate clearly between strains of *V. salmonicida* is plasmid profiling. Using this method, as many as 11 different plasmid profiles have been observed for *V. salmonicida* (Sørum *et al.* 1988, Wiik *et al.* 1989, Sørum *et al.* 1990).

This investigation describes the plasmid profiles identified in *V. salmonicida* isolated in the Faroe Islands in the period 1988 to 1990.

The first outbreak of cold-water vibriosis among farmed Atlantic salmon (*Salmo salar*) in the Faroe Islands was detected in 1987 (Dalsgaard *et al.* 1988).

Materials and Methods

Bacterial strains. Twenty strains were analyzed. 18 strains were isolated from diseased Atlantic salmon from 16 different sea-farms in the Faroe Islands. One strain was isolated from a coal fish (*Gadus virens*) captured near one of the sea-farms.

The strains from the Faroe Islands were isolated by O. Jurgens and identified at the Fish Disease Laboratory according to Dalsgaard *et al.* (1988). The last strain was a Norwegian strain, 1809, obtained from Dr. Håstein, National Veterinary Institute, Oslo. Bacteria were grown on blood agar with 2% NaCl. After 4 days incubation at 15°C, the bacteria were harvested for plasmid profiling.

Plasmid profiling. Plasmid DNA was isolated by the method of Kado and Liu (1981). DNA was subjected to electrophoresis in a 0,7% agarose gel (Litex LSL) at a current of 80 V for 3 h. Gels were stained in 2 mg/ml ethidium bromide (Sigma) and photographed under 254 nm ultraviolet light. Estimation of plasmid molecular weight was carried out as recommended by Rochelle *et al.* (1985). Plasmids from *E. coli* 39R861 (4.6, 24, 42, 98 MDa) (Threlfall *et al.* 1986) and *E.coli* V 517 (1.4, 1.8, 2.0, 2.6, 3.4, 3.7, 4.8, 35.8 MDa) (Macrina *et al.* 1978) served as molecular size markers.

Results and Discussion

The 20 strains could be divided into two groups according to plasmid content (Table 1). Group A contained 15 strains (75%) harbouring a 21 MDa plasmid and a 3.4 MDa plasmid. Group B contained 5 strains (25%) with a 2.8 MDa plasmid in addition to the 3.4 and 21 MDa plasmid. The isolate from the coal fish and the Norwegian strain both belonged to group A.

Table 1. Plasmids in the investigated strains of *V. salmonicida*.

Group A	Host	Plasmids (MDa)	No. of strains	Country of origin
	S. salar	21, 3.4	13	Faroe Islands
	G. virens	21, 3.4	1	Faroe Islands
	S. salar	21, 3.4	1	Norway
Group B	*S. salar*	21, 3.4, 2.8	5	Faroe Islands

Earlier investigations (Sørum *et al.* 1988, Wiik *et al.* 1989, Sørum *et al.* 1990) from Norway reported as many as 11 different plasmid profiles in *V. salmonicida*. Sørum *et al.* (1988) investigated the plasmid content of Norwegian strains of *V. salmonicida* isolated in the periods 1982 to 1984 and 1986 to 1987. All strains were isolated from salmonids. In the period from 1982 to 1984, the 84 isolates investigated could be divided into 3 major groups. Group A (41.7%) contained plasmids of 21 and 3.4 MDa, group B (27.4%) contained plasmids of 21, 3.4, 2.8 MDa, and group C (11.9%) contained plasmids of 61 and 21 MDa.

In the period from 1986 to 1987, 257 isolates were plasmid profiled, also with 3 dominating groups appearing. Group A (68.1%) contained plasmids of 21 and 3.4 MDa, group B (20.2%) contained plasmids of 21, 3.4 and 2.8 MDa, finally group C (9.3%) only possessed one plasmid of 21 MDa.

Strains containing the 61 MDa plasmid were isolated from northern Norway. It is remarkable that this large plasmid was only detected in the material from 1982 to 1984, since the 1986 to 1987 material was nearly three times as large and isolated in the same geographical area. Wiik *et al.*(1989) examined 31 Norwegian strains of *V. salmonicida* isolated between 1983 and 1987. This study also detected plasmids of 21, 3.4 and 2.8 MDa, but never a 61 MDa plasmid. Isolates from northern Norway were not incorporated in their study.

In an additional study Sørum *et al.* (1990) reported a new plasmid profile in *V. salmonicida* isolated from cod (*Gadus morhua*) and Atlantic salmon (*Salmo salar*). The new plasmid profile contained plasmids at 61, 21, 3.4 and 2.8 MDa, and was only isolated from fish farms in northern Norway. The same study indicated that *V. salmonicida* containing this new plasmid profile could be transmitted from Atlantic salmon to cod and vice versa.

The plasmid content of *V. salmonicida* from the Faroe Islands seems to be identical with the major plasmid profiles detected in Norwegian strains, despite the relatively large distance (600 km) between the Faroe Islands and the Norwegian coastline. One *V. salmonicida* isolated from coal fish was shown to have the same plasmid profile as strains isolated from Atlantic salmon.

Summary

The plasmid content of *Vibrio salmonicida* from the Faroe Islands seems to be identical with the major plasmid profiles detected in Norwegian strains.

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