

## Occurrence of Different Serotypes of *Erysipelothrix rhusiopathiae* in Retail Pork and Fish

By I.-M. Stenström, V. Nørrung, A. Ternström and G. Molin

Department of Applied Microbiology and Department of Food Technology, Chemical Center, Lund, Sweden and National Veterinary Laboratory, Copenhagen, Denmark.

**Stenström I.-M., V. Nørrung, A. Ternström and G. Molin: Occurrence of different serotypes of *Erysipelothrix rhusiopathiae* in retail pork and fish. Acta vet. scand. 1992, 33, 169-173.** – Retail pork (38 samples), cod (10 samples) and herring (10 samples) were obtained from 12 stores in the area of Lund in southern Sweden during September and October 1990. *Erysipelothrix rhusiopathiae* was isolated from 50% of the pork samples, 60% of the cod samples and from 30% of the samples from herring. Serotype 2 dominated on retail pork as well as on fish samples constituting 53% of the pork isolates (10 strains) and 33% of the cod isolates (2 strains). All *E. rhusiopathiae* isolates originating from herring were serotype 2 (3 strains). Serotypes 1b, 6, and 8 were isolated from retail pork only (6, 2 and 1 strains, respectively). Serotype 5 was isolated from cod only (3 strains) and so was serotype 9 (1 strain). The public health hazards with the occurrence of virulent strains of *Erysipelothrix rhusiopathiae* in retail pork and fish are discussed.

**cod; herring.**

### Introduction

*Erysipelothrix rhusiopathiae* is the bacteria responsible for swine erysipelas, the economic importance of which is reflected by the frequent use of vaccine in swine producing countries to control the disease (Wood 1984). According to Swedish legislation (Anon. 1990) any carcass on which *E. rhusiopathiae* is found must be destroyed. Anyhow, the occurrence of *E. rhusiopathiae* on pork directly from the cutting lines in some Swedish slaughter houses was reported by Ternström & Molin (1987) and Molin et al. (1989). *E. rhusiopathiae* has also been found on Japanese retail pork (Shiono et al. 1990). Since the antigenic heterogeneity within *E. rhusiopathiae* was first observed (Watts 1940) 26 serotypes have been described (Nørrung & Molin 1991). Although several serotypes have been isolated from diseased animals,

serotypes 1 and 2 are considered the most prevalent associated with *Erysipelothrix* infections in swine (Eamens 1988, Takahashi et al. 1985). *E. rhusiopathiae* has also been frequently isolated from fish (Shewan 1971) but reports concerning serotypes are scanty (Hashimoto et al. 1974).

In the pre-penicillian era *E. rhusiopathiae* was known as a common agent of infections in humans causing erysipelas in its acute phase and with arthritis and endocarditis as more rare complications (Eissner & Ewald 1973). Erysipelas is still considered an occupational disease affecting people handling meat and fish (Salamah 1988, Reboli & Farrar 1989). *E. rhusiopathiae* is however also considered an opportunistic pathogen and findings of the bacteria are reported from old and debilitated patients (Simerkoff & Rahal 1973, Papachristos 1987, Potvliege & Hansen

1989). The aim of this study was to elucidate the distribution of various serotypes of *E. rhusiopathiae* on retail pork and fish from a local area in southern Sweden.

## Materials and methods

### Sampling

Raw pork and fish were purchased during September and October 1990 from various local stores in Lund, Sweden. Cutlets of pork were cut from the end of whole pork loins and only 1 section surface per sample was made. In total, 38 cutlets were sampled from 9 stores. Twenty fish samples from 5 different stores were taken (10 cods and 10 herrings). Only 2 stores sold both pork and fish.

### Isolation

From each cutlet 2 meat samples were taken from the partly lardy longitudinal muscle surface using a cork borer (radius 1 cm). The cross-sectioned surfaces were sampled using a cotton-swab. The swab was transferred to a test tube with 8 ml of Wood's selective enrichment medium (Wood 1965) together with the 2 meat samples. The tubes were incubated for 5 days at 37°C. After 2 and 5 days 10 ml of the medium was inoculated on blood agar plates (blood agar base supplemented with 4% horse blood) which were incubated for 1 - 5 days at 37°C. Colonies with weak zones of  $\beta$ -hemolysis were transferred to Brain Heart Infusion agar plates (BHI, Oxoid; 37°C; 2d) and then examined for Gram reaction (Gregersen 1978), morphological characteristics and motility (phase contrast microscopy), catalase and H<sub>2</sub>S production (Molin et al. (1989). Gram positive, catalase negative, non motile rods with positive H<sub>2</sub>S reaction were considered *E. rhusiopathiae*.

From each fish sample 2 cork borer samples

Table 1. Incidence of *Erysipelothrix rhusiopathiae* on raw pork and fish for consumption.

Origin	Number of samples	Percentage of positive samples
Pork	38	50
Cod	10	60
Herring	10	30

were taken from the anterior part of the fish. The cotton-swab samples were taken both from the skin and from the muscle surface. The samples were then treated in the same way as the meat samples.

### Serotyping

Isolated strains were serotyped by agar gel precipitation tests as described by Nørrung et al. (1987).

## Results and discussion

In total 57 *E. rhusiopathiae* strains were isolated from 19 pork samples and 9 fish samples (Table 1). *E. rhusiopathiae* was isolated from 30-60% of the samples. Only 1 isolate from each *E. rhusiopathiae* positive pork and fish sample was serotyped, i.e. 28 strains in total (Table 2).

Serotype 2 was the dominating serotype on pork and was isolated also from herring and cod (Table 2). It constituted 53% of the pork isolates and 56% of the fish isolates (Table 2). Serotype 2 has previously been isolated from healthy and diseased slaughter pigs and from pig slurries (Nørrung et al. 1987, Joo et al. 1988, Takahashi et al. 1984, 1987, 1989). It has also been found on pork loins from a Swedish slaughter house (Molin et al. 1989) and in Japanese retail raw pork (Shiono et al. 1990). Pathogenicity tests have shown that serotype 2 strains are highly virulent for mice (Molin et al. 1989, Shiono et al. 1990) and

Table 2. Distribution of different serotypes of *Erysipelothrix rhusiopathiae* on raw pork and fish for consumption

Origin	Number of strains belonging to serotype					
	1b	2	5	6	8	9
Pork	6	10		2	1	
Cod		2	3			1
Herring		3				
In total:	6	15	3	2	1	1

pigs (Takahashi *et al.* 1987, 1989, Eamens & Nicholls 1989).

Serotype 1b was isolated from 32% of the pork samples in the present study (Table 2) and was thereby about 4 times more frequent than in Japanese retail raw pork (Shiono *et al.* 1990). However, Takahashi *et al.* (1984, 1989) isolated several serotype 1b strains from both healthy and diseased pigs and in Australia it was found to be the most common serotype associated with diseased pigs, sheep and poultry (Eamens *et al.* 1988). Mice as well as pig pathogenicity has been demonstrated within serotype 1b strains (Shiono *et al.* 1990, Takahashi *et al.* 1989).

The 3 strains of serotype 5 isolated in the present study all originated from cod (Table 2). Serotype 5 has previously been reported from outbreaks of erysipelas in poultry (Bisgaard *et al.* 1980) and from healthy and diseased swine, fish body surfaces (Lamont 1979, Takahashi *et al.* 1985) and from diseased sheep (Eamens *et al.* 1988). Takahashi *et al.* (1985) demonstrated varying mice pathogenicity of serotype 5 strains.

In the present study serotypes 6 and 8 were represented by 2 and 1 strains from pork, respectively (Table 2). Highly virulent, mice pathogenic strains belonging to serotypes 6 and 8 were isolated from slaughter pigs with

chronic erysipelas by Takahashi *et al.* (1984, 1985).

The remaining serotype 9 strain in the present study was isolated from cod (Table 2). Together with serotypes 1, 5 and 6, serotype 9 has been shown to be the most prevalent in outbreaks of erysipelas in poultry in Denmark (Bisgaard *et al.* 1980). Serotype 9 has also been proved to be mice pathogenic (Shiono *et al.* 1990).

Occupational exposure to animals, meat or fish are often revealed in the anamnesis of patients suffering from infections with *E. rhusiopathiae* (Simerkoff & Rahal 1973, Ryan 1982, Normann & Kihlström 1985). Although infections with *E. rhusiopathiae* in human are still reported, there is no information concerning serotypes involved.

Virulent *E. rhusiopathiae* strains are widely distributed within apparently healthy animals as well as within pork and fish for consumption. Although present in numbers which necessitate an enrichment before isolation, there is an obvious risk that the consumers will become infected with virulent *E. rhusiopathiae* strains from retail pork and fish. To our knowledge pathogenic serotypes of *E. rhusiopathiae* have never before been reported from Swedish retail fish.

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**Sammanfattning**

Förekomst av olika serotyper av *Erysipelothrix rhusiopathiae* isolerade från griskött och färsk fisk som inköpts i livsmedelsbutiker i Lund med omnejd. Griskött (38 prov), torsk (10 prov) och sill (10 prov) inhandlades under september och oktober 1990 i 12 butiker i Lundatrakten med manuella kött- respektive fiskdiskar. *Erysipelothrix rhusiopathiae* isolerades från 50% av proverna från gris, 60% från torsk samt från 30% av sillproverna. Ett *E.rhusiopathiae*-isolat från varje positivt kött- resp

fiskprov serotypades. Serotyp 2 dominerade bland kött- såväl som fiskisolaten och utgjorde 53% av isolaten från gris och 33% av torskisolaten. Samtliga *E.rhusiopathiae*-isolat från sill tillhörde serotyp 2. Av övriga serotyper återfanns 1b, 6 och 8 på griskött medan serotyp 5 och 9 hittades på torsk. Samtliga dessa serotyper har i litteraturen beskrivits som virulenta för möss och svin. Risken för konsumenter att exponeras för *E. rhusiopathiae* diskuteras.

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Reprints may be requested from: Inga-Maj Stenström, Department of Applied Microbiology, Chemical Center, P. O. Box 124, S-221 00 Lund, Sweden.