Variation in the Prevalence of Enteropathogenic Yersinia in Slaughter Pigs from Belgium, Italy, and Spain

Pilar Ortiz Martinez,1 Maria Fredriksson-Ahomaa,1,2 Adolfo Pallotti,3 Roberto Rosmini,3 Kurt Houf,4 and Hannu Korkeala1

Abstract
Tonsils of 829 fattening pigs originating from Belgium (n = 201), Italy (n = 428), and Spain (n = 200) were collected between 2005 and 2007 to study the prevalence of enteropathogenic Yersinia in slaughter pigs. Isolation of Yersinia enterocolitica and Yersinia pseudotuberculosis was done by selective enrichment and by cold enrichment for 7 and 14 days. Pathogenic Y. enterocolitica and Y. pseudotuberculosis isolates were identified by polymerase chain reaction targeting the chromosomal genes ail and inv, respectively, as well as the plasmid-encoded virF of both species. A significantly higher (p < 0.001) prevalence of ail-positive Y. enterocolitica in Spain (93%) than in Belgium (44%) or Italy (32%) was observed. virF-positive Y. enterocolitica was present in 77% of ail-positive samples. Bioserotype 4/O:3 was the most common type in all three countries. Bioserotypes 2/O:5 and 3/O:9 were found in Italy (1%) and Belgium (9%), respectively. The prevalence of inv- and virF-positive Y. pseudotuberculosis was 2% and 1% in Belgium and Italy, respectively. Y. pseudotuberculosis was not detected in pigs from Spain. Bioserotypes 1/O:1 (20%), 1/O:2 (20%), and 2/O:3 (60%) were found in Belgium, and 1/O:1 (60%) and 2/O:3 (20%) in Italy. The most efficient method for isolation of Y. enterocolitica was combined cold enrichment for 7 and 14 days; however, the isolation method for Y. pseudotuberculosis was cold enrichment for 14 days. Fattening pigs seem to be an important reservoir of pathogenic Y. enterocolitica in Belgium, Italy, and Spain. Bioserotype 4/O:3 of Y. enterocolitica and bioserotypes 2/O:3 and 1/O:1 of Y. pseudotuberculosis have been shown to predominate.

Introduction
In Europe, sporadic yersiniosis cases related to Yersinia enterocolitica in humans are common, whereas outbreaks are rare (Fredriksson-Ahomaa et al., 2009). However, large foodborne outbreaks due to Yersinia pseudotuberculosis have been reported in Finland and Russia, and also an increasing number of Y. pseudotuberculosis infections have been observed in France (Jalava et al., 2004, 2006; Nuorti et al., 2004; Anonymous, 2005, 2006; EFSA, 2006; Vincent et al., 2008; Rimhanen-Finne et al., 2009). In Belgium, Italy, and Spain, notification of yersiniosis is not compulsory; thus, no true incidence rates are available from these countries (ECDC, 2009).

Infections due to Y. enterocolitica and Y. pseudotuberculosis result in similar manifestations. Diarrhea is a common disorder among young children. Vomiting, fever, and abdominal pain are also symptoms that occur in yersiniosis patients (Anonymous, 2009a). Enteral yersiniosis in adults often goes unnoticed because of mild symptoms (Fredriksson-Ahomaa et al., 2009; Rastawicki et al., 2009). Reactive arthritis, erythema nodosum, and uveitis are examples of yersiniosis post-infectious sequels (Smego et al., 1999; Fredriksson-Ahomaa et al., 2009). Most human infections are due to Y. enterocolitica of bioserotype 4/O:3 (Anonymous, 2009a). All enteropathogenic Yersinia strains carry several essential chromosomal virulence genes such as ail and inv. A virulence plasmid (pYV) is needed for full pathogenicity; however, it can be easily lost during culturing (Bottone, 1999).

Contaminated pork is a suspected source of human yersiniosis cases (Kanazawa et al., 1974; Tauxe et al., 1987; Fredriksson-Ahomaa et al., 2006; Grahek-Ogden et al., 2007; Fosse et al., 2008). Pigs are an important reservoir of Y. enterocolitica, especially bioserotype 4/O:3, which has a worldwide distribution. They frequently carry this pathogen in tonsils at slaughter (Fredriksson-Ahomaa et al., 2006; Ortiz Martinez et al., 2009). Y. pseudotuberculosis has sporadically been isolated from several animal species (Fredriksson-Ahomaa et al., 2009). One potential reservoir for Y. pseudotuberculosis of bioserotype 2/O:3 is slaughter pigs (Kanazawa et al., 1974;
Niskanen et al., 2002, 2008; Ortiz Martínez et al., 2009). During the slaughtering of pigs, contamination of pluck sets (tongue, tonsils, and trachea hanging together with thoracic organs such as lungs, liver, and heart) and carcasses with enteropathogenic *Yersinia* from tonsils and feces may occur (Fredriksson-Ahomaa et al., 2001a, 2001b, 2009; Laukkanen et al., 2008, 2009b). Pork is the most consumed meat in Europe (Foreign Agricultural Service, U.S. Department of Agriculture, 2009). Pork and pork products are widely exported from Spain, Belgium, and Italy to other European countries (Anonymous, 2007, 2008, 2009c). Consumption of raw, undercooked, or improperly handled pork contaminated with *Y. enterocolitica* or *Y. pseudotuberculosis* may result in human infection (Kanazawa et al., 1974; Tauxe et al., 1987; Fredriksson-Ahomaa et al., 2006; Grahek-Ogden et al., 2007; Fosse et al., 2008). In Spain, pig meat, which was inadequately heat treated, was recently implicated in a small household *Y. enterocolitica* outbreak (Anonymous, 2009b).

Although pigs are considered a reservoir of enteropathogenic *Yersinia*, information about the prevalence and bioserotype distribution of *Y. enterocolitica* and *Y. pseudotuberculosis* is limited in most European countries. This study was carried out to gain knowledge of the prevalence and distribution of different bioserotypes of enteropathogenic *Yersinia* in pigs in Belgium, Italy, and Spain by using selective and cold enrichments.

**Materials and Methods**

**Sampling**

Tonsils of 829 fattening pigs were collected between 2005 and 2007 at slaughter in the northern part of Belgium (n = 201), northern Italy (n = 428), and south-east Spain (n = 200). The pigs originated from 10 farms in Belgium, 22 farms in Italy, and 14 farms in Spain. Farms examined complied with the current EU-legislative requirements (EEC-Regulations, No. 2001/93). The tonsils were removed immediately after evisceration and placed in sterile sampling bags, frozen within 1–2 h after collection, and stored at −20°C until examination.

**Isolation of *Y. enterocolitica* and *Y. pseudotuberculosis***

Enteropathogenic *Yersinia* was isolated using selective enrichment according to ISO 10273:2003 (Anonymous, 2003), 7 days cold enrichment and 14 days cold enrichment as described by Niskanen et al. (2002) and Korte et al. (2004). A 10-g portion of tonsil tissue was homogenized in 90 mL phosphate-buffered saline supplemented with 1% mannitol and 0.15% bile salts (PMB). For cold enrichment, the PMB was stored at 4°C for 7 and 14 days. The 14 days enrichment was followed immediately by an alkali treatment in 0.25% KOH solution for 20 sec before plating on a selective agar plate. For selective enrichment, 1 mL of the tonsil homogenate was transferred into 9 mL of irgasan–tiscarcillin–potassium chloride broth (Merck, Darmstadt, Germany) and incubated for 2 days at 25°C. Culturing on cefsulodin–irgasan–novobiocin (CIN) agar (Oxoid, Basingstoke, UK) was performed after every enrichment step, and CIN agar plates were incubated at 30°C for 24 h. Further, the plates were kept at room temperature for 2 days and checked for typical colonies (approximately 1.5 mm diameter with a dark pink center surrounded by a round pink and a translucent area). A maximum of three typical colonies on the CIN agar was streaked onto tryptic soy agar (Difco, Detroit, MI). Urea activity of the isolates was tested using an urea agar slant (Oxoid) incubated at 30°C for 24 h. Urea-positive isolates were biochemically identified with API 20E (BioMérieux, Marcy l’Étoile, France) incubated at 25°C for 18–20 h.

**Biotyping and serotyping**

*Y. enterocolitica* was biotyped based on its ability to ferment sugars (xylose, trehalose, salicine), pyrazinamidase activity, and tween and esculin hydrolysis (Wauters et al., 1987). The biotype of *Y. pseudotuberculosis* was determined as described by Tsubokura and Aleksić (1995) based on citrate utilization and melibiose and rhamnose fermentation. Serotyping was done by a slide agglutination test with commercial antisera O:1–O:3, O:5, and O:9 (Denka Seiken, Tokyo, Japan) for *Y. enterocolitica*, and antisera O:1–O:6 for *Y. pseudotuberculosis* (Denka Seiken).

**Confirmation of pathogenic *Y. enterocolitica* and *Y. pseudotuberculosis***

*Y. enterocolitica* and *Y. pseudotuberculosis* isolates were further confirmed by polymerase chain reaction targeting the chromosomal genes *ail* (*Y. enterocolitica*) and *inv* (*Y. pseudotuberculosis*) according to Nakajima et al. (1992). Further, the presence of the virulence plasmid was shown by determining virF of *Y. enterocolitica* and *Y. pseudotuberculosis* according to Nakajima et al. (1992).

**Statistical analysis**

A 95% confidence interval for the prevalence of pigs positive for *Y. enterocolitica* and *Y. pseudotuberculosis* in three countries was calculated taking into account the number of pigs coming from the same farm (clustering) (Laukkanen et al., 2008) using the EpilInfo 6 program (Dean et al., 1994). When clustering, the design effect (impact of sampling in clusters) was calculated first, and then using the design effect the confidence interval was calculated with the Fleiss quadratic method using EpilInfo 6 program. Differences in the prevalence of pig farms positive for *Y. enterocolitica* and *Y. pseudotuberculosis* between Belgium, Italy, and Spain were compared with the nonparametric Mann–Whitney U-test (from the highest to the lowest *Y. enterocolitica* or *Y. pseudotuberculosis* farm prevalence) using Statistical Package for Social Sciences (SPSS, Chicago, IL). In addition, the McNemar test for dependent samples was used to compare the ability of different methods to detect *Y. enterocolitica* and *Y. pseudotuberculosis* using SPSS.

**Results**

**Prevalence of *ail*-positive *Y. enterocolitica***

A significantly higher (*p < 0.001) prevalence of *ail*-positive *Y. enterocolitica* in Spain (93%) than in Belgium (44%) or Italy (32%) was observed (Table 1). No statistically significant difference in prevalence between pigs from Belgium and Italy emerged. *Ail*-positive *Y. enterocolitica* was isolated from pigs originating from all farms studied in Italy (22) and Spain (14), whereas pigs from 2 of 10 farms were negative in Belgium.
The prevalence of \textit{inv}-positive \textit{Y. pseudotuberculosis} was 2%, 1%, and 0% in pigs from Belgium, Italy, and Spain, respectively (Table 1). \textit{Y. pseudotuberculosis} was not found on Spanish farms, although 80% and 14% of farms in Belgium and Italy were positive, respectively. However, differences in prevalence between pigs from Belgium, Italy, and Spain were not significant ($p > 0.05$).

Altogether 77\% (317/411) of all-positive \textit{Y. enterocolitica} samples were \textit{virF} positive. All \textit{Y. pseudotuberculosis} isolates were \textit{virF} positive. \textit{Y. enterocolitica} and \textit{Y. pseudotuberculosis} were both isolated from one pig from Belgium (0.5\%).

\textbf{Isolation of enteropathogenic \textit{Yersinia} depending on the enrichment method}

\textit{Y. enterocolitica} was isolated from 35\% and 45\% of the pigs by using selective enrichment and cold enrichment for 7 and 14 days, respectively, and in 50\% of the samples when the results of all methods were combined (Table 2).

The combination of cold enrichment after 7 and 14 days was significantly ($p < 0.001$) more productive than selective enrichment for the isolation of \textit{Y. enterocolitica} from pig samples (McNemar test) (Table 2). \textit{Y. pseudotuberculosis}-positive samples were not detected after selective enrichment. Cold enrichment after 14 days yielded a significantly ($p < 0.05$) higher isolation rate of \textit{Y. pseudotuberculosis} than cold enrichment after 7 days (McNemar test).

\textbf{Bioserotypes of enteropathogenic \textit{Yersinia}}

\textit{Y. enterocolitica} 4/O:3 was the predominant bioserotype recovered among Belgian (91\%), Italian (99\%), and Spanish (100\%) positive pig samples (Table 3). Bioserotypes 3/O:9 and 2/O:5 were only observed among Belgian (9\%) and Italian pigs (1\%), respectively.

Three different bioserotypes of \textit{Y. pseudotuberculosis}—1/O:1, 1/O:2, and 2/O:3—were present among pigs from Belgium, being \textit{Y. pseudotuberculosis} 2/O:3 the most common (Table 3). In Italy, two bioserotypes of \textit{Y. pseudotuberculosis}—1/O:1 and 2/O:3—were observed, with \textit{Y. pseudotuberculosis} 1/O:1 predominating.

\textbf{Discussion}

Pathogenic \textit{Y. enterocolitica} 4/O:3 was commonly present in pigs from Belgium, Italy, and Spain. The prevalence of all-positive \textit{Y. enterocolitica} isolated from the tonsils of fattening pigs was extremely high (93\%) in Spain, indicating that this pathogen is very common in southern Europe. A high prevalence (89\%) among pigs has also been reported in Estonia (1\%), Finland (4\%), Italy (0.3\%), Germany (6\%), Latvia (5\%), Russia (7\%), and the Netherlands (4\%) (Narurka and Westendorp, 1977; Weber and Knapp, 1981; Chiesa et al., 1993; Niskanen et al., 2002; Ortiz Martínez et al., 2009).

Selective enrichment yielded a lower recovery of \textit{Y. enterocolitica} and \textit{Y. pseudotuberculosis} among pig samples than either the combination of 7 and 14 days of cold enrichment or cold enrichment for 14 days. Cold enrichment has increased the number of \textit{Y. enterocolitica} and \textit{Y. pseudotuberculosis} isolates recovered from pigs in previous studies (Niskanen et al., 2002; Laukkanen et al., 2009a; Ortiz Martínez et al., 2009). Low selectivity of PMB together with cold enrichment allows the growth of both enteropathogenic \textit{Yersinia} spp., with competitive microflora reduced by using KOH treatment.

Bioserotype 4/O:3 of \textit{Y. enterocolitica} was predominant, as previously observed in slaughtered pigs from other European countries, including Denmark, Estonia, Greece, Italy, Finland, Germany, Latvia, Norway, Russia, Sweden, Switzerland, and Poland (Nielsen and Wegener, 1997; Fredriksen-Ahomaa et al., 2000, 2007; Bonardi et al., 2003; Gürtler et al., 2005; Platt-Samaraj et al., 2006; Kechagia et al., 2007; Kot et al., 2007; Ortiz Martínez et al., 2009). Two less common bioserotypes (3/O:9 and 2/O:5) associated with human disease were also found. \textit{Y. enterocolitica} 3/O:9 (2\%) was present among pigs in Belgium. Bioserotype 3/O:9 is not commonly found among European pigs; it has only sporadically been isolated from pigs in Great Britain (6\%) (Milnes et al., 2008). Serotype O:9 of \textit{Y. enterocolitica} has sporadically been isolated from German (0.3\%) and Italian pigs (4\%) (Bonardi et al., 2003; Gürtler et al., 2005). \textit{Y. enterocolitica} 3/O:5,27 was the most common bioserotype isolated among pigs in Great Britain (Milnes et al., 2008). In this study, bioserotype 2/O:5 was present in Italian pigs. The same type has been isolated from 3\% of Swiss pigs (Fredriksen-Ahomaa et al., 2007).

In Belgium, serotypes O:3 and O:9 have been shown to predominate in human yersiniosis (Verhaegen et al., 1998). Our study shows that Belgian pigs carry bioserotypes 4/O:3 and 3/O:9 in tonsils. Bioserotypes 4/O:3 and 2/O:9 have earlier been recovered among Italian children (Mingrone et al., 1987). However, in our study, pigs were a reservoir for bioserotypes 4/O:3 and 2/O:5 in Italy. \textit{Y. enterocolitica} bioserotype 4/O:3 has been the only type reported among human yersiniosis cases in different Spanish regions such as Asturias, Barcelona, Guipuzcoa, and Madrid (Gurgui et al., 1988; Pérez-Trallero et al., 1992; Gómez-Garcés et al., 1996; Lobato et al., 1998). Bioserotype 4/O:3 was also the only type found in Spanish slaughter pigs in this study.

\textit{Y. pseudotuberculosis} bioserotype 2/O:3 has thus far been the only bioserotype isolated from tonsils of pigs in Estonia, Finland, Latvia, and Russia (Niskanen et al., 2002, 2008; Ortiz Martínez et al., 2009). Serotype O:3 of \textit{Y. pseudotuberculosis} has also been isolated from healthy pigs in Japan (Shiozawa et al., 1988). \textit{Y. pseudotuberculosis} O:1 has sporadically been isolated from tonsils of German pigs (Weber and Knapp, 1981) and seemed to be the main serotype among human yersiniosis cases reported in France (Vincent et al., 2008; Rimhanen-Finne et al., 2009). In Finland, both serotypes O:1 and O:3 have been common in outbreaks (Jalava et al., 2004, 2006; Nuorti et al., 2007).
### Table 1. Prevalence of ail-Positive *Yersinia enterocolitica* and inv-Positive *Yersinia pseudotuberculosis* in Tonsils of Fattening Pigs from Belgium, Italy, and Spain

<table>
<thead>
<tr>
<th>Country</th>
<th>Pigs</th>
<th>Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y. enterocolitica</td>
<td>Y. pseudotuberculosis</td>
</tr>
<tr>
<td>Belgium</td>
<td>201</td>
<td>89</td>
</tr>
<tr>
<td>Italy</td>
<td>428</td>
<td>137</td>
</tr>
<tr>
<td>Spain</td>
<td>200</td>
<td>185</td>
</tr>
<tr>
<td>Total</td>
<td>829</td>
<td>411</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Pigs</th>
<th>Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y. enterocolitica</td>
<td>Y. pseudotuberculosis</td>
</tr>
<tr>
<td>Belgium</td>
<td>201</td>
<td>89</td>
</tr>
<tr>
<td>Italy</td>
<td>428</td>
<td>137</td>
</tr>
<tr>
<td>Spain</td>
<td>200</td>
<td>185</td>
</tr>
<tr>
<td>Total</td>
<td>829</td>
<td>411</td>
</tr>
</tbody>
</table>

*95% Confidence interval taking into account that 20–21 pigs from Belgium, 12–48 pigs from Italy, and 8–19 pigs from Spain originated from the same farm. The design effect (impact of sampling in clusters) was calculated, and then using the design effect the confidence interval was calculated with the Fleiss quadratic method.

*95% Confidence interval was calculated by exact binomial estimates.

### Table 2. Recovery of *Yersinia enterocolitica* and *Yersinia pseudotuberculosis* from Pig Tonsils Depending on the Enrichment Method

<table>
<thead>
<tr>
<th>Species</th>
<th>Cold enrichment</th>
<th>Selective enrichmenta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 daysc</td>
<td>14 days + KOHd</td>
</tr>
<tr>
<td></td>
<td>Totalc</td>
<td>Totalb</td>
</tr>
<tr>
<td></td>
<td>No. of positive tonsils</td>
<td>No. of positive tonsils</td>
</tr>
<tr>
<td>Y. enterocolitica</td>
<td>288</td>
<td>302</td>
</tr>
<tr>
<td>Y. pseudotuberculosis</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Selective enrichment in irgasan-ticarcillin-potassium chlorate broth (ITC) according to Anonymous (2003) (ISO 10273:2003) and plating on CIN.

*Combined total for all enrichments: selective enrichment and cold enrichment for 7 and 14 days.

*Cold enrichment in phosphate-buffered saline supplemented with 1% mannitol and 0.15% bile salts (PMB) and plating on CIN according to Korte et al. (2004) and Niskanen et al. (2002).

*Combined total for both cold enrichments: 7 and 14 days.

CIN, cefsulodin-irgasan-novobiocin; PMB, phosphate-buffered saline supplemented with 1% mannitol and 0.15% bile salts.

### Table 3. Bioserotypes of ail-Positive *Yersinia enterocolitica* and inv-Positive *Yersinia pseudotuberculosis* Pig Tonsils

<table>
<thead>
<tr>
<th>Species</th>
<th>2/O:5</th>
<th>3/O:9</th>
<th>4/O:3</th>
<th>1/O:1</th>
<th>1/O:2</th>
<th>2/O:3</th>
<th>2/NTc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y. enterocolitica</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>89</td>
<td>0</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Italy</td>
<td>137</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>136</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Spain</td>
<td>185</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>185</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>411</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>402</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Y. pseudotuberculosis</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*9: number of ail-positive *Y. enterocolitica* pig tonsils.

*9: number of inv-positive *Y. pseudotuberculosis* pig tonsils.

*NT, nontypeable isolates by serotyping.
To reduce the potential transmission of enteropathogenic *Yersinia* from pork to humans, preventive measures starting at the pig farms and followed by the hygienic handling of pork meat during slaughter, in processing plants, and at points of consumptions are needed (Kapperud, 1991; Laukkanen et al., 2008).

In conclusion, human pathogenic *Y. enterocolitica* and *Y. pseudotuberculosis* were commonly found among slaughter pigs from Belgium, Italy, and Spain and represent a potential food safety risk for humans in these countries. *Y. enterocolitica* prevalence was extremely high in Spain relative to Belgium and Italy. Further, *Y. enterocolitica* 4/O:3 among all countries studied and *Y. pseudotuberculosis* 1/O:1 and 2/O:3 in Belgium and Italy were the main bioserotypes isolated from pig tonsils. Cold enrichment was more effective in isolating both enteropathogenic *Yersinia* spp. than selective enrichment.

**Acknowledgments**

This work was performed at the Centre of Excellence on Microbial Food Safety Research, Academy of Finland (118602). The Walter Ehrström Foundation is acknowledged for financial support. Erika Pitkänen, Maria Stark, and Anu Seppänen are thanked for technical assistance.

**Disclosure Statement**

No competing financial interests exist.

**References**


Kechagia N, Nicolau C, Ioannidou V, et al. Detection of chromosomal and plasmid-encoded virulence determinants in
Kot B, Trafny EA, and Jakubczak A. Application of multiplex PCR for monitoring colonization of pigs tonsils by Yersinia enterocolitica, including biotype 1A, and Yersinia pseudotuberculosis. J Food Prot 2007;70:1110–1115.

Address correspondence to:
Pilar Ortiz Martínez, D.V.M.
Department of Food Hygiene and Environmental Health
Faculty of Veterinary Medicine
University of Helsinki
P.O. Box 66
Helsinki FI-00014
Finland

E-mail: pilar.ortiz@helsinki.fi