

IZS

T E R A M O

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LABORATORIO  
NAZIONALE  
DI RIFERIMENTO PER  
*CAMPYLOBACTER*

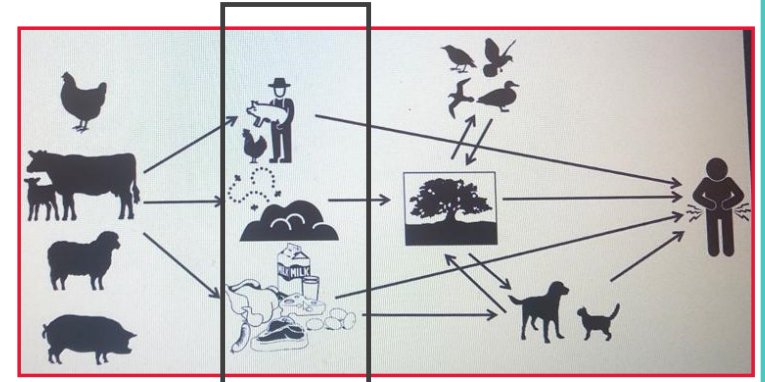
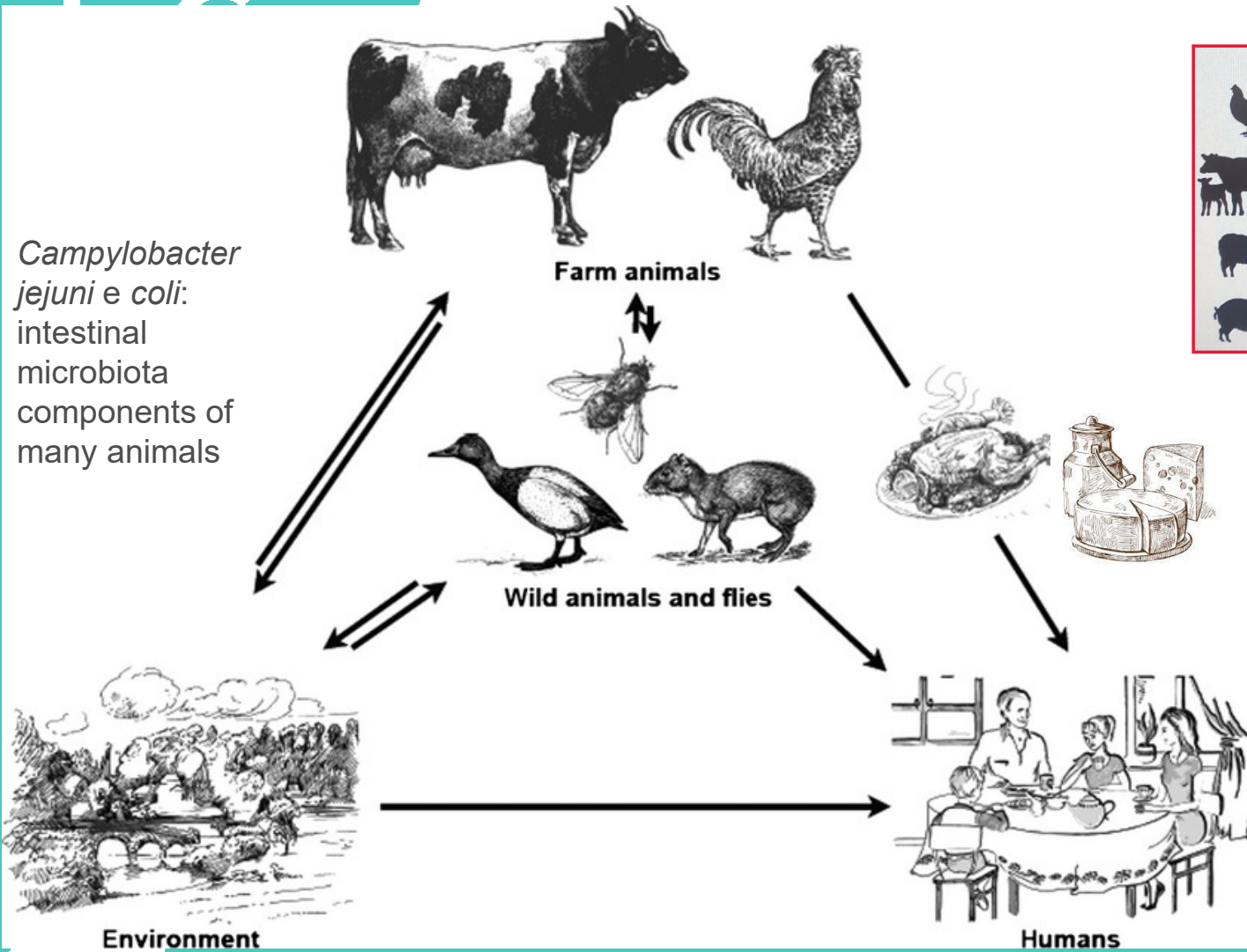
# CAMPYLOBACTER GENOMIC SURVEILLANCE IN CATTLE

**Giuliano Garofolo**

EURL-Campylobacter workshop 2022,  
26-28 September

# TRANSMISSION

*Campylobacter jejuni* e *coli*:  
intestinal  
microbiota  
components of  
many animals



Mughini Gras L et al.2021



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## PREVALENCE IN ANIMALS



- France **39,3%** in adult bovine and **99,4%** in calves (Thépault Amandine et al., 2018)
- USA, **71%** in farm bovine (Cha et al., 2017)
- UK **54.6%** (Milnes et al., 2008)
- Scotland **22%** (Rotariu et al., 2009)
- New Zealand **51%** in diary cattle and **65%** in calves (Gilpin et al., 2008)
- Austria **33%** in diarys and 14.4% (*C. jejuni*) in calves (Klein T et al., 2013)
- Finland **31%** in cattle (Hakkinen et al., 2007)
- Ireland **11,8%** (Tizazu et al., 2020)
- Norway **8,1%**
- Ethiopia **11,0%** (Tefera Woldemariam., 2009)
- Scotland **25%** (Rotariu et al. 2009)
- Ghana **19%** (Karikari et al. 2017)
- Ethiopia **9,4%** (Tefera Woldemariam., 2009)
- Kenya **6,3%**
- Canada **2,7%**

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**0.4% a 12%**

**Italy – 12%** Bianchini et al 2014,  
**Italy – 6.45%** Giacometti et al 2012,  
**USA – 2%** Jayarao et al 2006  
**Svezia 12% /13%** - EURL Campylobacter studies  
**Francia 1.4%** Desmaures et al. 1997  
**Olanda 4.5%** Beumer et al. 1988  
**Germania 0,5%** Messlhausser et al. 2008  
**Irlanda 1.6%** Whyte et al. 2004  
**Repubblica Ceca 3%** Bardon et al. 2012

## PREVALENCE IN FOOD



**~ 0%**

**Canada - 0%**  
**Finlandia - 0.5%**  
**Fino al 5% in Belgium**  
**0.58%. LNR Campylobacter & IIZZSS study**

**These results contrast with the prevalence data found in ruminants**

It is likely that hygiene in the slaughtering process is an important factor in preventing carcass contamination

Lower - middle -  
income countries

- Da 14% a 7.5% bovine meat in **Malesia**
- 12% bovine meat in **Etiopia**
- 9% for sheep and goat meat in **Etiopia**
- 10.9% bovine meat in **Pakistan**
- 5.1% for sheep and goat meat in **Pakistan**
- 10% bovine meat in **Iran**

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## AIM AND SAMPLING

1. collect new data on the **prevalence** of thermotolerant *Campylobacter* on carcasses and faeces of ruminants sampled at the slaughterhouse, in milk and on dairy products
2. **characterize** the strains
3. study the **survival potential** of different *Campylobacter* clones in milk and / or dairy products

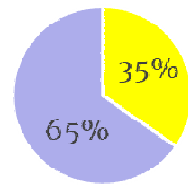
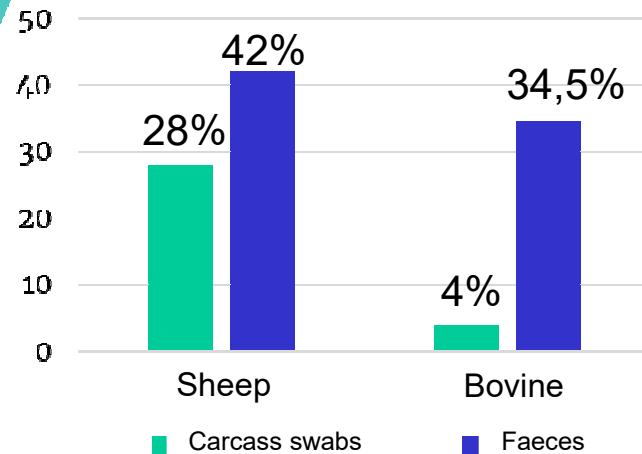


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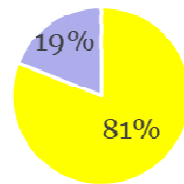
TERAMO

LABORATORIO NAZIONALE DI RIFERIMENTO PER *CAMPYLOBACTER*

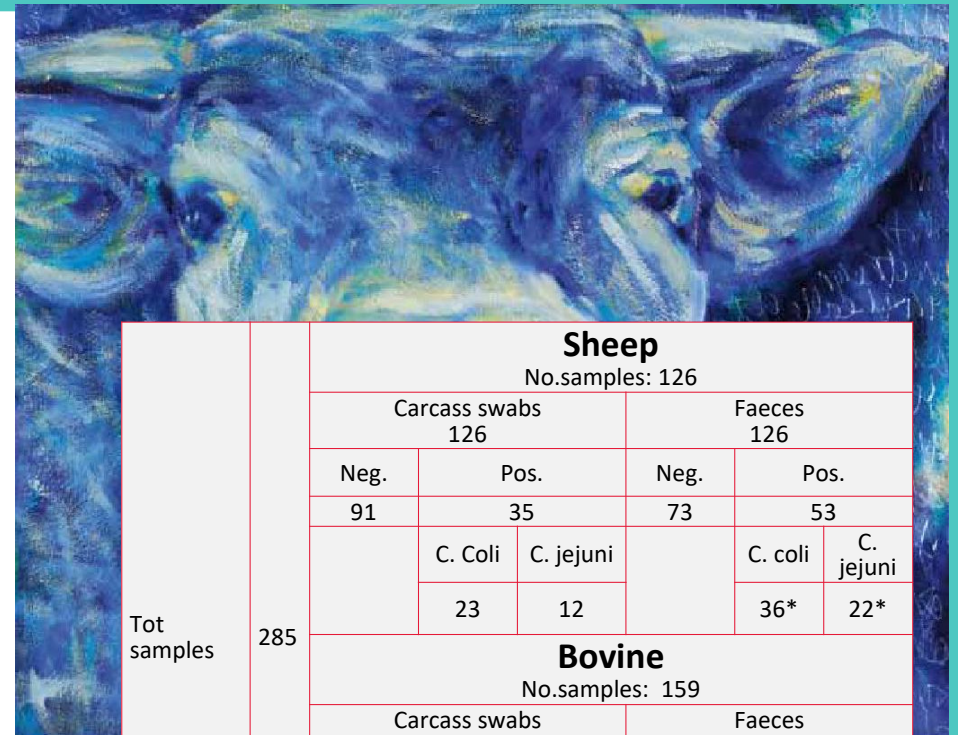
## RESULTS-prevalence in animals



■ *C.jejuni* ■ *C.coli*



■ *C.jejuni* ■ *C.coli*



		<b>Sheep</b>			
		No.samples: 126			
Tot samples	285	Carcass swabs 126		Faeces 126	
		Neg.	Pos.	Neg.	Pos.
		91	35	73	53
			<i>C. Coli</i>	<i>C. jejuni</i>	<i>C. coli</i>
	23	12	36*	22*	
		<b>Bovine</b>			
		No.samples: 159			
Tot samples	285	Carcass swabs 159		Faeces 159	
		Neg.	Pos.	Neg.	Pos.
		153	6	104	55
			<i>C. coli</i>	<i>C. jejuni</i>	<i>C. coli</i>
	2	4	11*	51*	

\*the disagreement with the number of positives is due to the fact that some tested positive for both *C. coli* and *C. jejuni*.

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## RESULTS-prevalence in food

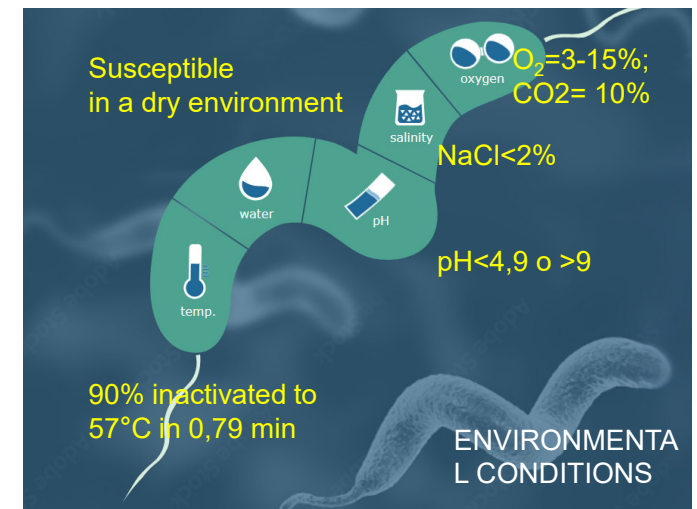
79 milk samples

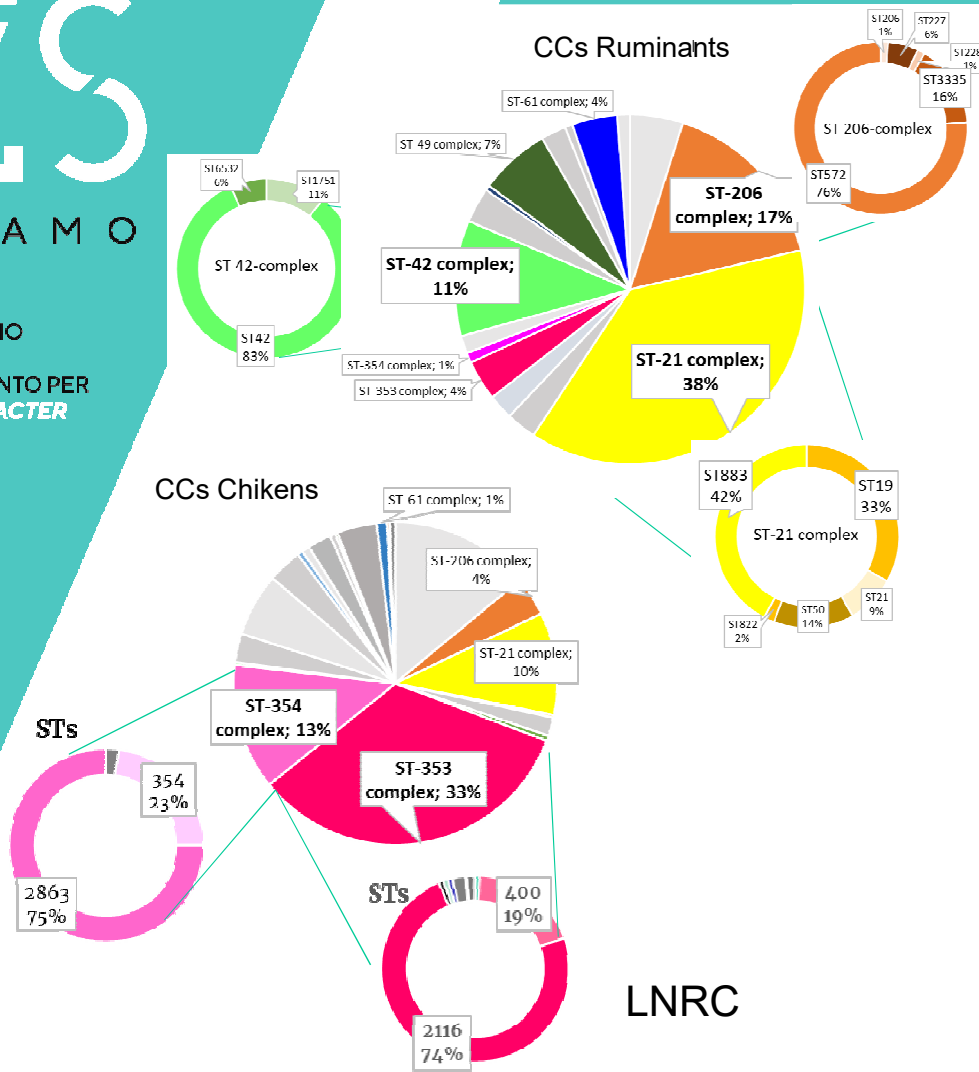
6,4% POS

33 diary products

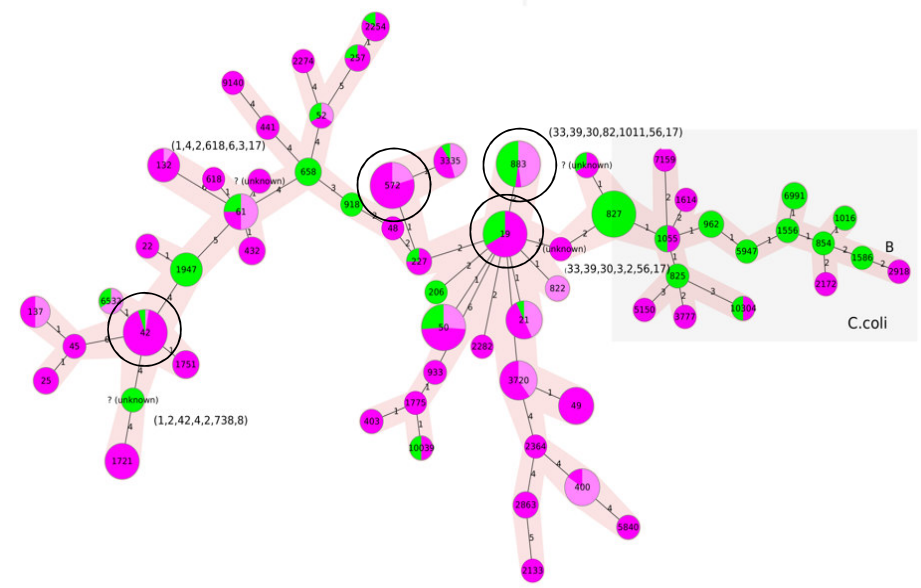
Formaggio "Primo Sale"  
Mozzarella "Bocconcini"  
Formaggio Caciotta  
Formaggio Fior di latte  
Caciocavallo  
Formaggio vaccino  
Burro vaccino  
yogurt

NEGATIVES





**N= 430 *C. jejuni* (22.3% from bovine food, 58.4% from bovine and 33.2% from sheep)**  
**N= 70 *C. jejuni* (16% from bovine and 84% from sheep)**



Task Templates: C. jejuni/coli MLST v1.1, C. jejuni/coli cgMLST v1.3  
 C. jejuni/coli cgMLST Complex Type / Cluster-Alert distance: 13  
 Cluster-Alert distance: 13  
 Comparison Table Retrieval: jejun\_coli da giu2020 [unstored]  
 Projects: jejun\_coli da giu2020 (Campylobacter jejun/coli)  
 Comparison Table created: 17-giu-2022 9.26 (v6.0.2\_2019-06)  
 Ridom SeqSphere+ MST for 500 Samples based on 7 columns, no missing values  
 Distance based on columns from C. jejuni/coli MLST (7)  
 For citing correctly in publications the tools used for this analysis see menu Help | Citations.  
 Cluster distance threshold: 13

Legend:  
 ● Alimenti  
 ● ovini  
 ● Bovini



# OUTBREAK IN ABRUZZO ST 883

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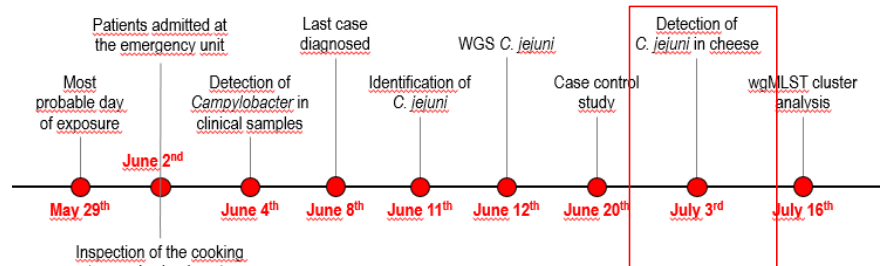
> J Med Microbiol. 2021 Mar;70(3). doi: 10.1099/jmm.0.001262. Epub 2021 Jan 20.

## A large food-borne outbreak of campylobacteriosis in kindergartens and primary schools in Pescara, Italy, May-June 2018

Simona Sorgentone<sup>1</sup>, Luca Busani<sup>2</sup>, Paolo Calistri<sup>3</sup>, Giorgio Robuffo<sup>1</sup>, Stefania Bellino<sup>2</sup>, Vicidalia Acciari<sup>3</sup>, Maurizio Ferri<sup>1</sup>, Caterina Graziani<sup>4, 2</sup>, Salvatore Antoci<sup>3</sup>, Fabrizio Lodi<sup>1</sup>, Valeria Alfonsi<sup>5, 2</sup>, Cesare Cammà<sup>3</sup>, Paolo Fazii<sup>6</sup>, Xanthi Andrianou<sup>2</sup>, Francesca Cito<sup>3</sup>, Giuliano Lombardi<sup>6</sup>, Gabriella Centrotola<sup>3</sup>, Massimo D'Amario<sup>1</sup>, Nicola D'Alterio<sup>3</sup>, Vincenzo Savini<sup>6</sup>, Fabrizio De Massis<sup>3</sup>, Anna Pelatti<sup>6</sup>, Marco Di Domenico<sup>3</sup>, Guido Di Donato<sup>3</sup>, Elisabetta Di Giannatale<sup>3</sup>, Lisa Di Marcantonio<sup>3</sup>, Violeta Di Marzio<sup>3</sup>, Gabriella Di Serafino<sup>3</sup>, Anna Janowicz<sup>3</sup>, Cristina Marfoglia<sup>3</sup>, Francesca Marotta<sup>3</sup>, Daniela Morelli<sup>3</sup>, Giacomo Migliorati<sup>3</sup>, Diana Neri<sup>3</sup>, Francesco Pomilio<sup>3</sup>, Silvia Scattolini<sup>3</sup>, Giovanni Rezza<sup>7, 2</sup>, Antonio Caponetti<sup>1</sup>, Patrizio Pezzotti<sup>2</sup>, Giuliano Garofolo<sup>3</sup>

Affiliations + expand  
PMID: 33475480 DOI: 10.1099/jmm.0.001262

### Laboratory investigation in chronological order



883ST-21 complex in cheese after 35 gg

APPLIED AND ENVIRONMENTAL MICROBIOLOGY, Nov. 1982, p. 1154-1158  
0099-2240/82/111154-05\$02.00/0  
Copyright © 1982, American Society for Microbiology

Vol. 44, No. 5

## Prevalence and Survival of *Campylobacter jejuni* in Unpasteurized Milk

MICHAEL P. DOYLE\* AND DEBRA J. ROMAN

The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

Received 7 May 1982/Accepted 8 July 1982

RESEARCH ARTICLE

## Persistent contamination of raw milk by *Campylobacter jejuni* ST-883

Anniina Jaakkonen<sup>1,2\*</sup>, Rauni Kivistö<sup>2</sup>, Maria Aarnio<sup>1</sup>, Jenni Kalekivi<sup>1</sup>, Marjaana Hakkinen<sup>1\*</sup>

<sup>1</sup> Microbiology Unit, Laboratory and Research Division, Finnish Food Authority, Helsinki, Finland,  
<sup>2</sup> Department of Food Hygiene and Environmental Health, Faculty of Veterinary Medicine, University of Helsinki, Helsinki, Finland

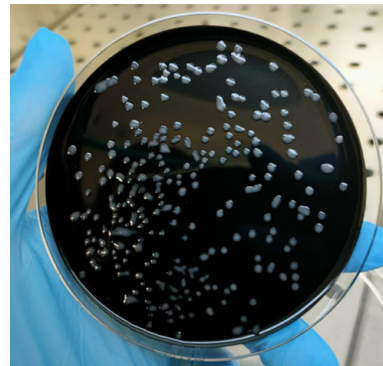
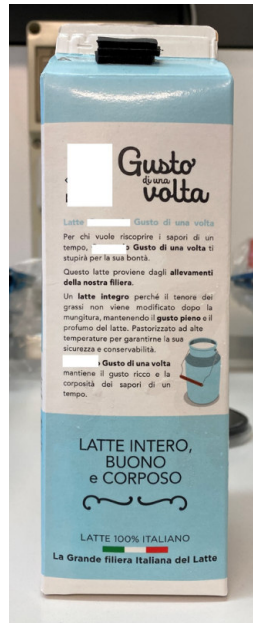
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## CHALLENGE TEST

- Food examined → (ready-to-eat):
  - 2 CT on **ricotta cheese**, at 4°C and 7°C,  
(Inoculum :  $2 \cdot 10^9$  CFU/ml (9,30 log))
  - 1 CT on **pasteurized whole milk**, at 4°C and 7°C  
(Inoculum :  $2 \cdot 10^9$  CFU/ml (9,30 log))



Strain: *Campylobacter jejuni* M1

(Friis C, TM, et al., 2010)

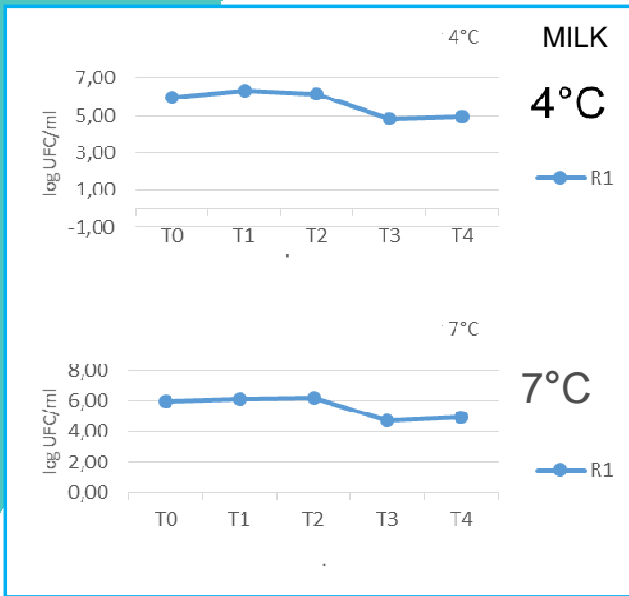
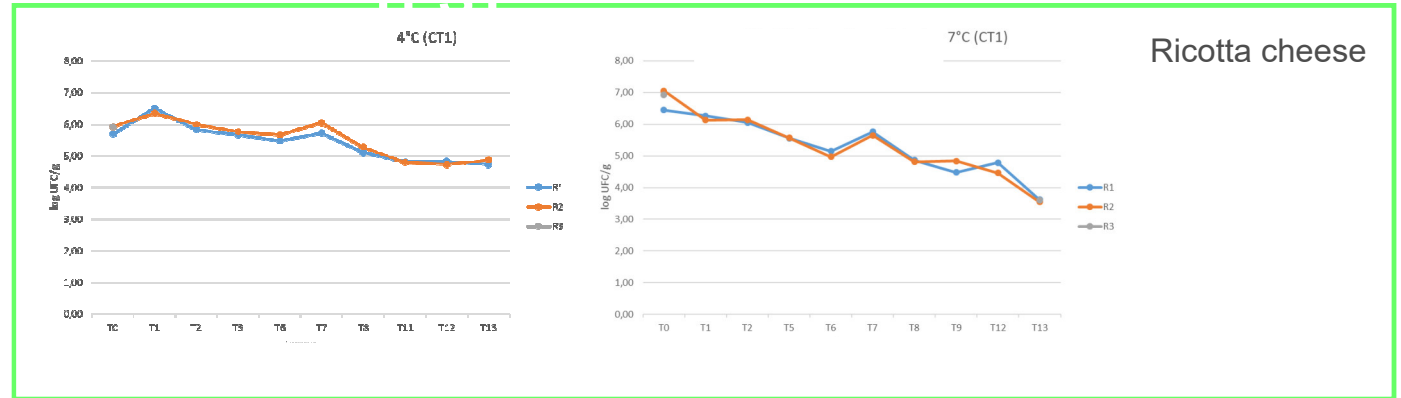
- ISO 20976-1:2019 Microbiology of the food chain — Requirements and guidelines for conducting challenge tests of food and feed products
- EURL Lm TECHNICAL GUIDANCE DOCUMENT on challenge tests and durability studies for assessing shelf-life of ready-to-eat foods related to *Listeria monocytogenes* (Version 4 of 1 July 2021) - ANSES

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inactivation curves

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## PRELIMINARY RESULTS\_CHALLENGE



	RICOTTA CT1		RICOTTA CT2		MILK	
	4°C	7°C	4°C	7°C	4°C	7°C
period	14 days	14 days	14 days	14 days	5 days	5 days
$\Delta (T0 - T \text{ END})$	-1,05	-3,22	-1,96	-2,12	-1,03	-1,00

**infectious dose= 500 CFU/180ml milk**

Robinson, D. A. (1981). Infective dose of *Campylobacter jejuni* in milk. British medical journal (Clinical research ed.), 282(6276), 1584.

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Ruminants important *Campylobacter* reservoirs and amplifiers in Italy

STs of ruminants different from STs of poultry and superimposable with those of humans

Pasteurization reduces zoonotic risks in milk, but care should be taken with post-treatment recontamination

In the cheese and milk models tested, the concentrations of *C.jejuni* used pose a health risk to the consumer

The increase in habits of consuming raw foods, proper hygiene must be guaranteed starting from primary production. Farm management, waste disposal and water control are essential.





***NRL-IT Campylobacter***  
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**Francesca Marotta**  
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**Federica Di Timoteo**  
**Teresa Romualdi**  
**Valentina Iezzi**  
**Anno Abass**