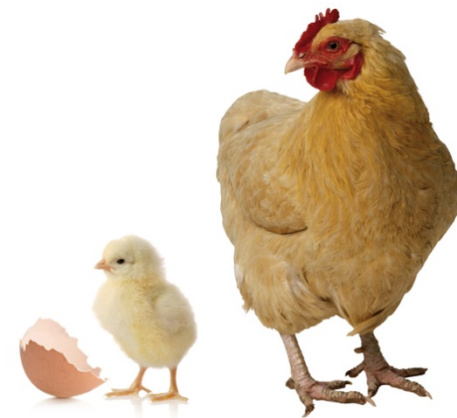


RECENT INVESTIGATIONS ON *SALMONELLA* ENTERITIDIS CONTAMINATION IN THE POULTRY PRODUCTION IN FRANCE

Laetitia Bonifait, Marilynne Quéguiner, Françoise Le Gall, Typhaine Poëzévara, Marylène Bohnert,
Gilles Salvat and Marianne Chemaly

Introduction

- *Salmonella* spp. are part of the most important cause of food-borne bacterial gastroenteritis in developed countries
- Cases of salmonellosis are often associated with poultry products
 - Transmission of *Salmonella* to humans in around 30 % of cases
- Contamination may occur throughout the whole production chain
 - Breeding
 - Broilers
 - Pullets
 - Laying hens



EFSA, 2012

National Reference Laboratory strain collection

- Monitoring of *Salmonella* in poultry flocks is laid down by the regulation (EC) N° 2160/2003
- All *Salmonella* strains
 - Isolated from poultry farms positives controls
 - Different origins
 - Different steps
 - Different source samples
 - Isolated and identified according to the standard ISO 6579-A1 with the scheme of White-Kauffman Le-Minor
 - Sent to the NRL (stored in stock culture agar)
 - Appointed to keep all strains at least 2 years
 - Allows the selection and the follow up of *Salmonella* antibiotic resistance

Strains traceability

- Each strain is sent with a cover note for traceability
- ACTEOLab (2012)
 - Monitoring salmonellae of non-human origin
 - Originated from the need to update the information system
 - Coordinate the *Salmonella* network
 - Produce health indicators for surveillance purposes
 - Directly integrate data from laboratories in electronic format (EFSA data standardization classification)
 - Take the opportunity to add the NRL collection strains

Mailing address:

ANSES - Unit HQPAP - NRL *Salmonella*
Zoopôle – 41 rue Beaucemaine
B.P.53
22440 PLOUFRAGAN

Shipment
**1 isolate of *Salmonella subsp enterica*,
by positive control**

Sender Lab:

File N°:

Sample's reception date:

Sample taken by: _____

Particular context? _____

Sampling location: _____

INUAV code:

Department:

Rearing ID:

	Breeding				Production		
	Hatchery		Breeder's		Pullets	Laying hens	Broilers
	Selection	Multiplication	Pre laying	Laying			
<i>Gallus</i> laying sector							
<i>Gallus</i> broilers sector							
Turkeys					NA	NA	

Sampling time: _____

Origin of *Salmonella*: _____

- Socks or swabs
- Bird droppings
- Dust
- Hatcher swabs
- Egg shell
- Muscles
- Liver / ovary / caecum
- Other (to be precised) : _____

Strain reference: _____

Lab. tube ID: _____

***Salmonella* serotype :**

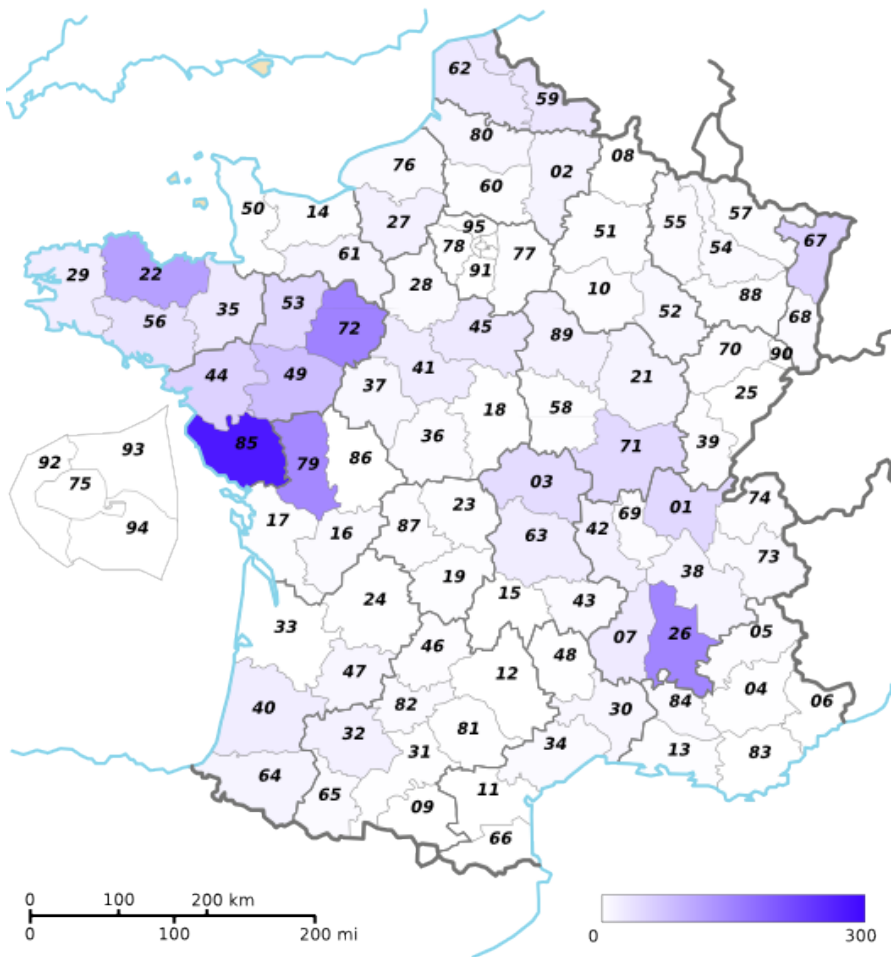
- Enteritidis
- Typhimurium (STm)
- STm variant : 1,4,[5],12:i:-
- STm variant : 1,4,[5],12:-i:
- Other : _____

Parcel number N°:

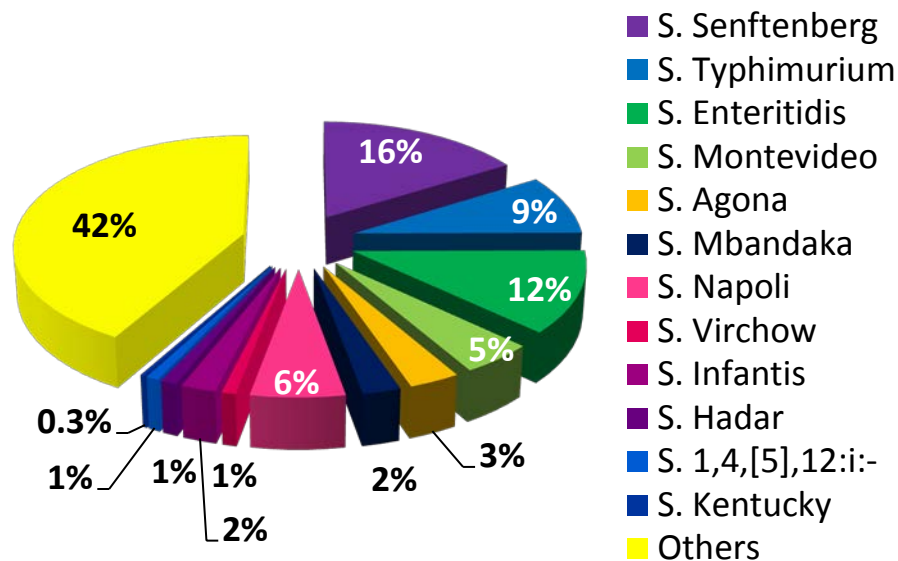
LNR code:

Trend of *Salmonella* infection of poultry flocks

2015



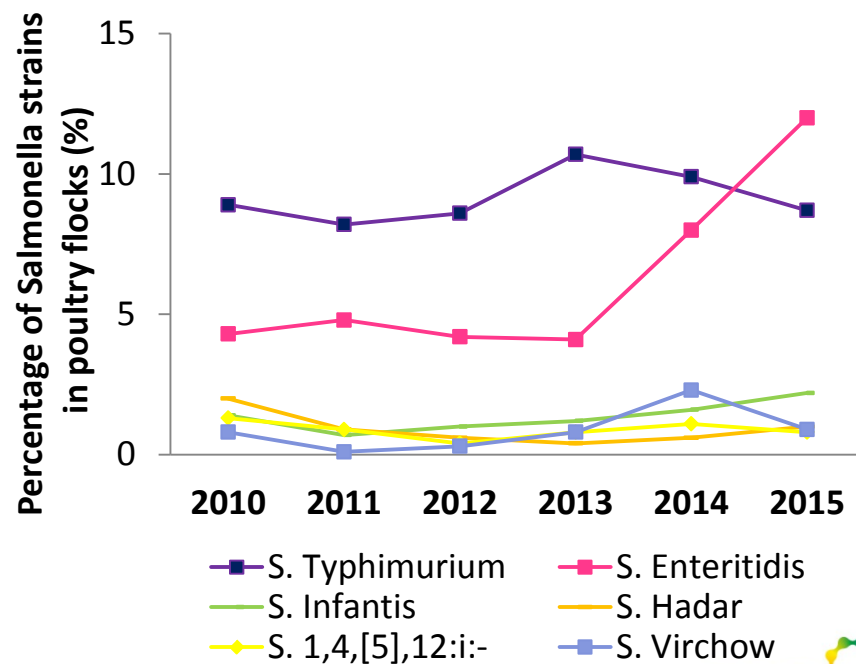
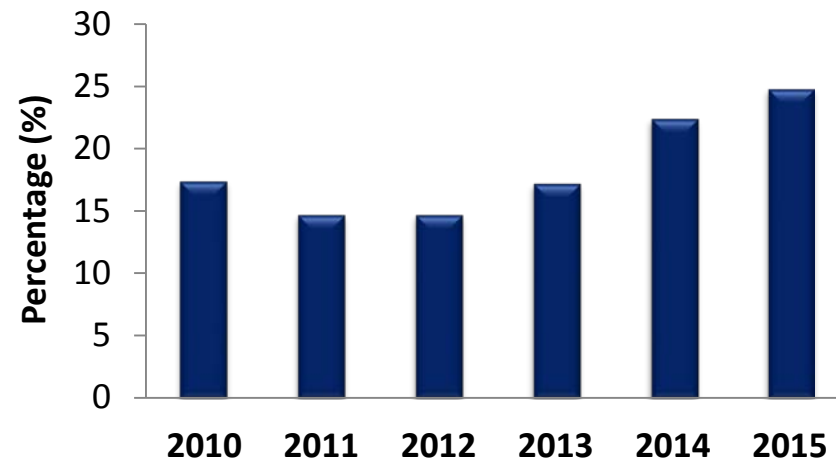
Geographic distribution



Main *Salmonella* serotypes found

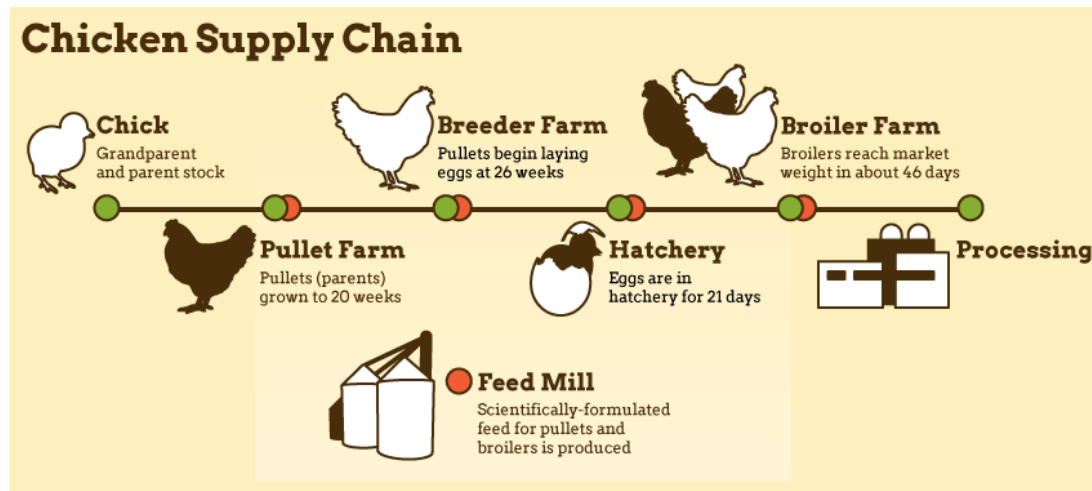
Trend of *Salmonella* infection of poultry flocks

- The 5 regulated serovars represented almost 15% of total infections
 - *Salmonella* Enteritidis
 - *Salmonella* Typhimurium
 - *Salmonella* Hadar
 - *Salmonella* Infantis
 - *Salmonella* Virchow
- They tend to be less frequently isolated
- There is an increase observed between 2013 and 2015
 - Associated to *Salmonella* Enteritidis infection cases in poultry flocks



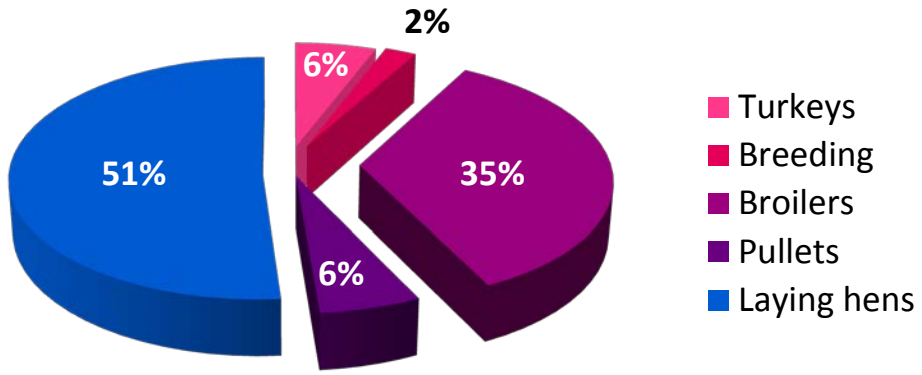
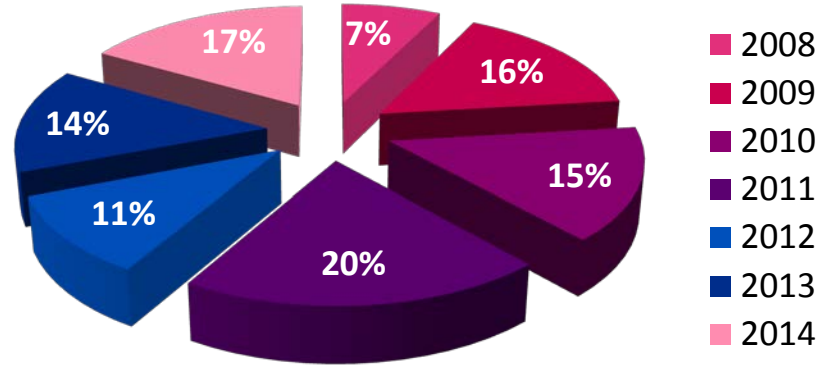
Epidemiological investigations

- NRL refers to the strain collection, through the national control program, for selection and typing of involved strains
- *Salmonella enterica* subsp *enterica* serovar Enteritidis is still a major problem in some production areas in France



Salmonella Enteritidis contamination in France

- 311 isolates of S. Enteritidis
- From 4 departments
 - 1 initial
 - 3 related
- 2008 to 2014
- Different stages of poultry production



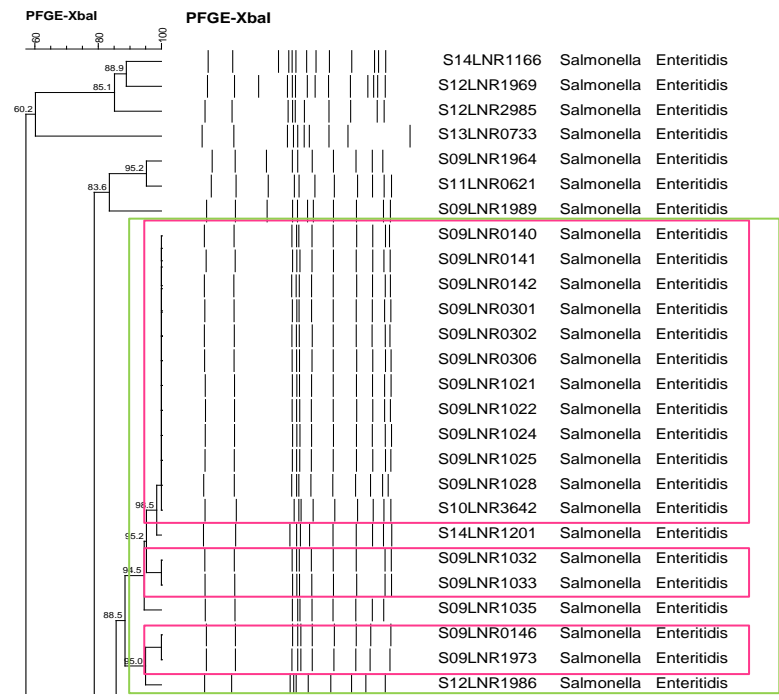
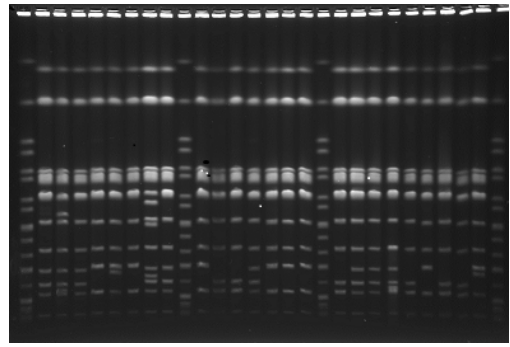
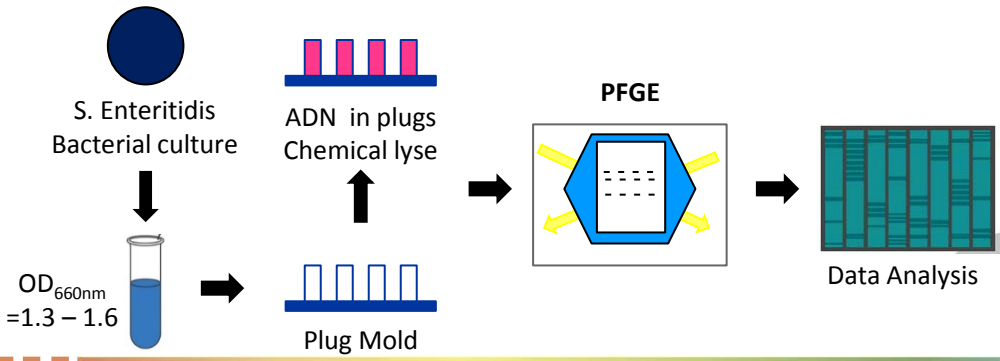
Salmonella Enteritidis contamination in France

- S. Enteritidis were collected and analyzed by Pulsed Field Gel Electrophoresis (PFGE)

- Xba I

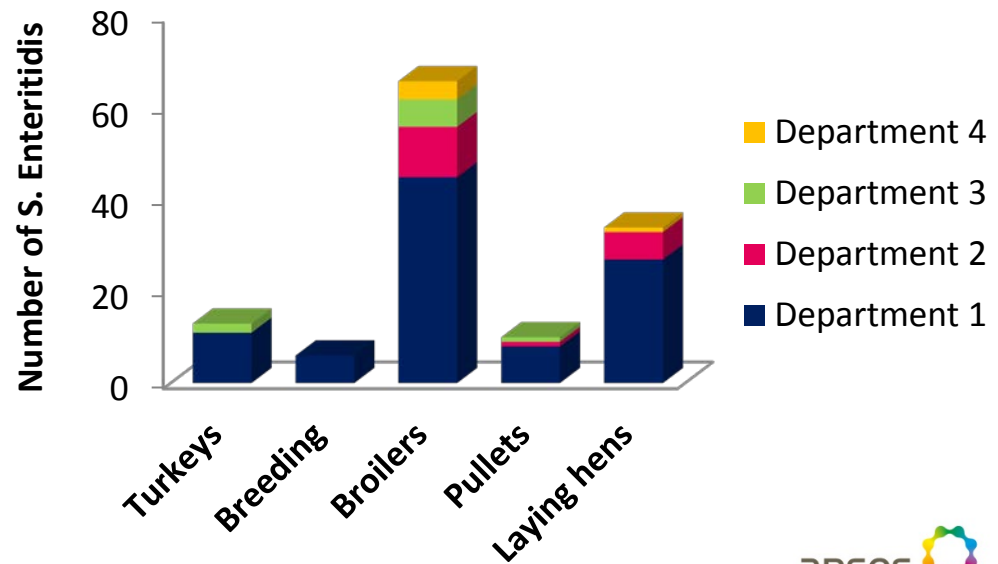
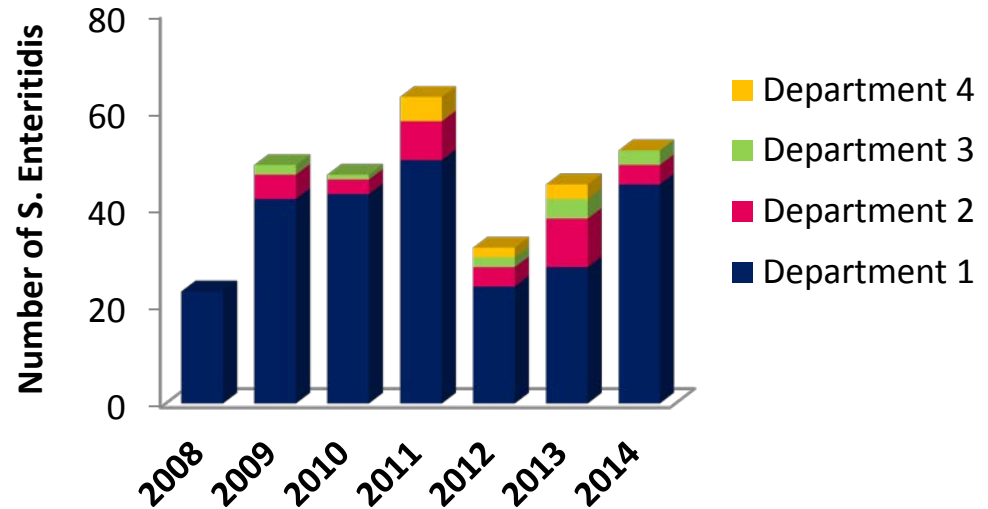
- Dendrogram of S. Enteritidis from 2008 to 2014

- Data analysis (BioNumerics 6.6)
 - 49 pulsotypes
 - Simpson's index : 0.91



S. Enteritidis contamination from 2008 to 2014

- S. Enteritidis were identified circulating throughout
 - The years
 - The departments
- Contamination appeared to originate from the department 1
- All production types in the department 1 were infected



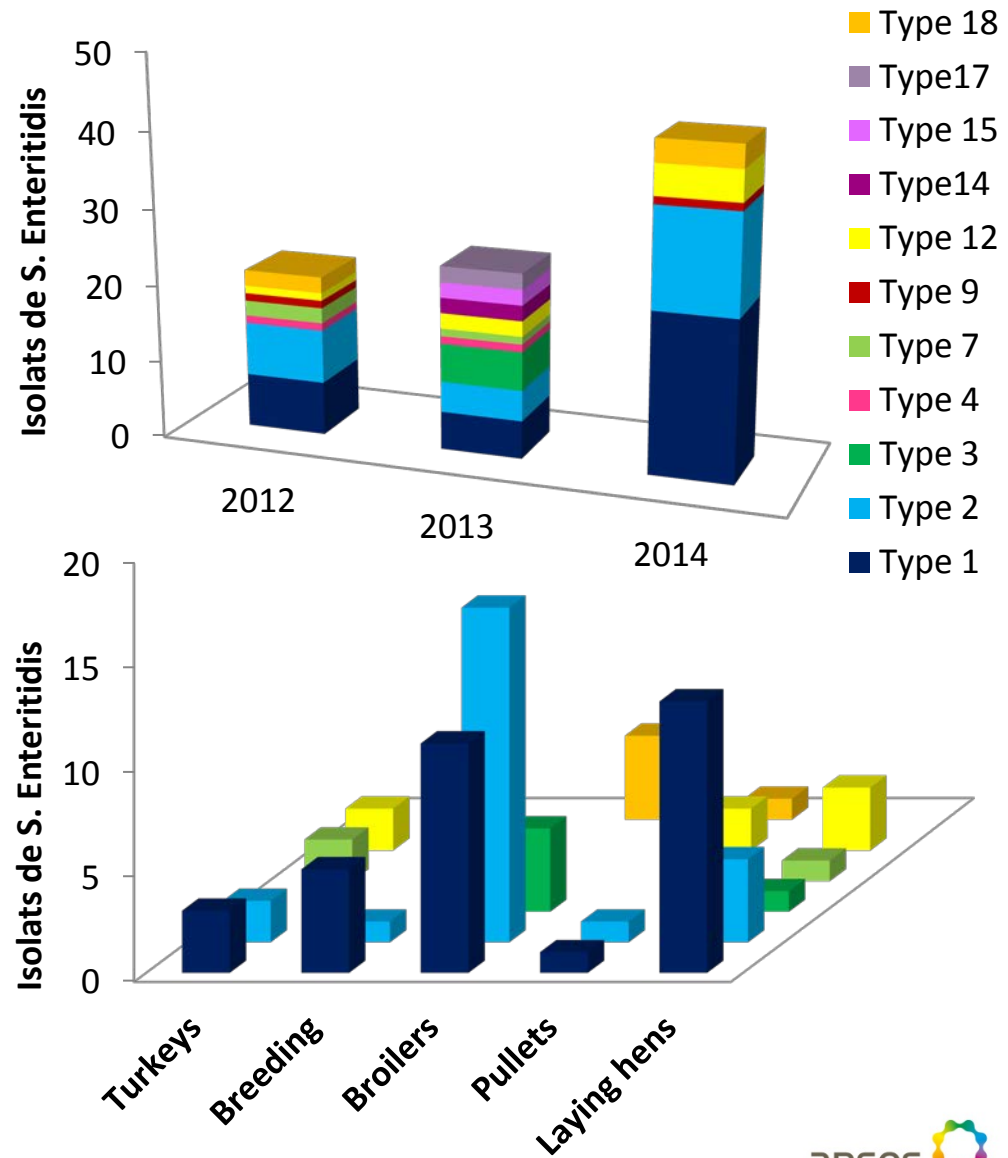
S. Enteritidis contamination in department 1

- PFGE revealed distinct pulsotypes
- Diversity index varying between 0.7 and 0.9 according to the year
- 2014
 - Highest number of strains
 - Lowest diversity
 - Increase of contamination with similar pulsotypes

PFGE Types	Number of S. Enteritidis		
	2012	2013	2014
Type 1	7	5	21
Type 2	7	4	13
Type 3		5	
Type 4	1	1	
Type 5	1		
Type 6	1		
Type 7	2	1	
Type 8	1		
Type 9	1		1
Type 10		1	
Type 11		1	
Type 12	1	2	4
Type 13			1
Type 14		2	
Type 15		2	
Type 16			1
Type 17		2	
Type 18	2		3
Type 19			1
Type 20		1	
Type 21		1	
TOTAL strains	24	28	45
ID Simpson	0.84	0.92	0.70

S. Enteritidis contamination in department 1

- The diversity tended to decrease
- Two dominant pulsotypes (Types 1 and 2) persisted
 - Persisted over the years
 - Between the production types
- Contamination at the breeding level suggested the diffusion of the contamination at the following stages



Conclusions

- The strain collection of the French NRL is an important tool
 - Follow-up of regulated serovars
 - Detection of emergent serovars
- Help to adapt the control system to real situations
- This investigation revealed the importance of S. Enteritidis infection
 - Persisted over the years
 - Persisted across the poultry productions
 - Cases increased in 2014 and 2015
- These results highlighted the need to reinforce sanitary barriers and corrective measures in the infected department in order to eradicate the contamination

**THANK YOU
FOR YOUR ATTENTION**