Bovine Tuberculosis Surveillance at Slaughterhouse and Purchase in Belgium: Approach towards Benchmarking

CODA CERVA Veterinary and Agrochemical Research Center - Groeselenberg, 99 B-1180 BRUSSELS BELGIUM phone : +32(0)2 379 04 00 www.coda-cerva.be

Sarah Welby[1], David Fretin[2], Hans Vandewiele[3], Hein Imberechts[2], Yves Van der Stede[1, 4]

[1]CODA-CERVA, Veterinary and Agrochemical Research Centre, Unit: Coordination Veterinary Diagnosis-Epidemiology and Risk Analysis (CVD-ERA), Brussels, Belgium
[2]CODA-CERVA, Veterinary and Agrochemical Research Centre, Unit: Bacteriology, Brussels, Belgium
[3]FASFC, Federal Agency for the Safety of the Food Chain, Section Animal health, Brussels, Belgium
[4]Ghent University of Veterinary Medicine, Laboratory of Veterinary Immunology, Merelbeke, Belgium

Context & Aims

Official free status 25/06/2003 (EC Decision 2003/467/EC):

Few sporadic breakdowns observed yearly in Belgium & re-emergence of the disease in some neighbouring countries.

=> Objective: Maintain the Official Free Status applying the current surveillance (Slaughterhouse inspection & Purchase testing)

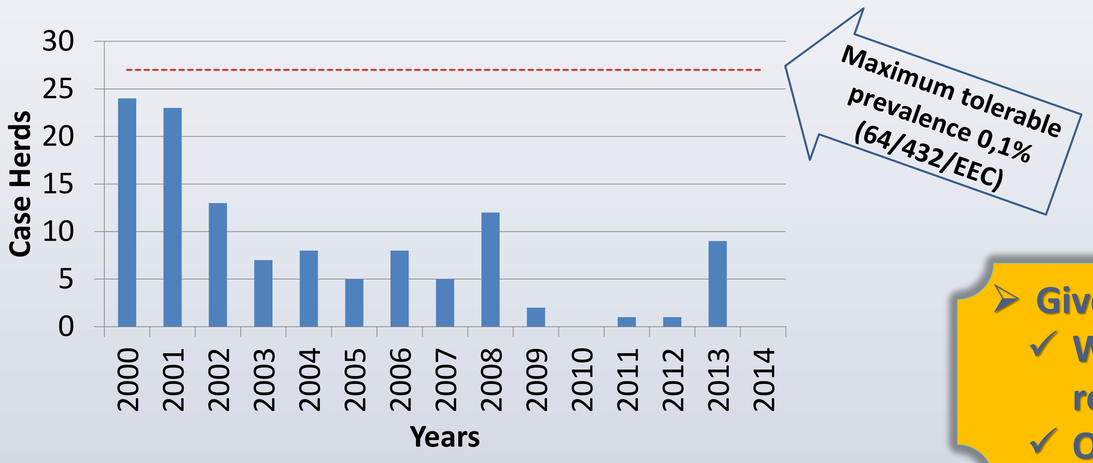

Figure 1: Yearly number of Tuberculosis breakdown herds in Belgium since 2000

- **Given the surveillance characteristics:**
  - ✓ **What is the expected positive reaction rate?**
  - ✓ **Opportunities for benchmarking?**

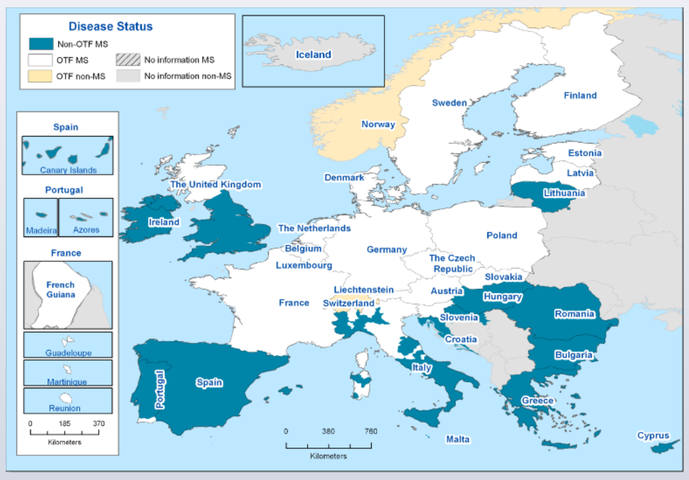

Figure 2: Status of countries regarding bovine tuberculosis in 2013 (EFSA summary report, 2015)

Material & Methods

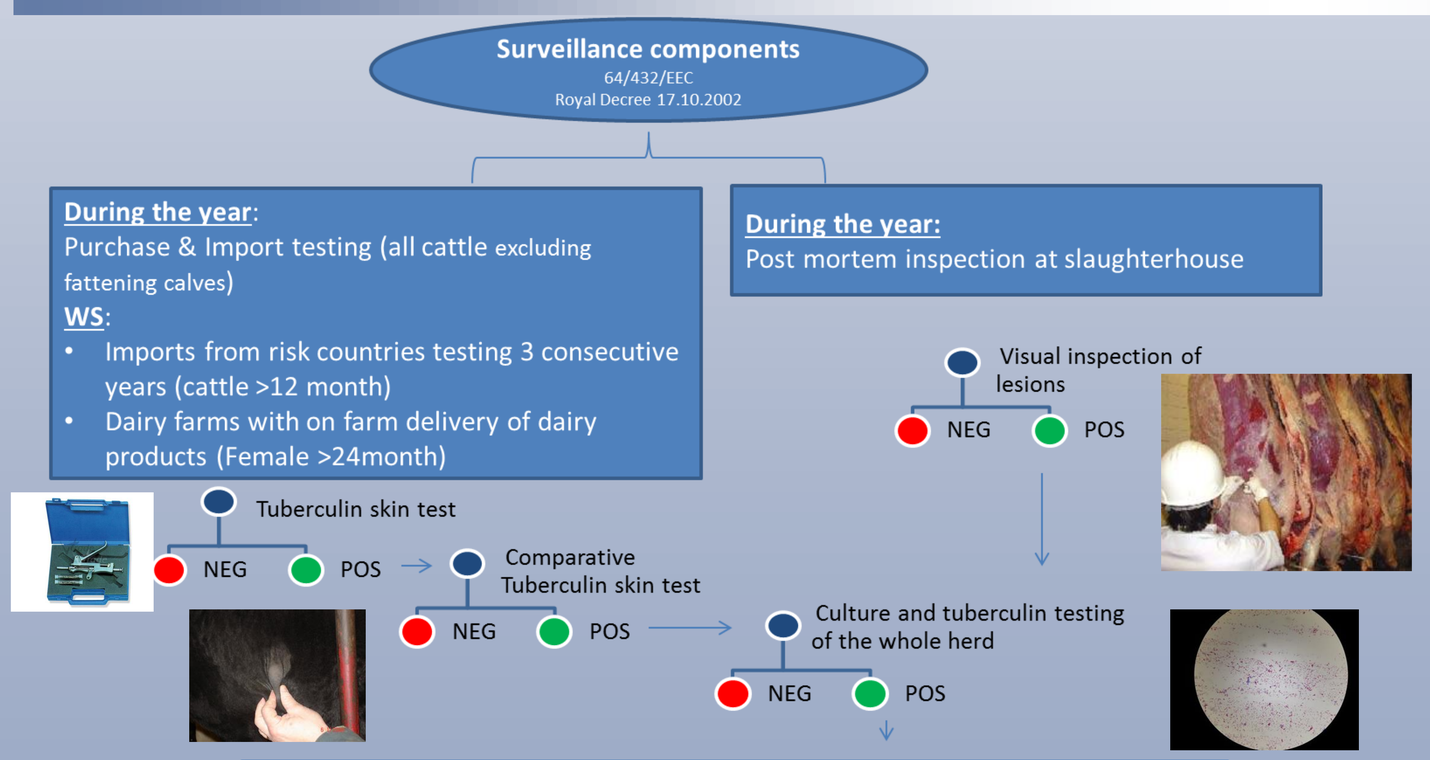

Figure 3: Tuberculosis surveillance decision tree applied in Belgium

Table 1: Parameters used to feed the model

Input of the model	Value	Sources
Intradermal skin test Sensitivity	0.94 (0.49 -1.00)	EFSA scientific opinion 2012
Intradermal skin test Specificity	0.91 (0.70 -1.00)	
Inspection at Slaughterhouse Sensitivity	0.71 (0.38 -0.92)	
Inspection at Slaughterhouse Specificity	1.00 (0.99-1.00)	
Prevalence herd level	0.1%	64/432/CEE
Prevalence animal level	0.1%-0.01%-0.001%	***Simulations***

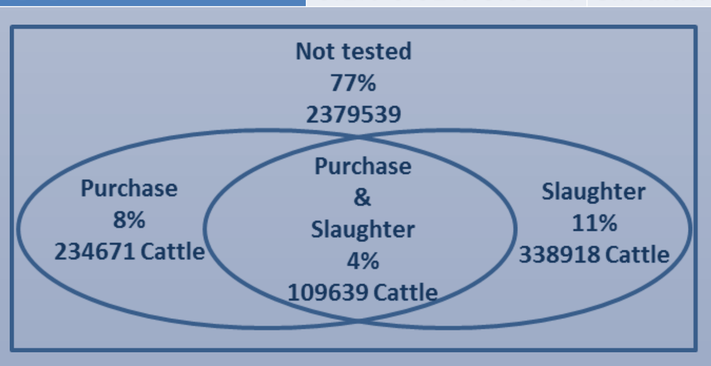

Figure 4: Yearly number of tested cattle in each component (Sanitel, 2009)

- **Stochastic simulations, 10000 iterations per simulation (**Model Risk 3,0®**) :**
  - ✓ **ExpectedTruePositiveReactors = Population proportion ∗ Test Sensitivity ∗ Prevalence**
  - ✓ **ExpectedFalsePositiveReactors = Population proportion ∗ [1 – Test Specificity] ∗ [1–Prevalence]**

Results & Discussion

Table 2: Expected true and false positive rate per surveillance component purchase (PUR) and slaughterhouse (SLGH) simulated for different animal prevalence

Simulated animal prevalence		False positives		True positives	
		PUR	SLGH	PUR	SLGH
0.001%	**Mean**	1.33215%	0.02465%	*0.00011%*	*0.00010%*
	Minimum	0.00602%	0.00000%	0.00006%	0.00006%
	Maximum	3.37939%	0.12777%	0.00012%	0.00014%
0.010%	**Mean**	1.31266%	0.02504%	*0.00105%*	*0.00104%*
	Minimum	0.02712%	0.00000%	0.00064%	0.00058%
	Maximum	3.51198%	0.12532%	0.00120%	0.00138%
0.100%	**Mean**	1.31448%	0.02489%	*0.01049%*	*0.01035%*
	Minimum	0.02203%	0.00000%	0.00651%	0.00594%
	Maximum	3.26768%	0.11891%	0.01200%	0.01374%

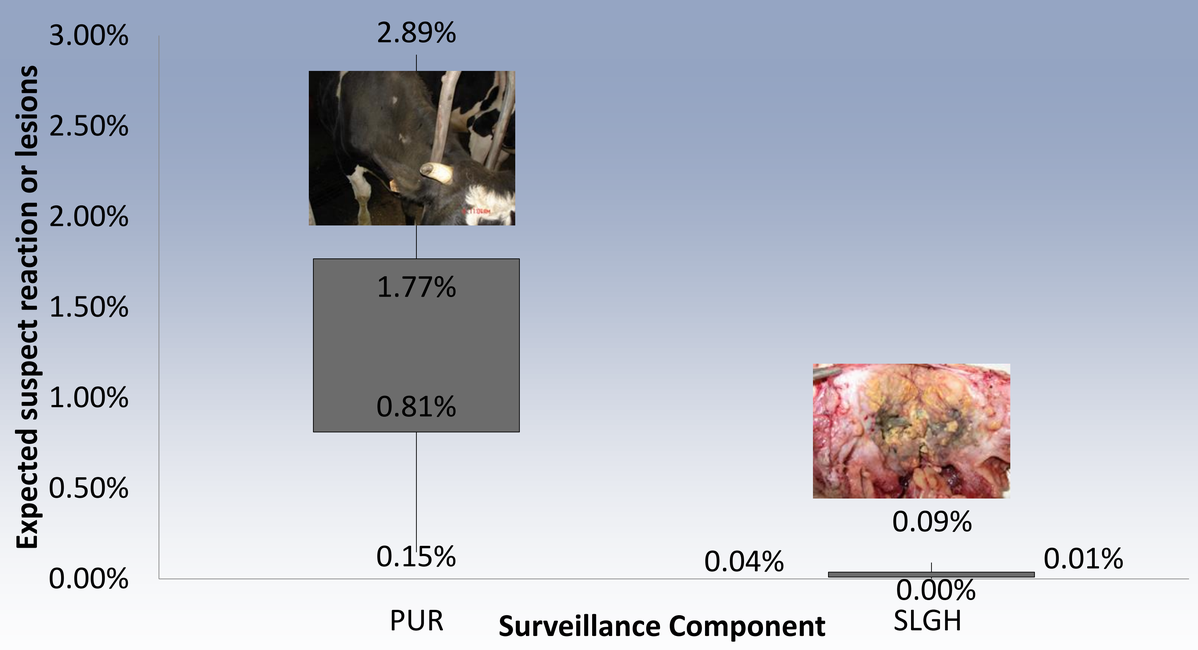

Figure 5: Expected total (true positive + false positive) suspect reactions and lesions (1st, 25th, 75th, 99th percentile) relative to the annual purchase (PUR) and slaughtered (SLGH) cattle, given 0.01 % animal prevalence

Given the **total purchased** and **slaughtered cattle** in Belgium and an expected **animal prevalence below 0,01%:**

- ✓ **At least** (1st percentile) **515 suspect reactions at purchase** should be expected per year (25th-75th percentile: **2838 - 6186**)
- ✓ **At least** (1st percentile) **6 suspect lesions at slaughter house** should be expected per year (25th-75th percentile: **44- 169**)

- False positive reactions >>> True positive
- NB: If other disease present with similar symptoms or in a the context of tracing on and back more suspect lesions could be expected

This simulation exercise, based on available quantitative data, provides useful insight and tools to policy makers for setting up benchmarks in surveillance