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ASSEMBLÉE GÉNÉRALE

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S'adapter aux menaces et conforter notre statut sanitaire

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STOC free: An innovative framework to compare probability of freedom from disease in heterogeneous control programmes

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In the STOC free project, six countries collaborate to develop a framework that is able to objectively quantify the probability and uncertainty of freedom from infection for animals in different control programmes. The ultimate goal is that the framework will be used throughout Europe to enhance safe trade.

Several European countries have implemented national or regional surveillance, control, or eradication programmes for endemic infections of cattle. Such programmes bring tangible benefits to participating farmers and national economies, and are to be strongly supported. However, they also create difficulties for intra-community trade, as free trade has the potential to allow (re-) introduction of infectious agents into regions where disease freedom has been achieved. With respect to non-regulated diseases, countries differ both in their progress towards eradication and in control programme design. When freedom from infection is reached, safe trade is essential to protect that status.

In 2017 a project was initiated in which a Surveillance analysis Tool for Outcome-based Comparison of the confidence of FREEdom generated by control or eradication programmes (STOC free) will be developed. The project is financially supported by EFSA and the European Commission and is executed by a consortium that consists of eight parties from six European countries that collaborate to tackle this major challenge.

The project aims to develop and validate a framework that enables a transparent and standardized comparison of confidence of disease freedom for control programmes across herds, regions or countries. The STOC free framework consists of a model (STOC free MODEL) combined with a tool to facilitate the collection of the necessary quantitative information (STOC free DATA). In Figure 1, a graphical overview of the STOC free framework is presented.
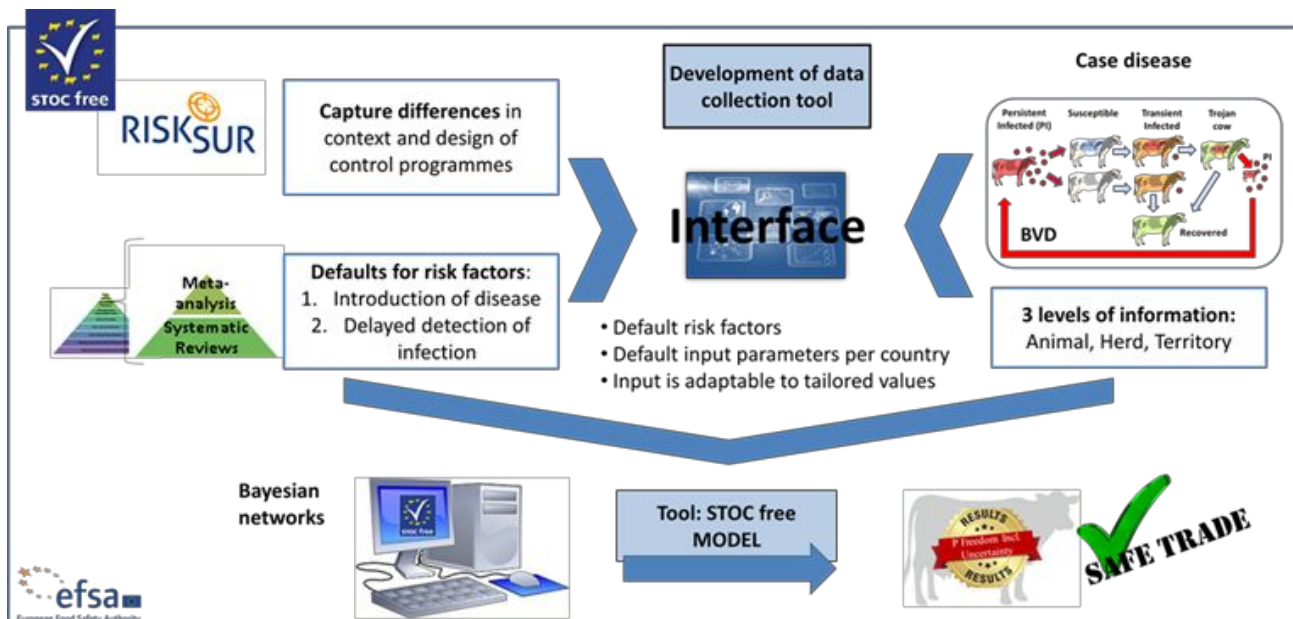

Figure 1. Graphical representation of the STOC free framework

In the project, bovine viral diarrhea (BVD) will be used as the example disease. BVD is a viral disease that can be transmitted both horizontally, leading to transiently infected cattle, and vertically. Vertical transmission in early gestation results in persistently infected (PI) calves which are considered the most important source for spread of the virus. The BVD virus is often introduced by purchase of either PI calves or cows pregnant with PI calves. The latter are popularly referred to as Trojans due to the deceptive way in which such cows can introduce the virus into a new herd.

Many countries have differently designed control programmes in place for BVD and are at different stages of eradication. The ultimate goal of STOC free is that the user of the framework can estimate the probability of freedom of bovine viral diarrhea virus (BVDV) and the uncertainty around that probability for a trade animal based on default input information on animal, herd and country level. The results can be tailored to the individual situation when programme-specific quantitative data is entered in the data collection tool. These data can be obtained from databases or control programmes, diagnostic data, demographic data and contact structures between herds. In addition, the model will include both the frequency of occurrence and risk estimates for factors that influence the probabilities of introduction and of delayed detection of the infection in an animal or herd.

The developed framework will be tested and validated to evaluate the probability of freedom of BVDV infection in each of the collaborating countries in which the BVD situation varies from endemic to free. Although BVD will be a thorough test of the flexibility of the initially developed framework, it should be generic enough to be adaptable to control programmes for other diseases. At a later stage of the project, the possibilities for expanding the framework to other diseases and other species will be explored. The long-term vision is that the use of the framework is supported by each European country and is extensively used to assess equivalence in the probability of freedom of traded animals for any infectious disease.

With the introduction of the new Animal Health Law (AHL), it is anticipated that assessments of the performance of control programmes will progressively change towards output-based measures. The STOC free framework will support the AHL by providing a single general framework that is adaptable to multiple diseases, which will provide an objective and standardized probability of freedom of infection combined with the uncertainty given the context and the design of the control programme.

More information about the project, the status and the progress can be found at the project website: www.stocfree.eu.

A **S**urveillance analysis **T**ool for **O**utcome-based **C**omparison of the confidence of **free**dom generated by control or eradication programmes

STOC free

December 2017

Aim of our presentation

- Inform about the project

- Input from stakeholders, please consider!

- Involve potential end users to maximise support for the developed framework

- Include feedback of stakeholders to improve the developed framework

Background

Risk of transmission of diseases through cattle movements

Example: cattle trade (live animals) between partners in project

		PARTNER						EXPORTS
		DE	FR	GB	IE	NL	SE	
REPORTER	DE		6,367	4,443	205	576,856		587,871
	FR	12,287		2,207	462	9,830		24,786
	GB				25	14		39
	IE	0	4,619	21,728		23,784		50,131
	NL	6,231	12,853	2,328	33			21,445
	SE							0
IMPORTS		18,518	23,839	30,706	725	610,484	0	684,272

Background

Risk of transmission of diseases through cattle movements

For a number of non regulated diseases, EU countries have:

- Diverse control/eradication programmes
- Different definitions of the "free" status
- e.g.: BVD, Paratuberculosis

Therefore, outcomes of programmes cannot be compared and the degree of certainty about freedom of disease varies

Need: ability to objectively compare programmes' outcomes using standardized measures to enhance safety of trade, especially in light of the new European Animal Health Law

Relevance

Examples where trade between countries resulted in introduction of diseases (non-regulated diseases):

- Introduction of BVDV in Denmark associated with import from the Netherlands

- Introduction of bovine besnoitiosis into Ireland through import of apparently healthy animals

Aim of the project

Develop and validate a new tool:

STOC free

that enables a **transparent and standardized comparison of confidence of freedom** for control and eradication programmes.

9 March 2017 – 9 March 2021

Development

Answering the question

When trading an animal: does it pose a risk of introducing a disease into the destination herd ?

$$p(freedom \mid information)$$

➢ **What is the underlined probability and underlined uncertainty that an animal is free of disease when leaving the farm given available information ?**
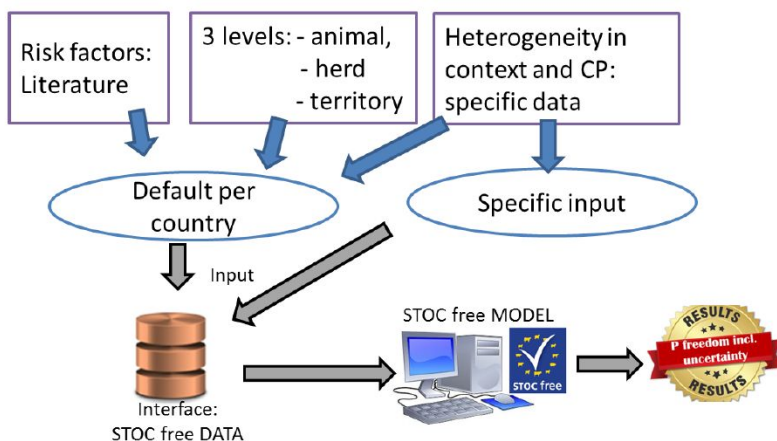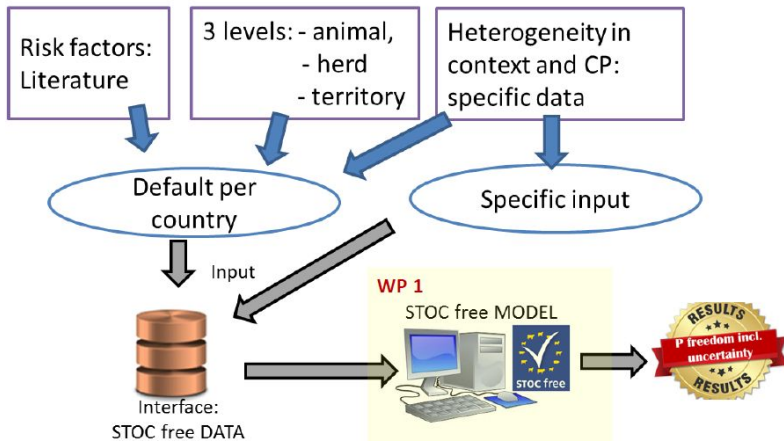
Outcome: framework

A framework consisting of a model (STOC free MODEL) combined with a tool to facilitate the collection of the necessary parameters (STOC free DATA).

- Easy to use by stakeholders
- Heterogeneous inputs, uniform output
- Output on different levels of aggregation
- Adaptable to multiple diseases in multiple species

STOC free: the Framework

Risk factors: Literature

3 levels: - animal, - herd - territory

Heterogeneity in context and CP: specific data

Default per country

Specific input

Input

STOC free MODEL

P freedom incl. uncertainty RESULTS

Interface: STOC free DATA

STOC free: the Framework

STOC free model: WP1

Three step approach:

1. Develop a conceptual framework
2. Develop STOC free model (WP1 and WP2)
3. Validate STOC free model (WP1 and WP3)

WP1: Conceptual framework

Aim: support development of STOC free MODEL. It reveals the key aspects in risk of <u>introduction</u> and <u>delayed detection</u> that needs to be taken into account.

Agreed assumptions
- biological system of a disease is homogeneous between countries
- The **sources of information** that need to be included are **heterogeneous**
- Three levels i.e. animal, herd/group and territory will be considered

Focus will be aspects that influence the confidence of freedom
Status: First draft will be distributed among the project partners in February 2018.

WP1: STOC free model

Provide a probability of freedom from disease including uncertainty around the presented probability

- Possibility inclusion of informative priors and temporal aspects
- Possibility to include distributions (uncertainty)
- Will provide a generic probability and related uncertainty **when no specific information is present**
- Provide the status at the farm gate
- Results may be used to compare different markets and can either provide the exact result or a classification of risk i.e. 1/1000, 1/10000, $1/1*10^6$, etc.
- **End users:** Independent organisations with access to data.

WP1: STOC free model

**Status:** several methodologies are being explored, decided to proceed with:

- Bayesian networks/forensic methods using directed acyclic graphs (DAGs)
  - Allows to connect various pieces of information
  - Is very flexible in its way to structure information and to remove correlation.
- Hidden Markov models
  - determine true status given that only circumstantial evidence is available
  - Are also using the Bayesian concept and can include the time aspect

STOC free: the Framework

WP 2 Analysis of existing surveilance programmes
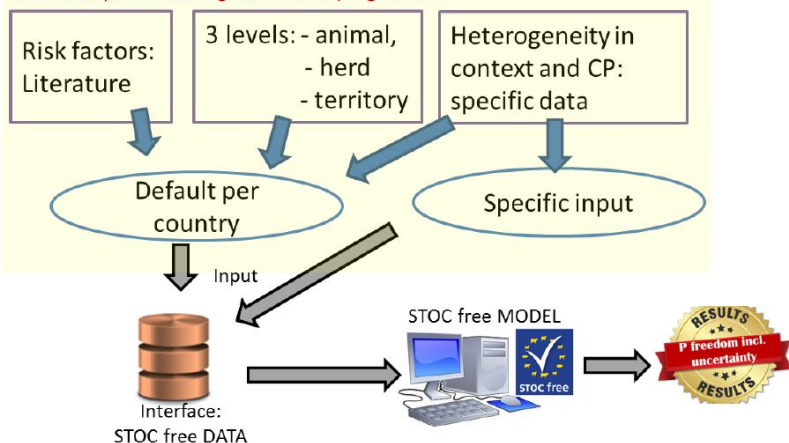
WP2: STOC free data

- Provide a thorough description of the BVDV control/eradication programmes (CPs) conducted in defined EU MS

- Collect specific quantitative information about the CPs

- Create default values to include in STOC free model (WP1 and WP2)

- Develop a generic data collection framework to support the fill STOC free model developed in WP1

WP2: Thorough description of control programmes

Status:

Step 1: Description of control programmes in partner countries

- Started with Risksur tool: an existing tool for harmonized description
- Addition of narratives and work sheets to obtain all info needed
  Pilot tested on the Dutch and Irish control programmes
- Discussed in annual meeting
- Optimized tool was distributed to partners and results were returned before the end of January 2018

- *Next step:* Analysis of the Risksur output reports

WP2: Thorough description of control programmes

Status: Step 1 Description of BVD surveillance programmes

Elements	Countries					
	Netherlands	Ireland	France (Brittany)	Germany	UK (Scotland)	Sweden
Herd level prevalence (breeding herds)	9%*	2%	unknown	0.2%	10%	0% - free
Type of programme	Voluntary	Mandatory	Voluntary	Mandatory	Mandatory	Mandatory
Type of testing – screening/case finding	Bulk milk, ear notch, blood/serum	Ear notch	Bulk milk, ear notch, blood/serum	Ear notch, blood/serum	Ear notch, blood/serum	-
Type of testing – monitoring freedom of disease	Ear notch, blood/serum	Ear notch	Bulk milk, ear notch, blood/serum	Ear notch, blood/serum	Antibody testing blood/serum	Antibody testing bulk milk, blood/serum
Vaccines licenced for use	Yes	Yes	Yes	Yes	Yes	No
Funding	Private	Private & public	Private	Private & public	Private	Private & public

WP2: Thorough description of control programmes

Status: Step 1 Description of BVD surveillance programmes

herd level risk factors for introduction	Countries					
	Netherlands	Ireland	France (Brittany)	Germany	UK (Scotland)	Sweden
1.	High cattle density	Neighbouring contact	Neighbouring contact	Imported cattle	Delayed removal	Imported cattle
2.	Pregnant cattle	Pregnant cattle	Introduction of cattle	TI cattle	Cattle with unknown status	-
3.	Indirect transmission	Indirect transmission	Presence of fattening unit	Pregnant cattle	Neighbouring contact	-

WP2: Thorough description of control programmes

Step 2: Results Risksur tool in combination with results Literature review and meta analyses (for default values): first draft questionnaire in april 2018
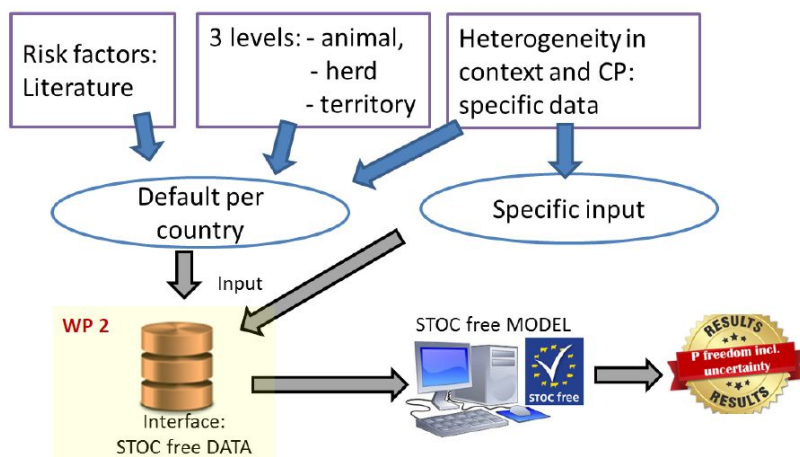
Aim questionnaire: obtain quantitative input information from heterogenous CPs

Subsequently:

Step 3: Development of a data collection tool (STOC free data) with which all relevant data for the STOC free model can be collected

STOC free: the Framework

WP3: Case studies

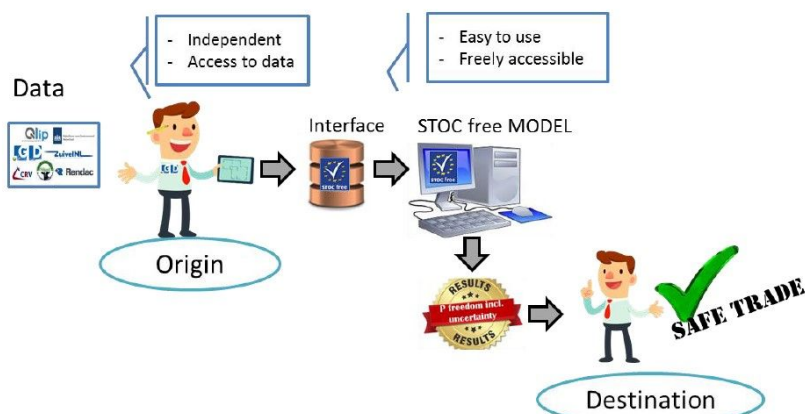- Will be discussed during the annual meeting (October 2018)
- Start in 2019

WP4: Dissemination

- Development website (delivered June 2017)

- Create discussion groups on research gate and linkedin

- Presentations and discussions about the project
  - National stakeholders
  - Stakeholders European level (FESASS, EFSA, Other??)
  - Presentations at scientific conferences
  - Annual newsletter
  - Workshop at the end of the project
  - Submission COST-Action proposal: SOUND control, to include many countries

Vision

Data

- Independent
- Access to data

- Easy to use
- Freely accessible

Interface   STOC free MODEL

Origin

RESULTS
P freedom incl. uncertainty
RESULTS

SAFE TRADE

Destination

Ultimate goal

STOC free will be used by every country or region to evaluate probability of freedom of traded animals for any disease

Thank you for your attention

http://www.stocfree.eu/