

COST Action CA17110

Standardizing output-based surveillance to control non-regulated diseases of cattle in the EU

WG1: Deliverable 1.1

Overview of non-regulated cattle diseases in the European Union for which control programmes (CPs) are in place within Member States (MS)

(This is an active document that will be updated
on a regular basis)

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Introduction

Working group (WG) 1 - Characteristics of existing Control Programmes (CPs) and requirements for an output-based framework. The objectives of WG 1 are:

- i) To evaluate for which non-regulated cattle diseases in the EU CPs are conducted in Member States (MS),
- ii) To identify the relevant stakeholders involved in the application of these CPs,
- iii) To evaluate the characteristics of these programmes,
- iv) To identify the essential requirements needed as inputs for an output-based framework.

The first WG1 meeting was held in January 2019 in Porto, Portugal. At that meeting, it was agreed that the definition of non-regulated cattle diseases and control programmes adopted by WG1 would be infectious cattle diseases not included in the Animal Health Law (AHL) lists A and B, but for which there are collective control programmes in place in the COST action members' countries. This definition also includes diseases for which eradication has been achieved and surveillance is ongoing (as long as they do not have status A or B in the AHL list). The diseases we are not interested in are listed in Annex 1. At the second WG1 meeting in Utrecht, Netherlands (March 2019) we agreed to exclude passive surveillance as a CP, as it doesn't provide adequate information on the country's status. We have also defined the level of implementation, as we are only interested in CPs of a wider implementation level like regional or nationwide and not CPs that include only a few or even just a single herd. The CPs should at least be run by an organization or government on multiple farms in an area and the status of those farms needs to be known both centrally by that organisation and by the respective farmers (Figure 1). In Zürich, Switzerland (November 2019) surveillance of breeding bulls (under the COUNCIL DIRECTIVE 88/407/EEC) was excluded, given that this Action is regulated by the EU. The above-mentioned Council Directive lays down the animal health requirements applicable to intra-Community trade in, and imports of, deep-frozen semen of domestic animals of the bovine species.

Based on the information gathered by the previous tables, we have compiled a list of 24 diseases that were controlled by at least one country: Bovine Viral Diarrhoea (BVD), Enzootic Bovine Leukosis (EBL), Bluetongue, Infectious Bovine Rhinotracheitis (IBR), Bovine Genital Campylobacteriosis, Paratuberculosis, Anthrax, Trichomonosis, Aujeszky's disease, Salmonella, Neosporosis, Leptospirosis, Epizootic Haemorrhagic Disease, *Mycoplasma bovis*, *Mycoplasma mycoides*, *Streptococcus agalactiae*, Bovine Coronavirus, *Staphylococcus aureus*, Bovine Respiratory Syncytial Virus, *Trichophyton verrucosum*, Bovine digital dermatitis, Leptospirosis (*L. hardjo*), Liver fluke, Q-fever. A new table was circulated to all the WG1 members.

The following information was asked from MS for each disease:

- If there was a CPs in place for this disease (Yes or No)
- The type of cattle that the CP applies to (e.g. dairy, beef, breeding, bulls, all types of cattle)
- If the CP is voluntary or compulsory
- If the CP is regional or national in terms of coverage
- What is the funding arrangement of the CP? (e.g. private or government or co-funded between private and public)
- If there are additional EU guarantees in place for that CP (Yes, No and not applicable)
- What is the country status for the disease (e.g. officially free (EU level), officially free (country level), perceived free, endemic, sporadic, never studied, unknown)
- Last occurrence of disease (year)

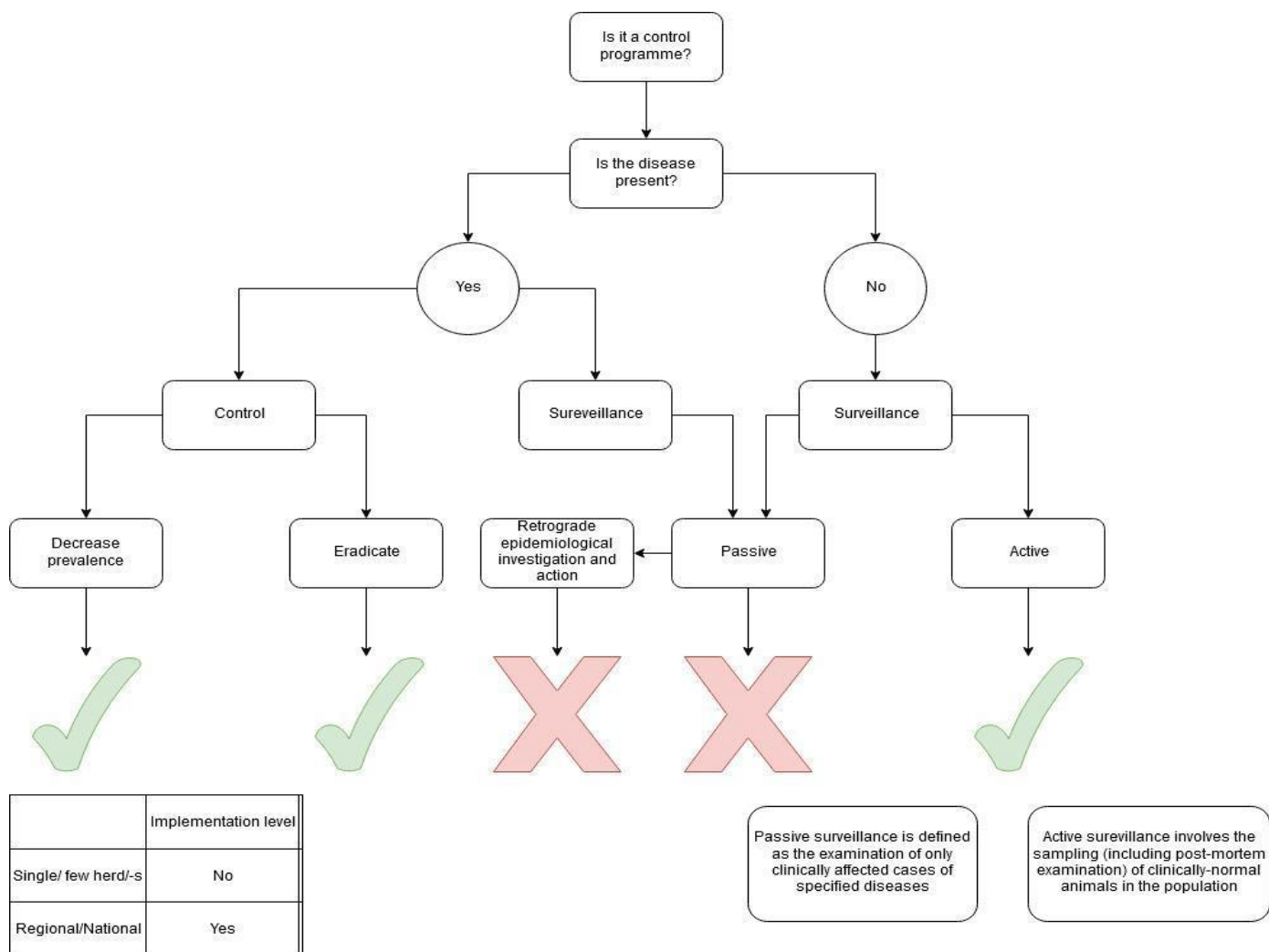


Figure 1 – Flowchart what is regarded as a control programme

Results

Overview of the results from different WG1 members

The following 29 countries contributed with information to this deliverable: Albania, Austria, Belgium, Bosnia and Herzegovina, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Republic of Ireland, Latvia, Lithuania, Netherlands, North Macedonia, Norway, Poland, Portugal, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom.

For the purpose of this deliverable, if a country was free of disease but has surveillance programmes in place it was considered a control programme. However, passive surveillance was no longer considered a control programme as well as the surveillance of breeding bulls covered under the COUNCIL DIRECTIVE 88/407/EEC

On average, there are eight CPs in place per country (minimum of 1 to a maximum of 20) and the distribution per country is shown in Figure 2. The number of CPs in place per disease are listed in Table 1. Figure 3 to 12 show which countries have CPs in place for the top 10 diseases in Table 1 and which have a free status for these diseases. Note that some countries have only regional control programmes in place for certain diseases.

Number of control programmes per country

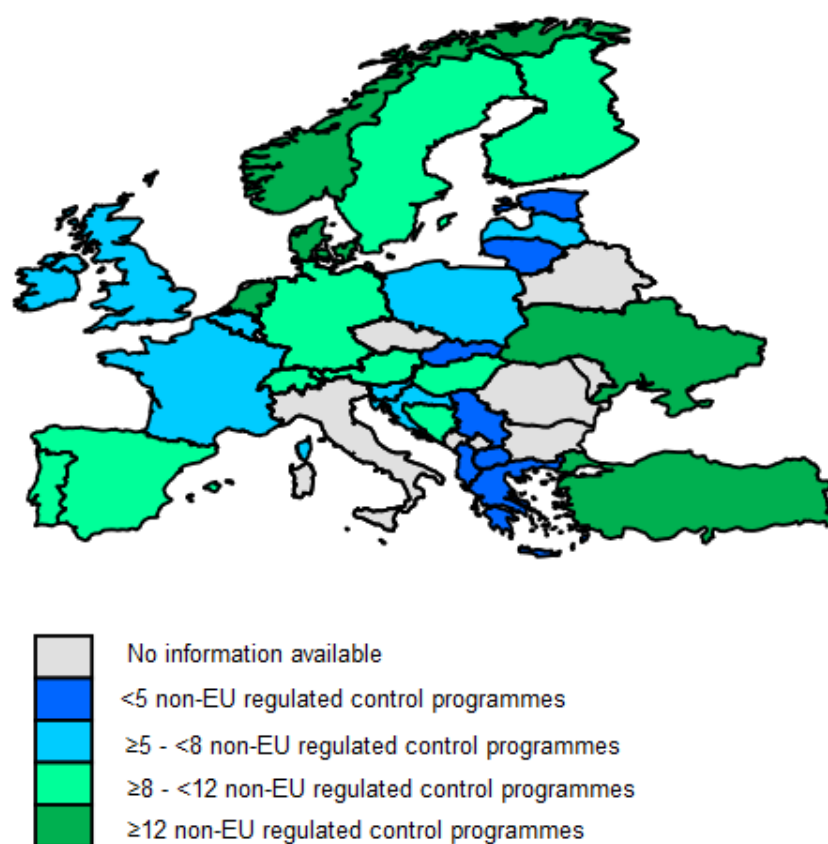


Figure 2 – Number of non-EU regulated control programmes implemented by country part of SOUND-Control COST Action.

Diseases	Number of countries that have a CPs in place for the disease
Enzootic Bovine Leukosis (EBL)	25
Bluetongue	24
Infectious Bovine Rhinotracheitis (IBR)	24
Bovine Viral Diarrhoea (BVD)	22
Paratuberculosis	15
Anthrax	14
Bovine Genital Campylobacteriosis	13
Trichomonosis	10
Salmonella	9
Neosporosis	7
Aujeszky's Disease	7
Epizootic Haemorrhagic Disease	6
Leptospirosis	6
<i>Mycoplasma bovis</i>	5
<i>Streptococcus agalactiae</i>	5
Q-fever	5
<i>Mycoplasma mycoides</i>	4
Bovine Coronavirus	4
<i>Staphylococcus aureus</i>	4
Bovine Respiratory Syncytial Virus	3
<i>Trichophyton verrucosum</i>	3
Bovine digital dermatitis	2
Liver fluke	2
Surra	1

Table 1: List of diseases and countries with CPs in place for each disease in the 29 countries that submitted information to SOUND Control.

Overview of the programmes in place per disease – top 10 disease in Table 1

ENZOOTIC BOVINE LEUKOSIS (EBL)¹

Enzootic bovine leukosis (EBL) is caused by the *bovine leukaemia virus* (BLV), a member of the *Retroviridae* family. All age groups are susceptible to infection, including at the embryonic stage. Most infections are subclinical, but some cattle, usually over the age of 3 years, may develop persistent lymphocytosis and an even smaller proportion develop lymphosarcomas in internal organs. Clinical signs and the time to death depend on the organs affected. Clinical signs may include enlarged superficial lymph nodes, digestive disturbances, inappetence, weight loss, weakness and neurological manifestations. The virus also causes immunological dysfunction, increased culling rates, lower conception rates and reduced milk yield.

The countries that have implemented CPs for EBL are displayed in Figure 3. Most of the CPs in place are applied at a national level to all types of cattle and all are compulsory. The vast majority are funded by the government. The aims of the CPs vary from control and eradication to surveillance. Nineteen countries are free from the disease and one (Portugal) has regions free from the disease (compare https://ec.europa.eu/food/sites/food/files/animals/docs/la_annual-situation_2017.pdf). The disease is endemic in three, sporadic in three and three countries don't know their status for the disease.

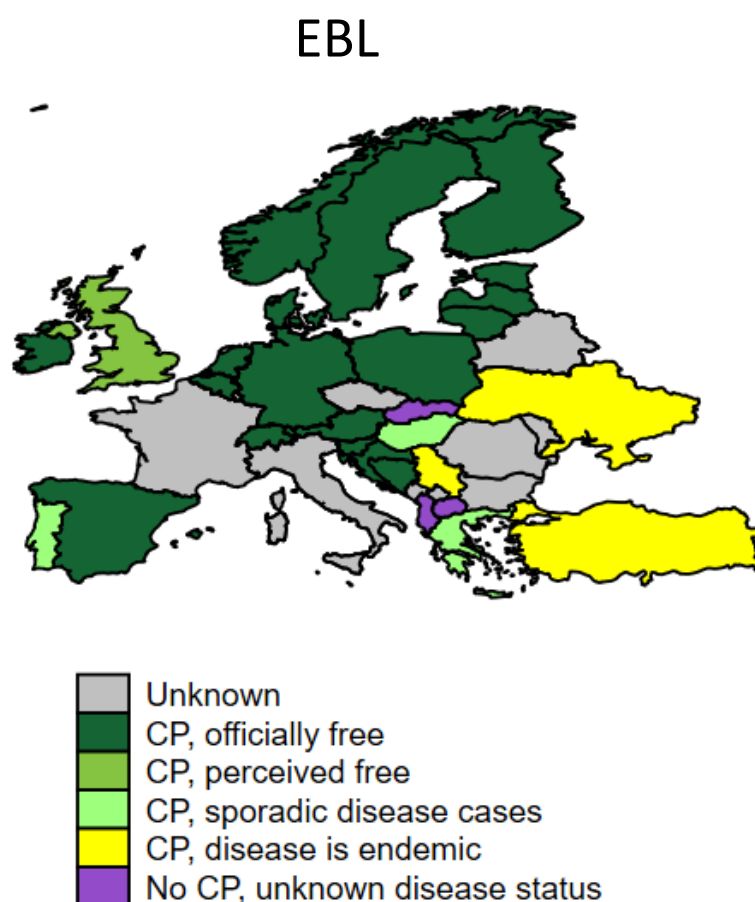


Figure 3 – Countries part of SOUND-Control COST Action that have implemented a control programme for enzootic bovine leukosis (EBL).

BLUETONGUE (BT)²

Bluetongue (BT) is a vector-borne, non-contagious viral disease caused by the *Bluetongue virus* that is a member of the *Orbivirus* genus. It is transmitted through bites of the *Culicoides* midges. Cattle play an important role in the transmission of the virus to other animals as they have a prolonged viremia and rarely show clinical signs, with the exception when infected with the BTV8 strain. If clinical signs do manifest fever, hyperaemia, congestion, facial oedema, haemorrhages and erosions of the mucosa membrane can occur. However, in most cases, only transitory hyperaemia and ocular and nasal discharge occur. Typical clinical signs like cyanotic and oedematous tongue occur mostly in sheep and deer. BTV can be introduced to a free area via infected insects, live ruminants or contaminated products.

The countries that have implemented CPs for BT are displayed in Figure 4. All CPs in place are compulsory and all but one (Sweden) are implemented at the national level, being mostly funded by the government. Fourteen countries consider themselves free from the disease (compare https://ec.europa.eu/food/animals/animal-diseases/control-measures/bluetongue_en). The most common type of CPs in place are surveillance programmes. Five countries have a sporadic, six an endemic status and three countries do not know their status for this disease.

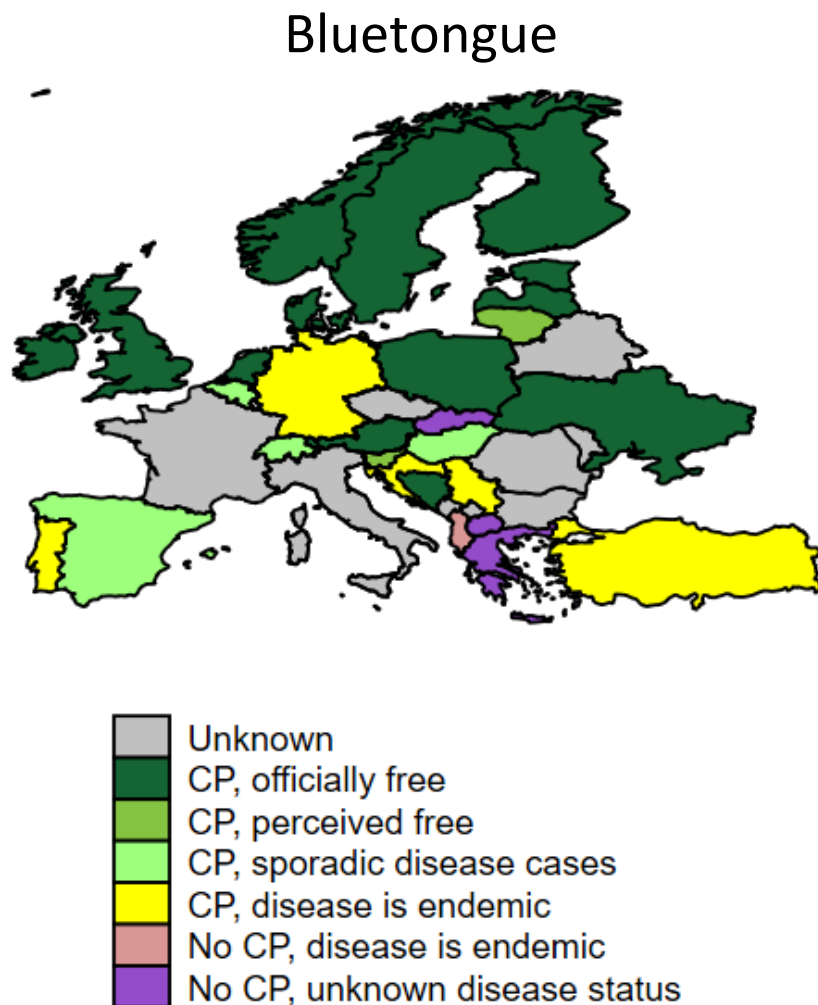


Figure 4 – Countries part of SOUND-Control COST Action that have implemented a control programme for bluetongue.

INFECTIOUS BOVINE RHINOTRACHEITIS/ INFECTIOUS PUSTULAR VULVOVAGINITIS (IBR/IPV)³

Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis (IBR/IPV) is caused by *bovine herpesvirus 1* (BoHV-1) a member of the *Herpesviridae* family. Clinical signs include fever, salivation, depression, inappetence, abortion and reduced milk yield. It can affect either the upper respiratory system with signs of a (muco)purulent nasal and ocular discharge, hyperaemia of the muzzle and conjunctivitis or the genital organs with pustular vulvovaginitis and balanoposthitis. Mortality is low and most infections are subclinical. However, secondary bacterial infection can lead to more severe respiratory disease. Animals can be infected through the airborne route, direct contact, venereal or with artificial insemination (AI) using infected semen. After acute infection, the disease becomes latent as viral DNA remains in neurons and ganglia, probably for the entire life of the host. Stress and the application of corticosteroids can induce reactivation of the latent infection.

The countries that have implemented CPs for IBR are displayed in Figure 5. Around 50% of the CPs in place for IBR are compulsory and the other half are voluntary. Most of them are implemented at the national level (there are only three implemented at regional level). Funding for these comes from a variety of sources (private, government or co-funded by a degree of frequency) and most of the CPs aim to control the disease. The disease is endemic for most of the countries, except for eight that consider themselves free (eight have additional EU guarantees), (compare https://ec.europa.eu/food/sites/food/files/animals/docs/la_annual-situation_2017.pdf). Three countries do not know their status for this disease.

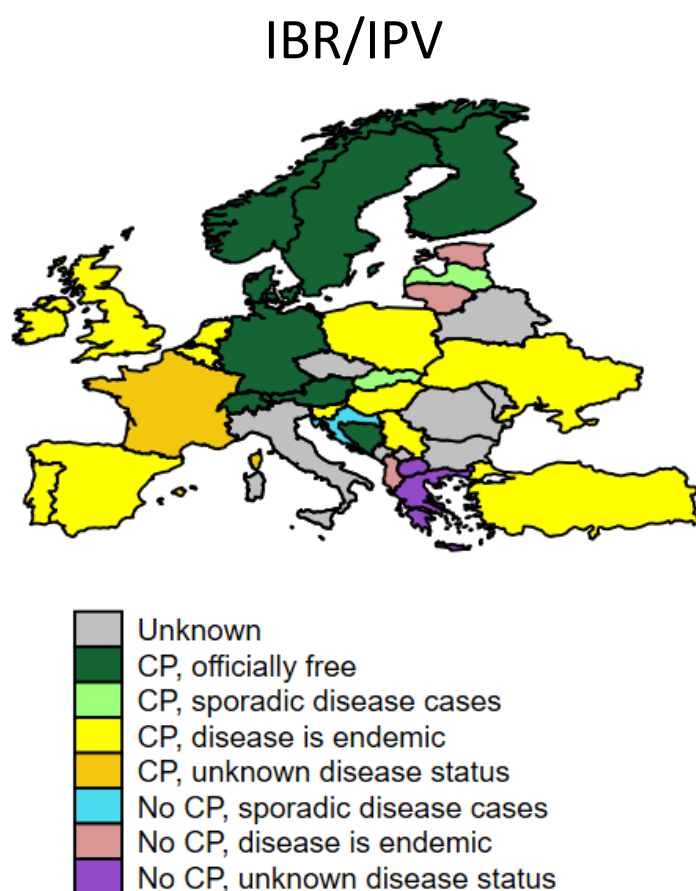


Figure 5 – Countries part of SOUND-Control COST Action that have implemented a control programme for infectious bovine rhinotracheitis (IBR).

BOVINE VIRAL DIARRHOEA (BVD)⁴

Bovine viral diarrhoea (BVD) is caused by Bovine viral diarrhoea virus which is a pestivirus and member of the Flaviviridae family. Pestiviruses have been recently classified into 11 viral species, that include among others Bovine Viral Diarrhea virus (BVDV) type 1 (Pestivirus A), BVDV type 2 (Pestivirus B) and Hobi-like pestivirus (Pestivirus H). All ages of cattle are susceptible to infection. The virus spreads with close contact between animals. Its clinical picture ranges from enteric and respiratory disease in cattle or reproductive and foetal disease in cows. Infection can be subclinical or may lead to severe fatal disease. The virus also causes immunosuppression, which predisposes animals to infection with other pathogens. Type 2 viruses have been associated with outbreaks of severe acute infection and haemorrhagic syndrome. Latent infection does not usually occur after the acute phase has passed. However, bulls may rarely have a persistent testicular infection. An atypical pestivirus, BVDV type 3, has also been found in cattle, but its distribution is presently unclear. Infection of a breeding female may result in conception failure or foetal infection, which results in abortions, stillbirths, teratogenic abnormalities or with the birth of normal seropositive calves. Infection in the first trimester of gestation can lead to persistently infected (PI) animals, which represent the main reservoir of infection. PIs secrete large amounts of virus in their urine, faeces, discharges, milk and semen. They may appear clinically healthy or weak with ill thrift. PIs usually die before they reach sexual maturity, with many developing mucosal disease (MD) which is precipitated by a super-infection with a cytopathogenic strain of the virus. MD presents with anorexia, gastrointestinal erosions and diarrhoea leading to death. If PIs survive to sexual maturity, any living calf they produce will also be a PI.

The countries that have implemented CPs for BVD are displayed in Figure 6. There is a mixture of programmes in place for BVD targeted at breeding bulls, breeding animals, dairy cattle or all types of cattle. There is almost an even split between compulsory and voluntary programmes. In some instances, there is a mixture of different types of programme in the same country. The majority of the CPs in place are at the national level and most of them are privately funded. However, there are also a mixture of co-funded programmes (i.e. funded by government and private stakeholders). The great majority of the programmes aim in controlling or eradicating the disease, while surveillance programmes are common in countries that have eradicated the disease and are officially or consider themselves as free. Six countries perceive they are free, while for the others the disease is endemic, sporadic, or they have an unknown status.

BVD

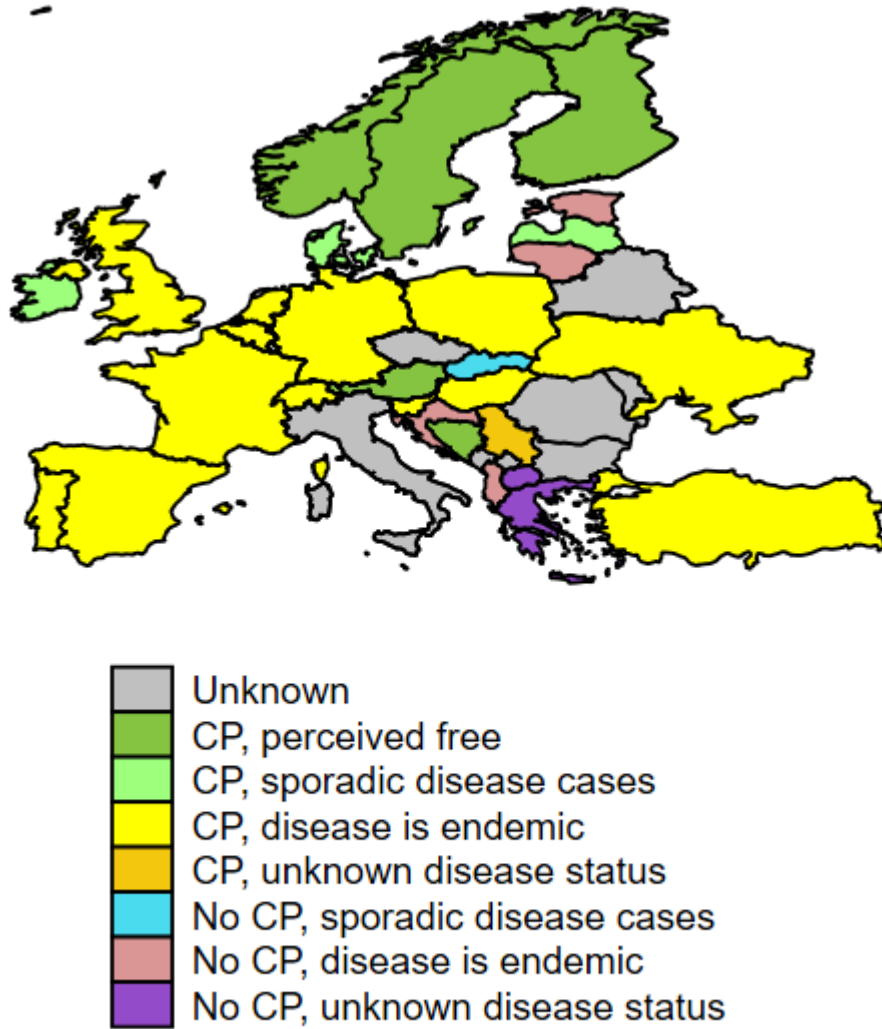


Figure 5 – Countries part of SOUND-Control COST Action that have implemented a control programme for bovine viral diarrhoea (BVD).

PARATUBERCULOSIS (JOHNE'S DISEASE)⁵

Paratuberculosis is a chronic granulomatous enteritis of ruminants caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP). The infection spreads mostly by the faecal-oral route but can also be acquired *in utero*. Herds usually become infected through the purchase of sub-clinically infected cattle. Clinical signs are slowly progressive and typically seen in animals over 2 years of age. The infection causes a cellular infiltration of the intestinal wall reducing its absorptive capacity and leading to a protein losing enteropathy. Typical clinical signs are chronic diarrhoea with weight loss. Its main economic effects are reduced milk yield and premature culling. It also predisposes animals to other infections. It has been suggested that MAP could be a zoonosis as it has been associated with Crohn's disease and other conditions in humans. However, this remains a matter of controversy.

The countries that have implemented CPs for paratuberculosis are displayed in Figure 6. Around two thirds of the CPs in place are voluntary, while the other third are compulsory. Most of them apply to all types of cattle (two (Netherlands and Sweden) only apply to beef and four (Belgium, Denmark, Ireland, Netherlands) only to dairy cattle) and are implemented at the national level (three (Portugal, Spain, Ukraine) at regional level). In terms of funding, there is an equal share of programmes privately funded and co-funded, only two (Austria, Turkey) are founded by the government. The majority of the programmes aim to control the disease, while five are surveillance only. Three countries declared themselves free from the disease, eight have sporadic cases, and four don't know their status. For the remaining, the disease is endemic.

Johne's disease

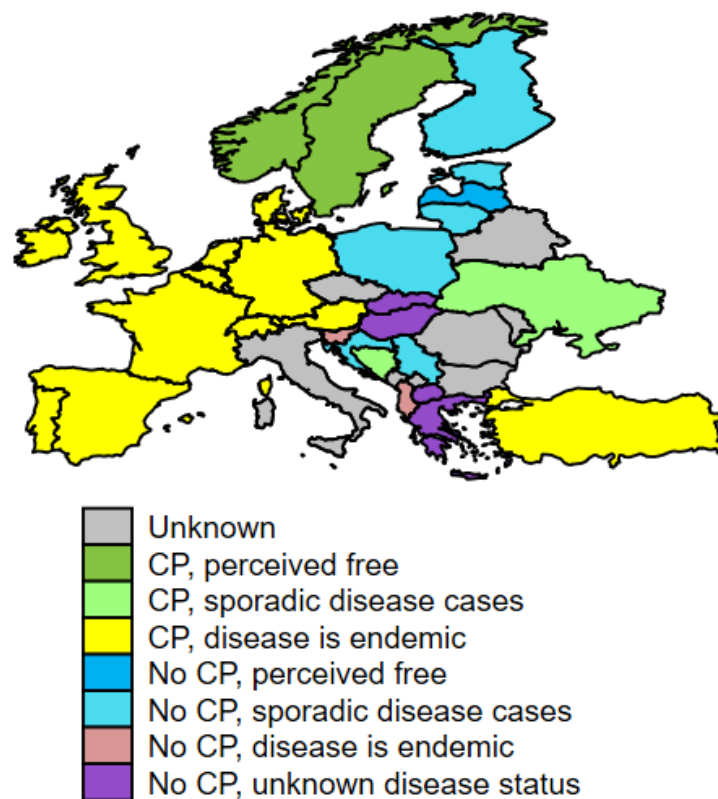


Figure 6 – Countries part of SOUND-Control COST Action that have implemented a control programme for paratuberculosis.

ANTHRAX⁶

The etiological agent of Anthrax is a spore-forming, rod shaped, Gram-positive bacterium called *Bacillus anthracis*. The disease is distributed worldwide. Its clinical manifestation can be peracute, acute, subacute and rarely chronic. Clinical signs are usually absent in the peracute and acute forms, as the animal is usually found dead. In the subacute form progressive fever, depression, inappetence, weakness, recumbency and death are observed. In the chronic form, only swollen lymph nodes may be seen. Animals become infected with the ingestion of spores or through the bites of flies that fed on infected animals or carcasses. Post-mortem lesions of generalized septicaemia, poorly clotted blood and an enlarged spleen can be observed. Haemorrhage from the mouth, nose, vagina or anus can happen. *Bacillus anthracis* is a zoonosis. In humans, it can manifest in cutaneous, gastrointestinal and inhalation (pulmonary) forms.

The countries that have implemented CPs for anthrax are displayed in Figure 7. All CPs in place are compulsory and most of them are implemented at the national level and based on surveillance. Most of the programmes are only funded by the government. Twelve countries are or consider themselves free from the disease, while for the others it is sporadic, endemic or they have an unknown status.

Anthrax

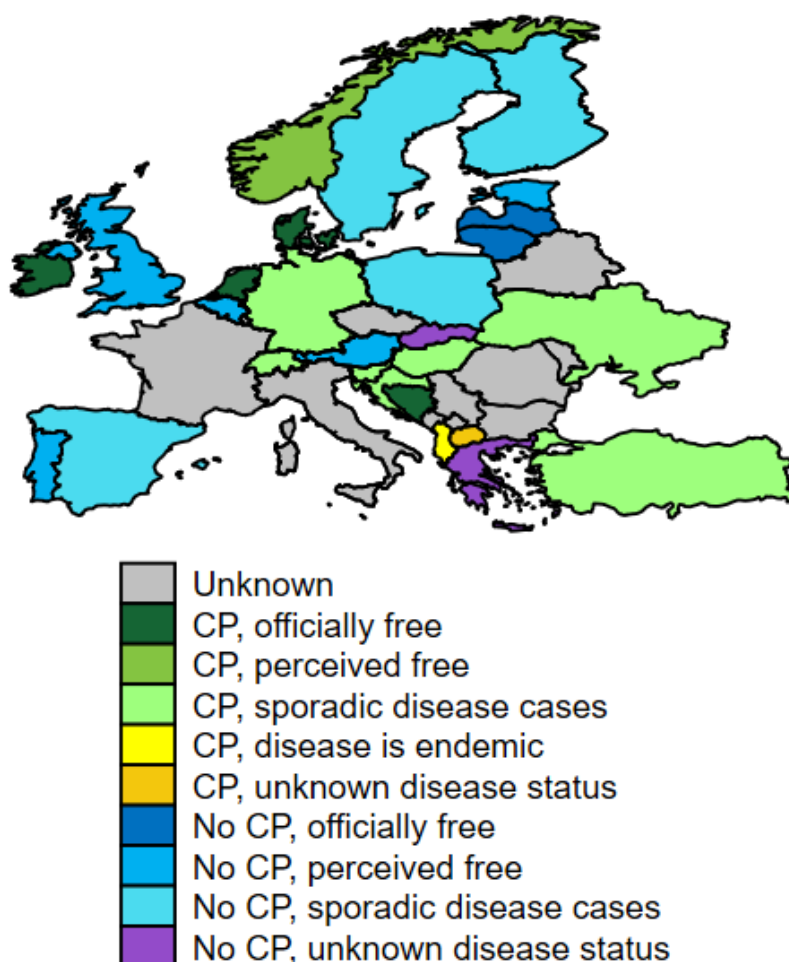


Figure 7 – Countries part of SOUND-Control COST Action that have implemented a control programme for anthrax.

BOVINE GENITAL CAMPYLOBACTERIOSIS⁷

Bovine genital campylobacteriosis is a venereal disease caused by *Campylobacter fetus* subsp. *veneralis* and *Campylobacter fetus* subsp. *fetus*. It can be isolated from the genital tract of cattle or internal organs of aborted foetuses. It causes fertility problems, like mucopurulent endometritis that causes early embryonic death, prolonged luteal phases, irregular oestrus cycles, delayed conception or abortions leading to significant economic losses. Bulls vary in susceptibility to infection, some may become permanent carriers, while others appear to be resistant (>3-4 years old). The development of preputial and penile epithelial crypts provide a microaerophilic environment in which the campylobacter can thrive. It is transmitted venereally or through the use of contaminated AI equipment or infected semen. *Campylobacter fetus* subsp. *fetus* is occasionally diagnosed as an opportunistic pathogen in humans. Infections usually occur in pregnant or immunocompromised individuals.

The countries that have implemented CPs for bovine genital campylobacteriosis are displayed in Figure 8. Most of the countries have national compulsory CPs in place based on surveillance of breeding bulls. Funding comes from private stakeholders, government or co-funded programmes. Fifteen countries are officially or consider themselves as free from the disease.

Bovine Genital Campylobacteriosis

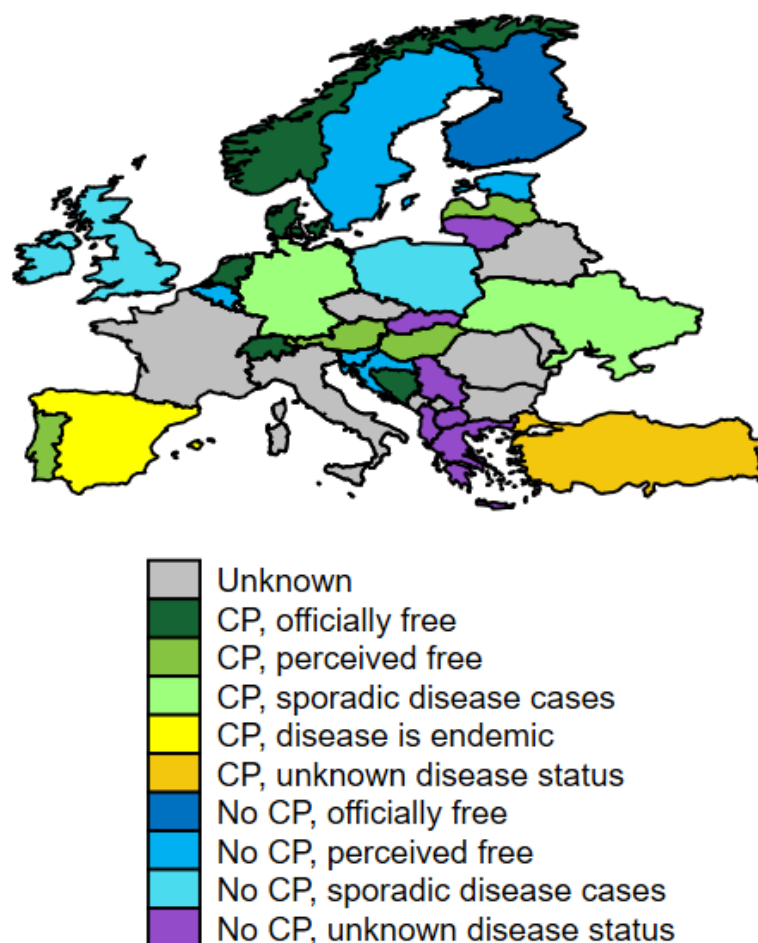
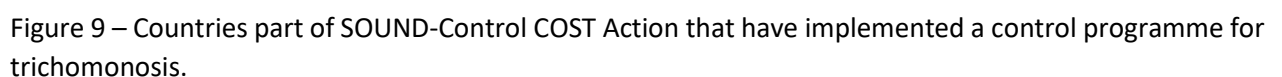


Figure 8 – Countries part of SOUND-Control COST Action that have implemented a control programme for bovine genital campylobacteriosis.

Trichomonosis is a venereal parasitic disease caused by *Tritrichomonas foetus*, a flagellate protozoan parasite. Bulls are asymptomatic whilst in cows, it can cause infertility, abortions, embryonic and early foetal death, foetal maceration, pyometra and vaginal discharge. Despite infection, a normal full-term calf can also be born. It was once a disease of great economic importance, but the use of AI has reduced its prevalence. The disease spreads with natural breeding, by the use of contaminated gynaecological and AI equipment or contaminated semen. Old bulls are the primary reservoir of infection as cows and younger bulls (younger than 3 years) can clear the infection spontaneously. The parasite resides in the preputial cavity.

Trichomonosis



SALMONELLOSIS⁹

Salmonellosis in cattle is predominantly caused by three *Salmonella* serotypes: *S. Typhimurium*, *S. Dublin*, *S. Newport*. Animals become infected via the faecal-oral route (contaminated feed or water), aerosol or close contact. It has a range of manifestations, from asymptomatic, mild clinical to fulminant bacteraemia/septicaemia and endotoxemia. It persists on farms in carrier animals that shed bacteria constantly or intermittently. *Salmonella* is typically introduced to a herd through the purchase of infected animals, the use of contaminated equipment, the purchase of contaminated feed or through vectors. Clinical signs include pyrexia, lethargy, depression, decreased milk yield, anorexia, dehydration, increased salivation, diarrhoea progressing to dysentery and abortion with retained foetal membranes in cattle, septicaemia, pneumonia, nervous signs, polyarthritis and gangrene of the feet or ear and tail tips in calves. Salmonellosis is also an important zoonosis.

The countries that have implemented CPs for salmonellosis are displayed in Figure 10. There is a mixture of compulsory and voluntary programmes for *Salmonella* in cattle. Most of them are applied to all types of cattle at the national level but there is one applied at regional (France) level. Funding varies from private, co-funded or government. All the CPs aim to control and eradicate the disease. There is no country free from the disease, but two countries have additional EU guarantees in place.

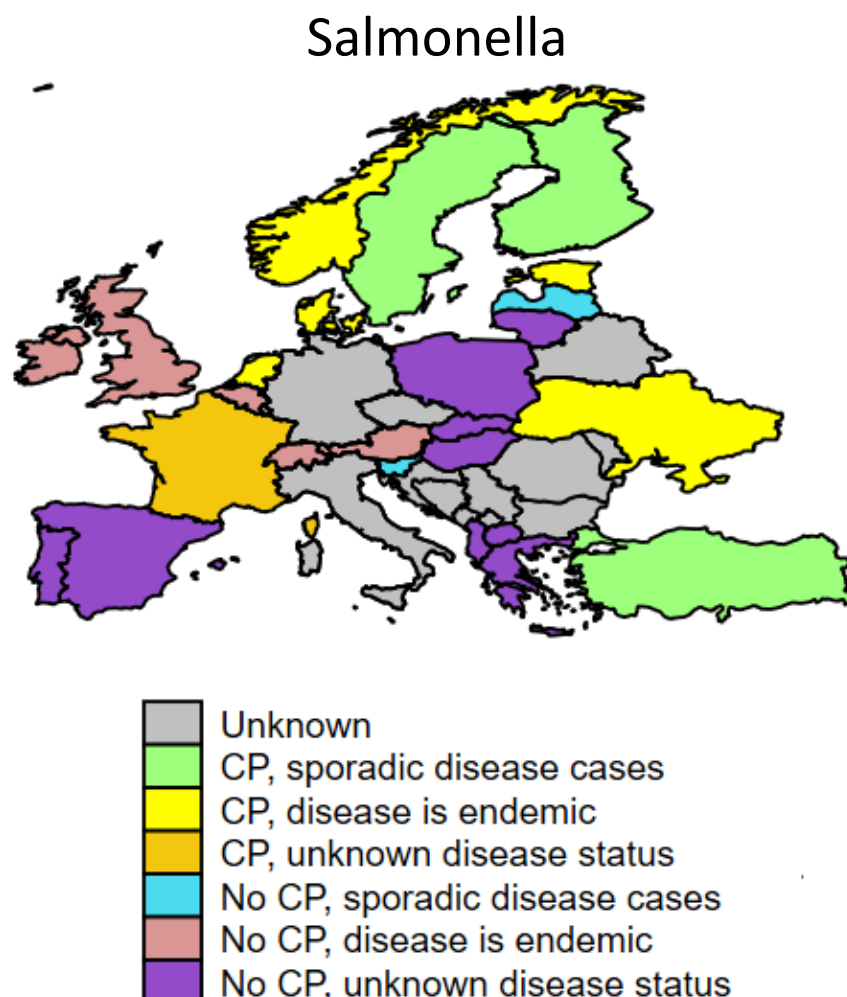


Figure 10 – Countries part of SOUND-Control COST Action that have implemented a control programme for *Salmonella* in bovine.

NEOSPOROSIS¹⁰

Neospora caninum is a microscopic protozoan parasite that can infect many domestic and wild animals including cattle. It causes endemic or epidemic abortion patterns in a cattle herd, but high infection prevalence can be present without a notable abortion problem. Animals become infected through the ingestion of feed or water contaminated with oocysts from dog faeces; which are the definitive host. The organism can become latent in cattle, but they do not shed oocysts. They can however, spread the disease to their offspring in-utero. Most abortions occur in mid to late gestation, but some calves may still be born but are weak or have neurologic deficits. Neosporosis has not, as yet, been associated with any human disease.

The countries that have implemented CPs for neosporosis are displayed in Figure 11. No country declared themselves as free from the disease. The disease status is endemic, or unknown in most countries. The CPs in place for this disease are a mix of national and regional voluntary programmes.

Neosporosis

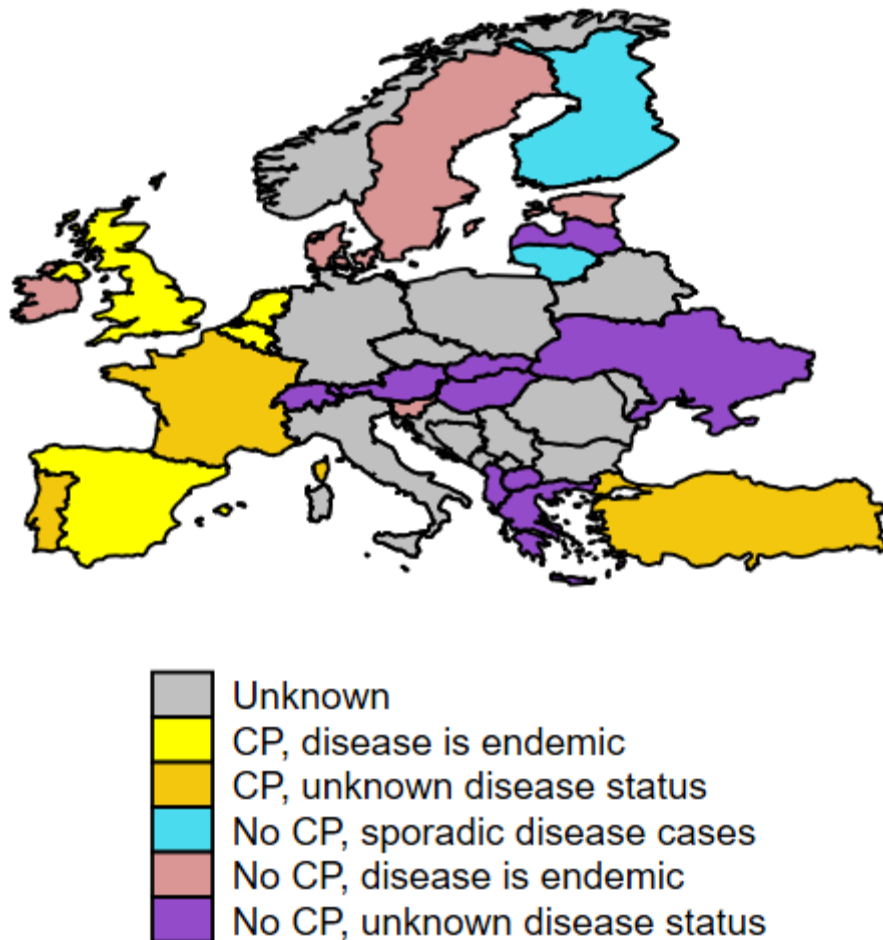
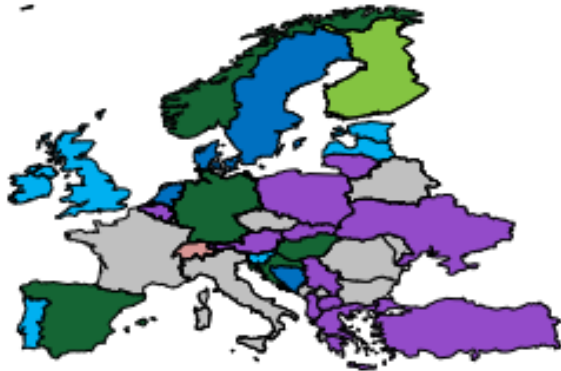


Figure 11 – Countries part of SOUND-Control COST Action that have implemented a control programme for Q-fever.

Maps for the remaining diseases

Epizootic haemorrhagic disease



Leptospirosis

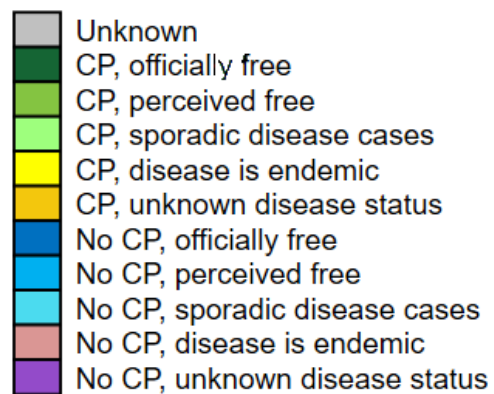
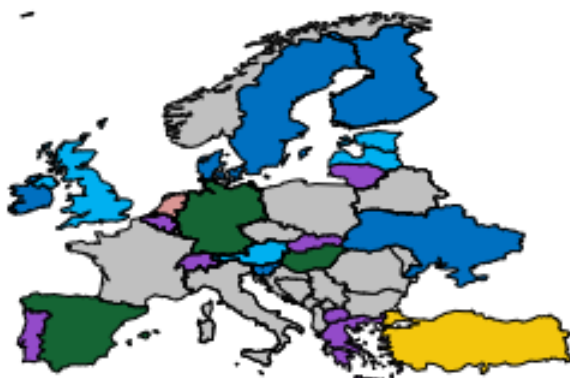


Mycoplasma bovis

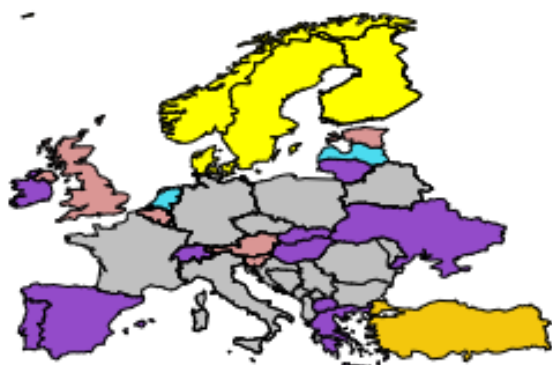
Aujesky's disease



Mycoplasma mycoides



Streptococcus agalactiae



Q fever



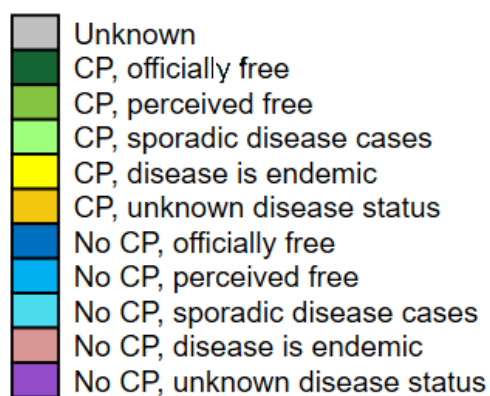
Bovine coronavirus



Staphylococcus aureus



Bovine respiratory syncytial virus



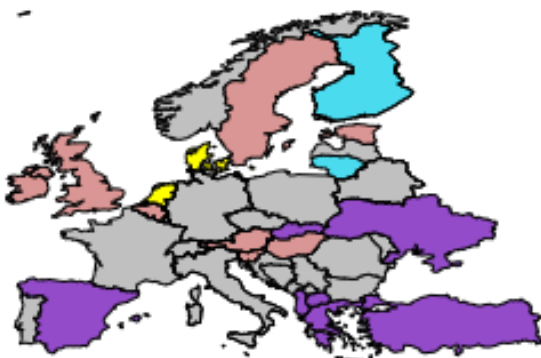
Trichophyton verrucosum



Bovine digital dermatitis



Liver fluke



Surra

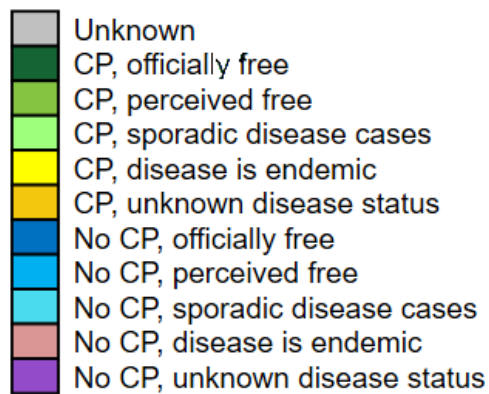
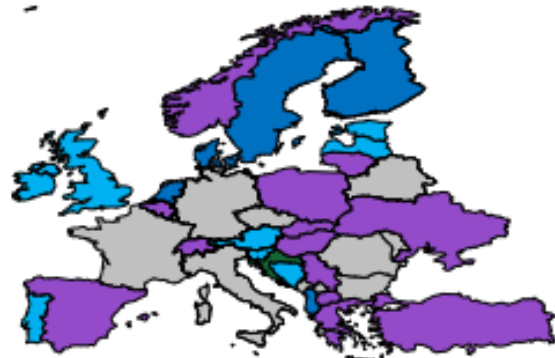


Figure 12- Countries part of SOUND-Control COST Action that have implemented a control programme for the remaining diseases.

Discussion

Most of the participating countries have a CP for Enzootic Bovine Leukosis, Infectious Bovine Rhinotracheitis, Bovine Viral Diarrhoea, Bluetongue, Paratuberculosis, Bovine Genital Campylobacteriosis, Anthrax and Trichomonosis. While other diseases are controlled only by a select few or just by a single country. The free status for BVD and Johne's disease was defined as perceived free as there is no officially recognized free status by the EU, as of yet. Turkey is the country, which has control programmes for most diseases, 20. Sweden tops the list of countries that have a free status for the most diseases, with officially or perceived free status for 13 diseases.

The limitations of this document are that the information was filled by MS themselves often including a group of experts with different definitions or interpretation of the information that was asked from them. The gathering of this information was difficult because of data heterogeneity and the number of countries and experts involved. In some instances, countries did not know their status for certain diseases, because the information is not accessible or because they just don't test for the disease. We haven't gotten the responses from some countries at all. For the countries that haven't sent in the new tables the information from the first tables was used (Albania, Croatia, Bosnia and Herzegovina, France, Germany, Norway, Serbia). The information on the type of programme (eradication, control, surveillance) was also summarised using the old tables. We also had some trouble in defining which diseases are regulated by the EU and further discussions will need to be held regarding the status of some diseases like bluetongue and enzootic bovine leukosis. The control of anthrax was also debated as only passive surveillance can be held due to the nature of the disease.

The next step in our action will be to write a handbook describing all the control programmes mentioned in this document

References for the disease descriptions

- 1 www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.04.10_EBL.pdf
- 2 http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.01.03_BLUETONGUE.pdf
- 3 http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.04.11_IBR_IPV.pdf
- 4 http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.04.07_BVD.pdf
- 5 http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.01.15_PARATB.pdf
- 6 www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.01.01_ANTHRAX.pdf
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Annex 1

EU regulated diseases (Animal Health Law List A or B):

- Foot and mouth disease
- Infection with Rinderpest virus
- Infection with Rift valley virus
- Infection with *Brucella abortus*, *B. melitensis* and *B. suis*
- Rabies
- Lumpy skin disease
- Bovine tuberculosis