Improving laboratory diagnostic capacity of epizootic diseases in Belgium

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Introduction

Belgium and other European neighbouring countries faced several **emerging and re-emerging diseases** as well as zoonotic diseases over the last decade. However, it has been noticed that during these episodes, the laboratory **diagnostic capabilities were surpassed**, which led to an increase in the time required for the control and the eradication of these diseases.

Belgium is a European hub and can be affected by these diseases which can via different paths e.g. trade of live animals or animal products from around the world or via wildlife. It is therefore **crucial to react rapidly** to these diseases, to establish contingency plans and to develop appropriate diagnostic tests. Moreover, there are only few publications looking at the issues of increased diagnostic capacities for epizootic diseases based on.

Objective

First of all, a **literature review**, based on the OIE reference manual as well as publications in PubMed and CAB abstract were consulted. Keywords and Boolean operators with relation to diagnostic assays were used in order to establish and map existing techniques. For each of them, the matrix, target (specific antibody or antigen), sensitivity (relative and/or diagnostic), diagnostic specificity, time lag to detect antigens/antibodies, the main advantages/disadvantages, the capacity to quantify the target, the cost per sample and the different application(s) of the assay were extracted and defined.

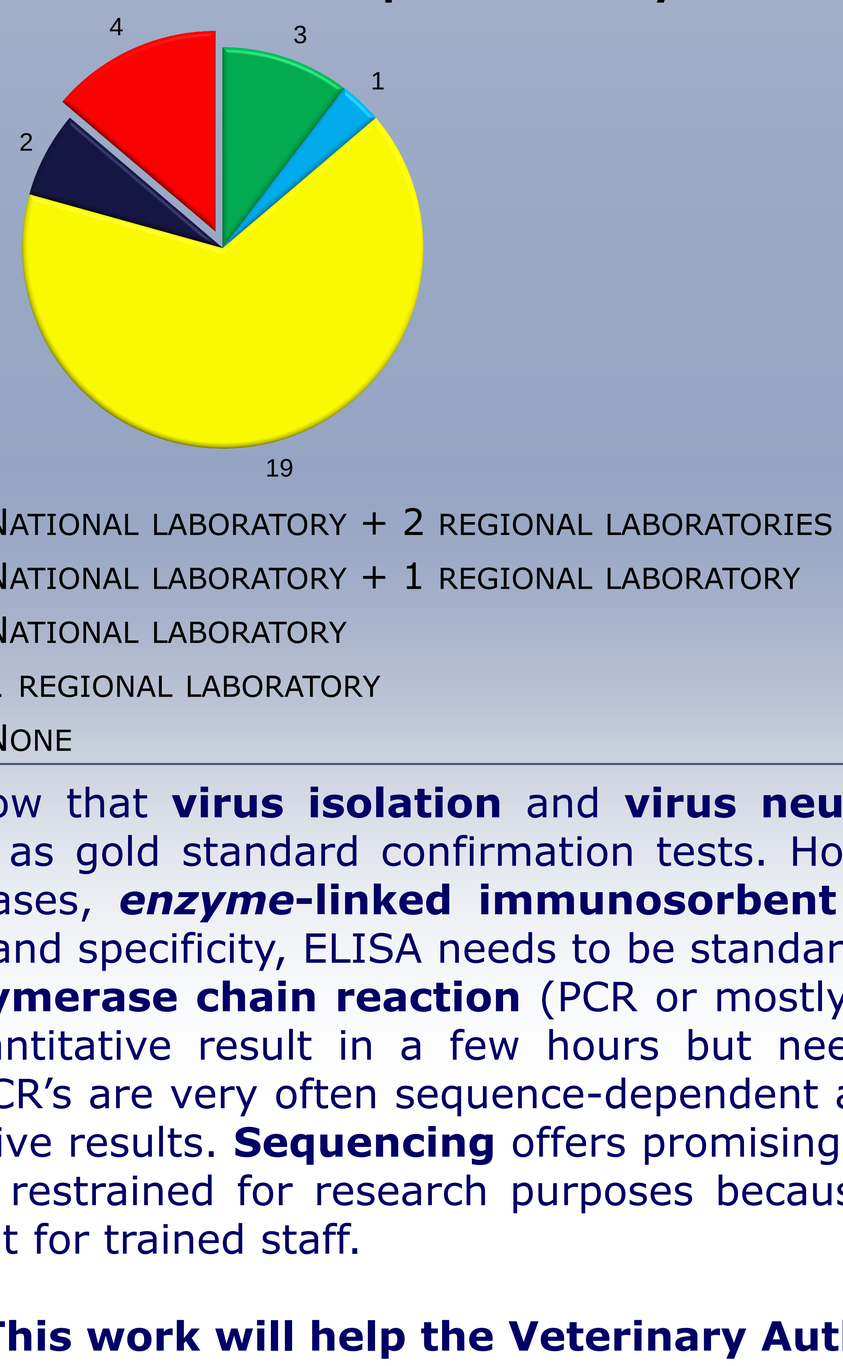
Results and perspectives

A large survey in Belgium and abroad has been completed to implement this database and to determine laboratories' capacities in Europe. Using the LimeSurvey® web application, the most frequent assays selected from the literature review were submitted to all main Belgian laboratories. For each of them, the same data discussed in the literature review was asked and additionally the commercial brand of the assay (if relevant), the capacity in routine as well as in crisis situations, the process duration (routine/crisis) and the degree of accreditation. Also bilateral partnership (techniques and/or collaboration protocols) between CODA-CERVA and other European institutions will be developed.

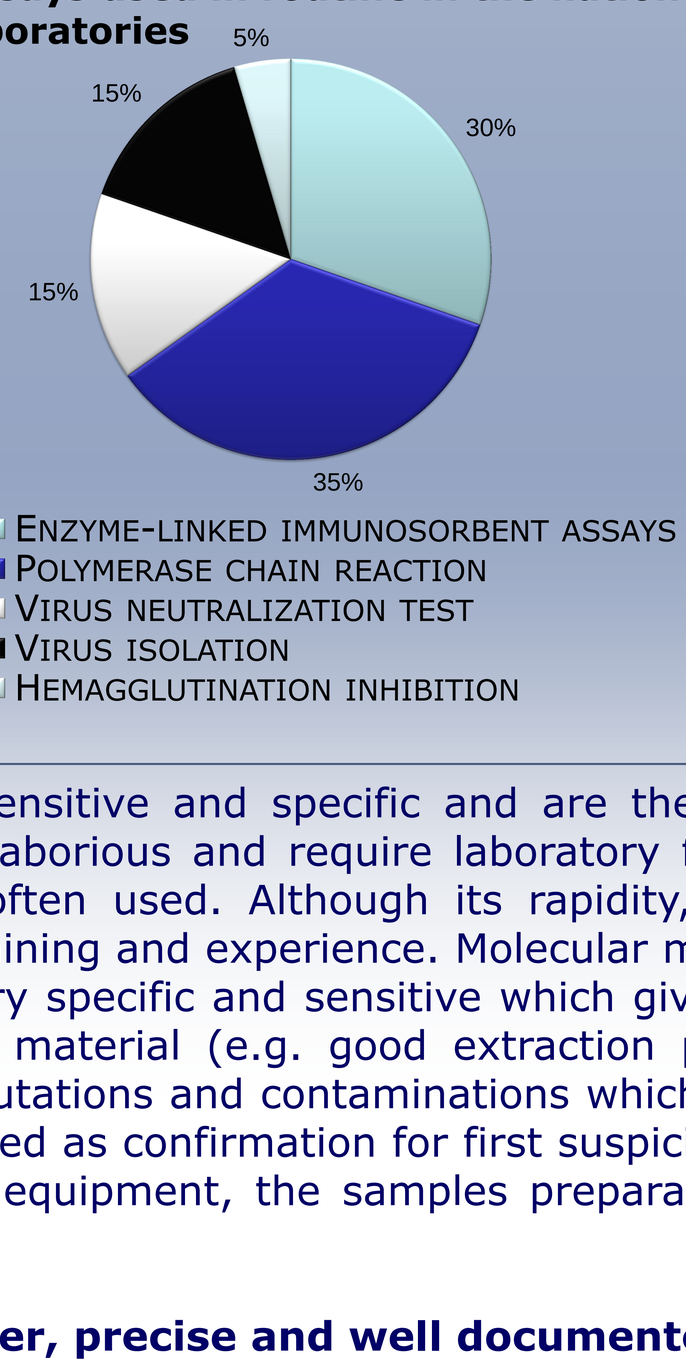
Finally, the evaluation of diagnostic capabilities achievements for each disease using **four scenario analyses** (importation, screening in sentinel animals, mass screening and freedom) and a diagnostic flow chart will be proposed to optimize detection.

29 epizootic diseases selected on risk analysis (Bianchini *et al.*, personal communication)

Number of diseases detected per laboratory contacted



Frequency of assays used in routine in the national and regional laboratories



Results show that **virus isolation** and **virus neutralization test** are sensitive and specific and are therefore often considered as gold standard confirmation tests. However, they are slow, laborious and require laboratory facilities. For many diseases, ***enzyme*-linked immunosorbent assays** (ELISA) are often used. Although its rapidity, often good sensitivity and specificity, ELISA needs to be standardized which requires training and experience. Molecular methods such as the **polymerase chain reaction** (PCR or mostly real-time PCR) are very specific and sensitive which give qualitative and/or quantitative result in a few hours but need fresh and adequate material (e.g. good extraction protocol). In addition, PCR's are very often sequence-dependent and thus sensitive to mutations and contaminations which can lead to false negative results. **Sequencing** offers promising solutions but is only used as confirmation for first suspicious samples and is still restrained for research purposes because of the price for the equipment, the samples preparation and the requirement for trained staff.

This work will help the Veterinary Authorities to take a faster, precise and well documented decision in case of an epidemic in Belgium.

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