

The “Surveillance Tool” – area monitoring to protect plants

Research Centre for Digital Labs & Production



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Project insights
FOAG phytosanitary and Surveillance Tool initiative

Leadership:
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Partner:
Agroscope Plant Health Service

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FOAG

Thanks to a partnership with Agroscope’s Plant Health Service, the development of a cutting-edge web application is underway for the comprehensive collection and analysis of control data from across Switzerland and the Principality of Liechtenstein. This application aims to investigate the spread of quarantine organisms and to prevent their introduction, settlement and spread in new areas. Included in this effort is the digitisation and optimisation of control processes and data flow, in collaboration with the Cantonal Phytosanitary Services (CPS).

On behalf of the Federal Office for Agriculture, the Agroscope Plant Health Service develops, organises and evaluates risk-based regional surveillance for the Cantonal Phytosanitary Services every year. Depending on the type of organism, the CPS has different ways of monitoring the spread of quarantine organisms in Switzerland, including strategies like plant sample collection and insect trapping. Reported samples and captures are analysed by designated laboratories. From this aggregated data, distribution maps are generated, facilitating the prompt initiation of phytosanitary

interventions to prevent the spread of the organisms and the associated socio-economic and environmental damage.

Objective: Comprehensive digitisation

For more than ten years, experts from the ZHAW’s Institute of Computational Life Sciences have been engaged in a partnership with the Agroscope Plant Health Service, focusing on area surveillance initiatives. The initial phase saw the development of a web platform designed to streamline the sharing of surveillance tasks and to facilitate the analysis of control data, which was then managed using Excel files. The current project, involving the creation of a central database and a web application, marks the next step towards achieving complete digitisation of the exchange of information with the CPS. Known as the “Surveillance Tool”, this web application is slated for ongoing development over the next three years, and aims to optimise the processes and fully exploit the potential of the database.

Significant benefits

The implementation of the Surveillance Tool for centralised data collection significantly reduces the workload related to organising, communicating and assessing surveillance data, while also

making it easier to handle specific cantonal requests with more flexibility. A paramount advantage is the possibility of direct data entry, which facilitates immediate analysis by the Agroscope Plant Health Service, leading to swift action in response to identified threats. Furthermore, this method substantially decreases the likelihood of mistakes that can occur with manual data transfer, notably when using Excel files for data management.

New options for research

The Surveillance Tool also opens up interesting new possibilities for research by enabling data to be integrated seamlessly into leading geoinformatics systems and merged with additional datasets. This amalgamation provides deeper understanding of the origins and spread of quarantine organisms. It also grants researchers access to the historical data of surveillance activities, thereby adding a critical time component to scientific studies. Future updates will introduce map visualisations within the Surveillance Tool, offering a graphical depiction of surveillance efforts across both cantonal and national levels. These advancements lay the groundwork for future student work with the data at the ZHAW. ■

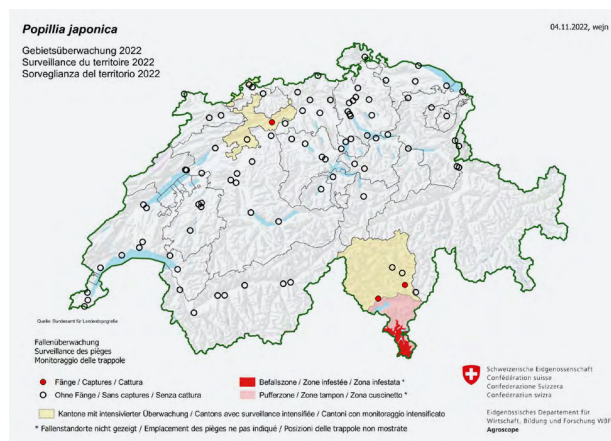


Figure 1: 2022 distribution map of the Japanese beetle; Source: Public FOAG Data

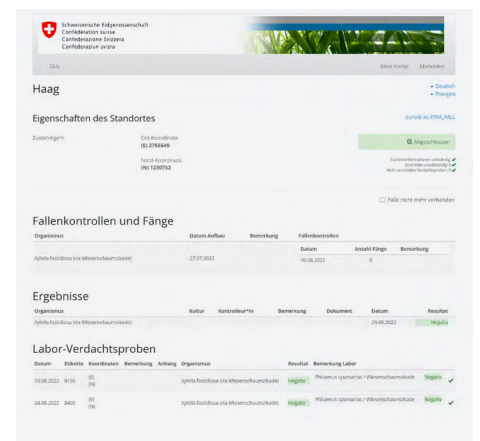


Figure 2: Completed monitoring interface in the Surveillance Tool; Source: Original Photography © ZHAW

Genetic variability of HIV-1: Exploring the importance of insertion and deletions in the HIV-1 genome



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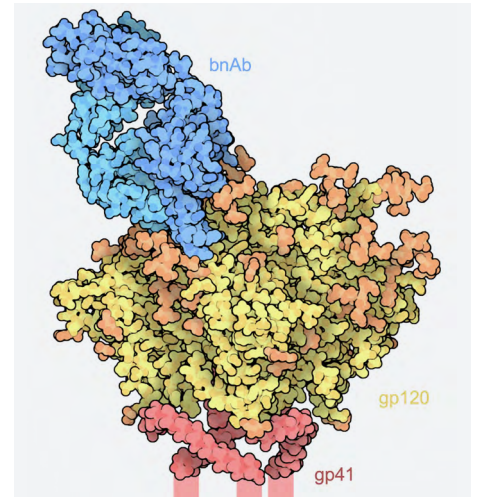
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Human immunodeficiency virus type 1 (HIV-1) is a retrovirus that has affected nearly 40 million people worldwide and is the primary cause of the HIV pandemic. HIV-1 is a rapidly evolving virus with significant genetic variability, making it challenging to develop effective vaccines and antiretroviral therapies. In particular, the env gene, which encodes two glycoproteins, gp41 and gp120, and is essential for viral binding and entry into host cells, is one of the most variable regions of the HIV-1 genome.

This envelope glycoprotein complex is the primary target for neutralising antibodies (see figure) generated in response to HIV infection or vaccination. Its rapid mutation rate allows the virus to evade the host's immune response. Current research on genetic variability in HIV-1 has mainly focused on substitutions, with limited attention

given to insertion and deletion (indel) variation and subtype-specific indel patterns.

In our new project, together with the Swiss HIV Cohort Study (SHCS), we use indel-aware phylogenetic inference methods developed in our group to systematically study indel variation of the whole HIV-1 genome with a particular focus on the env gene. Our methods have been specifically developed to infer indel patterns and reconstruct the evolutionary history of protein or DNA sequences, including indel events. In this way, a better insight is given into the genetic diversity of the HIV-1 genome, which is crucial for developing effective treatment and vaccine strategies. ■



Part of a broadly neutralising antibody (bnAb) bound to the HIV envelope glycoprotein complex consisting of gp120 and gp41 (Source: Goodsell, Broadly Neutralizing Antibodies, PDB, 2014)

Project SHIFT and the Hospital of the Future



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The flagship project SHIFT focuses on conceptualising the Hospital of the Future, which will be transformed through the integration of digital technologies and the networking of processes. Central to this vision are the needs of patients, their families and healthcare professionals. This project, supported by Innosuisse, is a collaborative endeavour involving five research teams and 24 industry partners. Among the collaborators is the Computational Health Lab at the ZHAW Institute for Computational Life Sciences, which, alongside the University Hospital Basel and the start-up Leitwert, explores the application of wearable technology – specifically, smart bracelets. A pivotal focus of this investigation is patient monitoring.

The initiative aims to facilitate the continuous monitoring of vital signs, thereby enabling efficient and precise oversight of patients. This innovation seeks not only to elevate the standard of patient care, but also to alleviate the burden on healthcare professionals, who are currently under immense pressure. Additionally, the technology offers insights into patient activity

levels. A common challenge in hospitals is the physical inactivity of patients, which can impede recovery processes and, particularly in elderly patients, lead to further health complications. Through targeted activity feedback, the project aspires to expedite patients' return to optimal health and fitness. ■



<https://future.hospital>