# Informatics assisting influenza antiviral susceptibility monitoring in Europe

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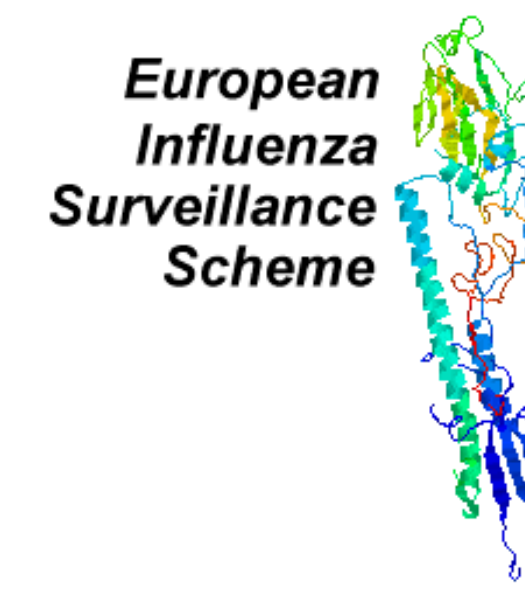
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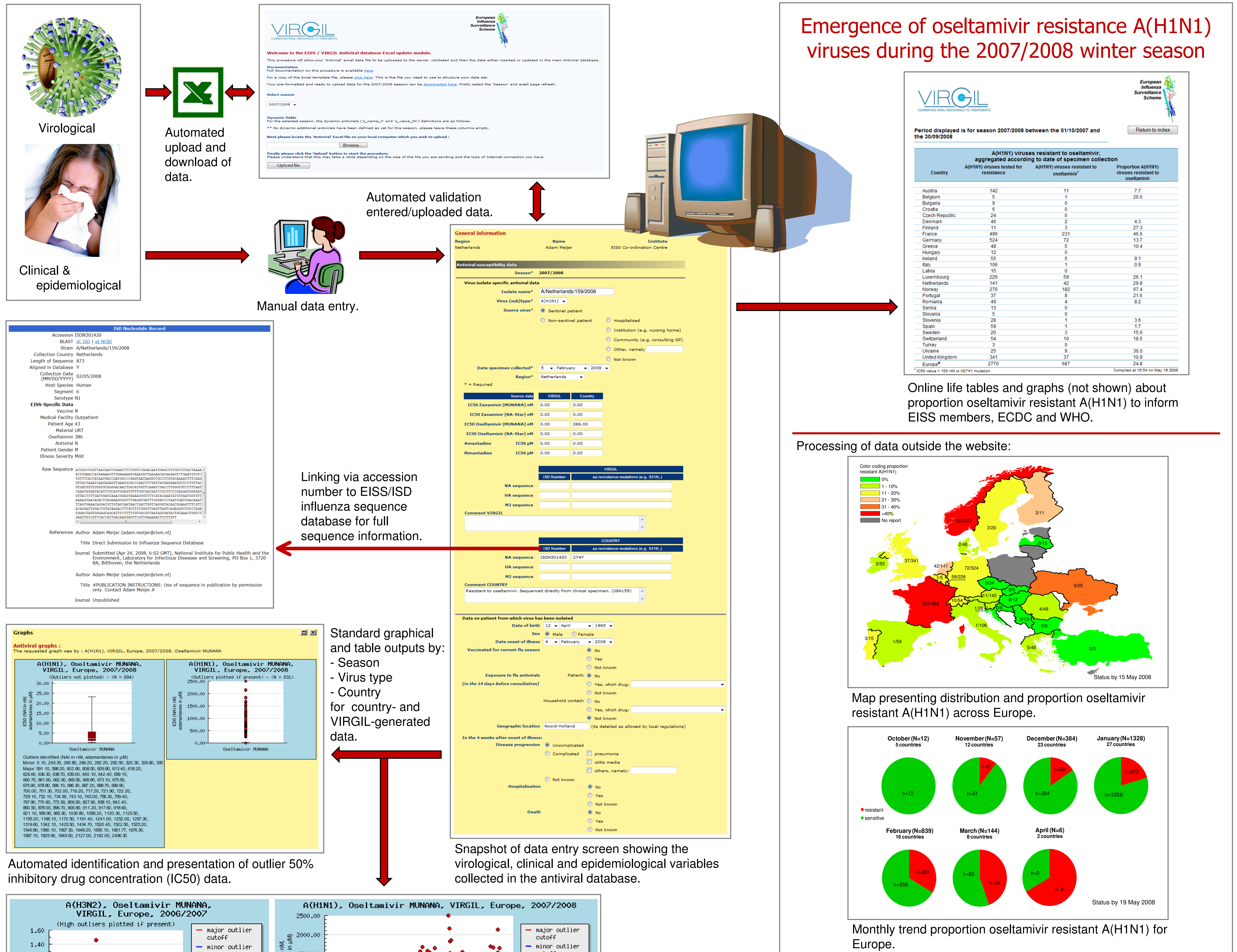**Internet** www.nivel.nl

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Introduction

Influenza antiviral resistance monitoring is now a required activity for National Influenza Centres (NICs), since the introduction of neuraminidase inhibitors (NAI) in 1999. With the availability and wider use of NAI and the stockpiling of antivirals for use during an influenza pandemic, continuous monitoring of the development of antiviral resistance to both NAI drugs and previously existing adamantane drugs (M2 channel inhibitors) has become increasingly important.

Methods

In Europe, the EU funded EISS and VIRGIL projects aim at influenza antiviral susceptibility monitoring coordinated with existing influenza surveillance activities and transfer of knowledge and expertise to NICs in Europe. To collect the antiviral susceptibility data and linked patient demographic and clinical data in a standardised and comprehensive way, a web-based database with online data analysis facilities was developed using phpMyAdmin.

Virological

Clinical & epidemiological

Automated upload and download of data.

Automated validation entered/uploaded data.

Manual data entry.

Linking via accession number to EISS/ISD influenza sequence database for full sequence information.

Standard graphical and table outputs by:
- Season
- Virus type
- Country
for country- and VIRGIL-generated data.

Automated identification and presentation of outlier 50% inhibitory drug concentration (IC50) data.

Snapshot of data entry screen showing the virological, clinical and epidemiological variables collected in the antiviral database.

Column-scatter plot and scatter plot by date of specimen collection; with outlier thresholds if available.

Extended query creates table with IC50 and sequencing data and by choice extended with clinical data and dynamic data (defined by season, e.g. monitoring of peramivir susceptibility). Table includes automated identification and presentation of minor (yellow) and major (red) outlier IC50 data.

Emergence of oseltamivir resistance A(H1N1) viruses during the 2007/2008 winter season

Online life tables and graphs (not shown) about proportion oseltamivir resistant A(H1N1) to inform EISS members, ECDC and WHO.

Processing of data outside the website:

Map presenting distribution and proportion oseltamivir resistant A(H1N1) across Europe.

Monthly trend proportion oseltamivir resistant A(H1N1) for Europe.

Conclusion

A web-based facility for collection, analysis and dissemination of influenza antiviral susceptibility data was successfully implemented. Its usefulness has been fully validated by the events of the 2007/2008 winter season when the emergence of high levels of oseltamivir resistant A(H1N1) viruses was first demonstrated in Europe and the database was the key tool used at European and global level for accurate dissemination of data.