

Making Linked Data accessible for One Health Surveillance with the "One Health Linked Data Toolbox"

Taras Günther[‡], Matthias Filter[‡], Fernanda Dórea[§]

[‡] Department Biological Safety, German Federal Institute for Risk Assessment (BfR), Berlin, Germany

[§] Department of Disease Control and Epidemiology, National Veterinary Institute (SVA), Uppsala, Sweden

Corresponding author: Taras Günther (taras.guenther@bfr.bund.de)

Abstract

In times of emerging diseases, data sharing and data integration are of particular relevance for One Health Surveillance (OHS) and decision support. Furthermore, there is an increasing demand to provide governmental data in compliance to the FAIR (Findable, Accessible, Interoperable, Reusable) data principles. Semantic web technologies are key facilitators for providing data interoperability, as they allow explicit annotation of data with their meaning, enabling reuse without loss of the data collection context. Among these, we highlight ontologies as a tool for modeling knowledge in a field, which simplify the interpretation and mapping of datasets in a computer readable medium; and the Resource Description Format (RDF), which allows data to be shared among human and computer agents following this knowledge model. Despite their potential for enabling cross-sectoral interoperability and data linkage, the use and application of these technologies is often hindered by their complexity and the lack of easy-to-use software applications.

To overcome these challenges the OHEJP Project ORION developed the [Health Surveillance Ontology \(HSO\)](#). This knowledge model forms a foundation for semantic interoperability in the domain of One Health Surveillance. It provides a solution to add data from the target sectors (public health, animal health and food safety) in compliance with the FAIR principles of findability, accessibility, interoperability, and reusability, supporting interdisciplinary data exchange and usage. To provide use cases and facilitate the accessibility to HSO, we developed the [One Health Linked Data Toolbox \(OHLDT\)](#), which consists of three new and custom-developed web applications with specific functionalities. The first web application allows users to convert surveillance data available in Excel files online into HSO-RDF and vice versa. The web application demonstrates that data provided in well-established data formats can be automatically translated in the linked data format HSO-RDF. The second application is a demonstrator of the usage of HSO-RDF in a HSO triplestore database. In the user interface of this application, the user can select HSO concepts based on which to search and filter among surveillance datasets stored in a HSO

triplestore database. The service then provides automatically generated dashboards based on the context of the data. The third web application demonstrates the use of data interoperability in the OHS context by using HSO-RDF to annotate meta-data, and in this way link datasets across sectors. The web application provides a dashboard to compare public data on zoonosis surveillance provided by EFSA and ECDC.

The first solution enables linked data production, while the second and third provide examples of linked data consumption, and their value in enabling data interoperability across sectors. All described solutions are based on the open-source software KNIME and are deployed as web service via a KNIME Server hosted at the German Federal Institute for Risk Assessment. The semantic web extension of KNIME, which is based on the Apache Jena Framework, allowed a rapid and easy development within the project. The underlying open source KNIME workflows are freely available and can be easily customized by interested end users.

With our applications, we demonstrate that the use of linked data has a great potential strengthening the use of FAIR data in OHS and interdisciplinary data exchange.

Keywords

One Health, surveillance, linked data, ontologies, KNIME

Presenting author

Taras Günther

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