



Recent and on-going WGS initiatives and activities of EFSA

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2nd course on bioinformatics tools for Next Generation Sequencing
data mining: use of bioinformatics tools for typing pathogenic *E. coli*
Rome, 16-17 June 2016

OUTLINE

- ❑ EFSA Interest on WGS for Food Safety
 - ❑ Previous Scientific Opinions
 - ❑ Scientific Colloquium
 - ❑ Procurement/ grant funding
 - ❑ EUSR-AMR support
 - ❑ Advisory board of EU funded projects



EFSA INTEREST ON WGS FOR FOOD SAFETY

The mission of the European Food Safety Authority (EFSA) is to improve food safety in the European Union (EU) and ensure a high level of consumer protection.



HOW EFSA WORKS



EFSA's scientists evaluate, assess, advise



FOOD SAFETY

**Biological
Hazards**



EFSA INTEREST ON WGS FOR FOOD SAFETY

EFSA is interested in using WGS for:

- ❑ Outbreak detection and investigation
- ❑ Source attribution
- ❑ Common source trace back investigations
- ❑ Detection and surveillance of emerging pathogens
- ❑ Monitoring of antimicrobial resistance

Our main interest is to use the data generated by new Sequencing technologies (WGS, Metagenomics) for Food Safety and Public Health Protection

EFSA INTEREST ON WGS FOR FOOD SAFETY

EFSA has shown an increasing interest in WGS over recent years:

- ❑ EFSA 10th Anniversary Conference
- ❑ EFSA Advisory Forum
- ❑ 20th EFSA Scientific Colloquium
- ❑ Self-task mandates
- ❑ Collaborations with ECDC, EURLs and other organisations
- ❑ Procurements/ Thematic grants

EFSA 10TH ANNIVERSARY CONFERENCE

The conclusions from the EFSA 10th Anniversary Scientific Conference “Challenging boundaries in risk assessment” and with respect to the topic of new trends in identifying and characterising hazards indicate that for biological hazards, the creation of a centralised microbial whole genome sequence (WGS) database based on the use of common experimental protocols is needed to better predict the outcome of pathogen-host interactions

(<http://www.efsa.europa.eu/en/press/news/121116b>)



EFSA ADVISORY FORUM

During an Advisory Forum meeting in Cyprus, Ireland raised the question of EFSA's role with regards to whole genome analysis.

In addition Denmark expressed that WGS will revolutionize our way of working in relation to typing of biological hazards and that EFSA should take an active role on this field.



WGS EFSA SCIENTIFIC COLLOQUIUM

EFSA's Scientific Colloquium on the Use of Whole Genome Sequencing (WGS) of food-borne pathogens for public health protection (Parma, June 2014)

- ❑ Discussion group 1: WGS of foodborne pathogens in action
- ❑ Discussion group 2: Curation and analysis of WGS data: bioinformatics solutions
- ❑ Discussion group 3: Cross-sectorial coordination and international cooperation

General conclusions: there is still limited experience in the use of WGS methods in applications related to microbial food safety in the EU, but there is great potential for this technology to provide risk assessors and risk managers with a powerful tool



SELF-TASK MANDATES: SCIENTIFIC OPINIONS

Evaluation of molecular typing methods for major food-borne microbiological hazards and their use for attribution modelling, outbreak investigation and scanning surveillance (self-task mandate, BIOHAZ PANEL, 2013-2015)

- ❑ *EFSA-Q-2013-00032: Part 1: evaluation of methods and applications*
 - ❑ Main objectives were to review information on current and prospective (e.g. WGS) molecular identification and subtyping methods for food-borne pathogens and evaluate their appropriateness for different purposes

http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/3502.pdf



SELF-TASK MANDATES: SCIENTIFIC OPINIONS

Evaluation of molecular typing methods for major food-borne microbiological hazards and their use for attribution modelling, outbreak investigation and scanning surveillance (self-task mandate, BIOHAZ PANEL, 2013-2015)

- *EFSA-Q-2013-00906: Part 2: surveillance and data management activities*
 - Main objectives were to evaluate the requirements for the design of surveillance activities for food-borne pathogens and to review the requirements for harmonised data collection, management and analysis.

http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/784.pdf



COLLABORATIONS WITH ECDC

Collaboration with ECDC in Expert WGs

- ECDC expert group on introduction of next-generation typing methods for surveillance of food- and waterborne diseases (FWD-NEXT Expert Group)
 - Expert Opinion on the introduction of next-generation typing methods for food- and waterborne diseases in the EU and EEAFirst mandate extension of the mandate to WGS nomenclature¹
 - FWD-NEXT extension of the mandate to WGS nomenclature

1. <http://ecdc.europa.eu/en/publications/Publications/food-and-waterborne-diseases-next-generation-typing-methods.pdf>



WGS TO SUPPORT EU SUMMARY REPORT ON AMR

SCIENTIFIC REPORT



The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2014

European Food Safety Authority
European Centre for Disease Prevention and Control



AMR Data from
EU MSs + EEA, CH



WGS TO SUPPORT EU SUMMARY REPORT ON AMR



Selection of isolates:

- Emerging resistances
- Detection of clones
- Discrepancies



- Confirmation of results
- Ask MSs for the isolates
- Perform:
WGS, MIC re-testing

WGS analyses support phenotypical AMR data?

PEER REVIEWED PAPERS

EFSA contributed to the peer review of the Technical background Paper '**Applications of Whole Genome Sequencing in food safety management**', prepared by Food and Agriculture Organization of the United Nations in collaboration with the World Health Organization (FAO, 2016)

<http://www.fao.org/3/a-i5619e.pdf>



ADVISORY BOARD WGS EU FUNDED PROJECTS



WGS PROCUREMENT LISTERIA IN RTE FOODS

Closing data gaps for performing RA on *L. monocytogenes* in “Ready to Eat Foods” (RTE).

Act. 3: Molecular characterisation employing WGS of strains from different compartments along the food chain and from humans (Oct. 2014–2016: SSI/ANSES/PHE/UA)

- ❑ Molecular characterisation *Lm* isolates: RTE foods, food chain compartments, humans
- ❑ Data analyses: genetic diversity, epidemiological relationships, markers for survival/ multiplication/ cause disease
- ❑ Retrospective analysis of outbreak strains: suitability of WGS as a tool in outbreak investigations?

THEMATIC GRANTS ON WGS FOR FOOD SAFETY

“NEW APPROACHES IN IDENTIFYING AND CHARACTERIZING MICROBIOLOGICAL AND CHEMICAL HAZARDS”

Objectives

Making use of molecular approaches to identify and characterise microbial foodborne pathogens, specifically using whole genome sequence (WGS) analysis, to enhance the understanding, the traceability and spread of the disease in humans that these bacteria populations may cause.

WGS generated data could be a **powerful tool for Risk assessors**

- i) explore the bacterial **genetic diversity** within and between compartments in the food chain,*
- ii) to assess the **epidemiological relationship** of isolates from different compartments,*
- iii) to identify the presence of **putative markers** conferring the potential to survive/multiply in the food chain and/or cause disease in humans.*

THEMATIC GRANTS, PROMOTE NETWORKING

BUT integration of WGS in microbial food safety routine needs:

i) time; ii) proofs of principle; iii) transnational collaboration/scientist coordination (One Health approach); iv) new analysis tools; v) translation of results into 'plain language'.

- ❑ Call launched in April 2015 (GP/EFSA/AFSCO/2015/01)
- ❑ Aimed to competent organisations adopted by EFSA Management Board (Art. 36 of EC 178/2002).
- ❑ Two out six projects were selected
- ❑ Total 1,000,000 € EFSA funding (50% self-funding)
- ❑ Projects run from beginning 2016 to 2018



THEMATIC GRANTS, PROMOTE NETWORKING

Projects funded concentrate on applicability and integration of WGS methods for identification and characterisation of microbial foodborne pathogens.

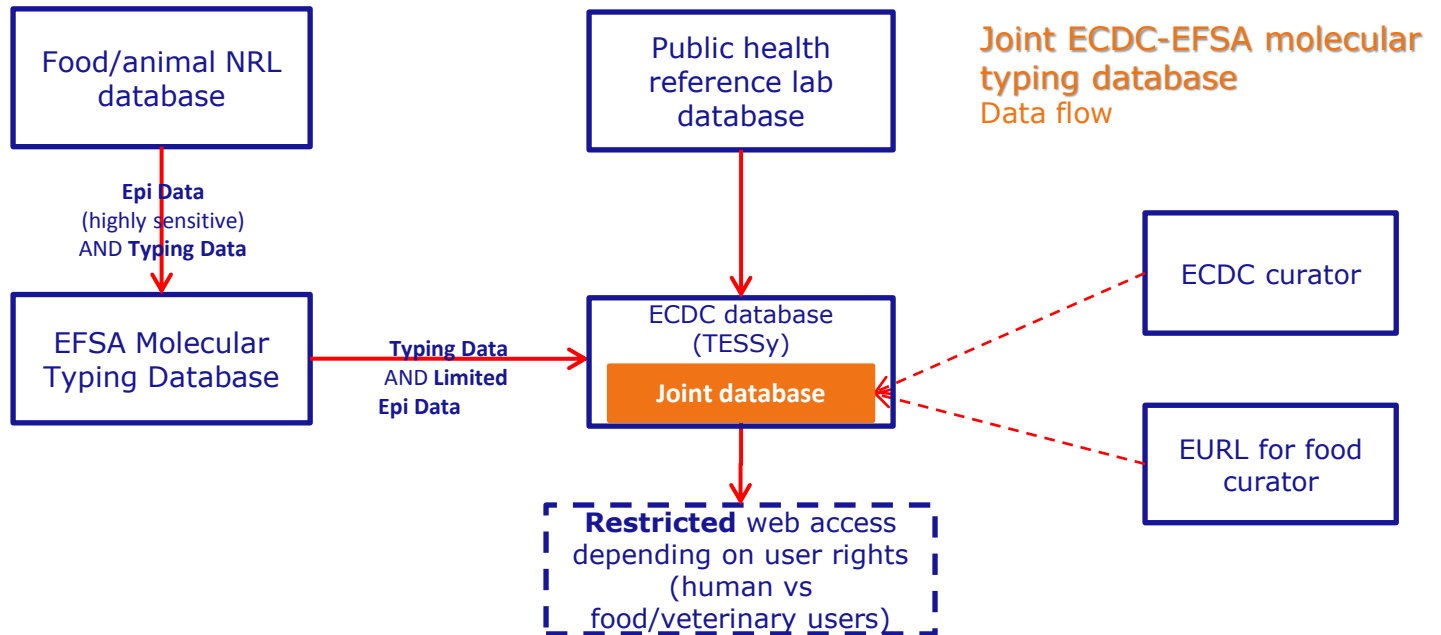
Granted Projects

- ❑ INNUENDO (University of Helsinki): 2.5 years
- ❑ ENGAGE (Danish Technical University): 2 years



FUTURE ACTIVITIES

A discussion is on-going to expand the joint EFSA-ECDC molecular typing database to WGS data



THANK YOU FOR YOUR ATTENTION!

Scientific Reports available at www.efsa.europa.eu

WGS Scientific Colloquium:

<http://www.efsa.europa.eu/en/press/news/150216.htm>

Scientific Opinions Molecular Typing:

<http://www.efsa.europa.eu/it/efsajournal/pub/3502.htm>

<http://www.efsa.europa.eu/it/efsajournal/pub/3784.htm>

EUSR-AMR:

http://www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/4380.pdf

Scientific Opinions AMR:

<http://www.efsa.europa.eu/it/efsajournal/pub/2322.htm>

<http://www.efsa.europa.eu/it/efsajournal/pub/3501.htm>

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