



“OMICS in risk assessment: state-of- the-art and next steps”

Objectives of the colloquium

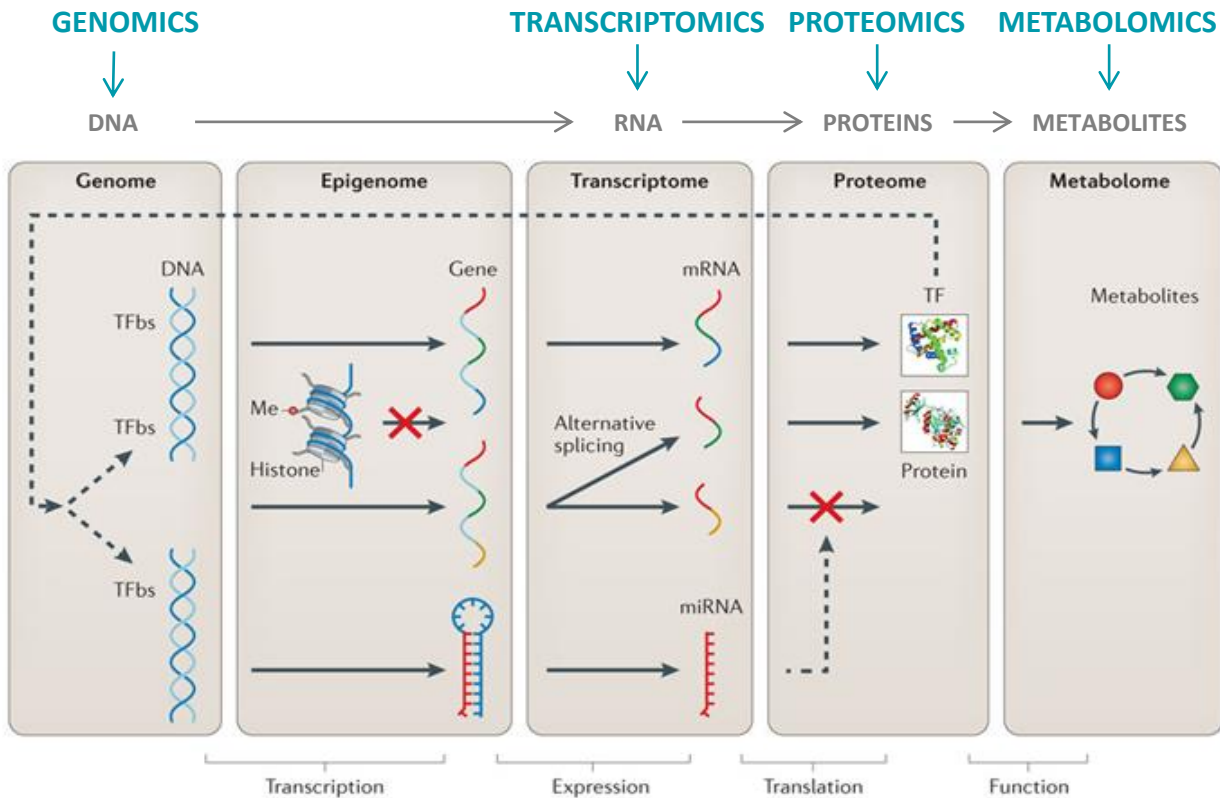
Matthew Ramon, EFSA

24 April 2018

"OMICS" studies

Omics studies are used to characterise and quantify the roles and relationships of large sets of different types of molecules in an organism to get information on the functional status of or the impact of environmental factors on an organism

"OMICS" studies



- Information on functional status of an organism
- Information on impact of external factors on an organism

"OMICS" studies

- OMICS technologies have been used for more than a decade to study basic biological problems and have lead to new possibilities for applied biology
- Vast amounts of analytical data are being collected and shared

Revolutionising basic and applied science

npj | Systems Biology
and Applications

REVIEW ARTICLE OPEN

A roadmap towards personalized immunology

Sylvie Delhalle¹, Sebastian F. N. Bode^{1,2}, Rudi Balling³, Markus Ollert^{1,4} and Feng Q. He¹

Omics: Fulfilling the Promise

Harnessing the power of omics in microbiology

Gail Teitzel (Editor)

Trends in Microbiology

Trends in Microbiology

Special Issue: Broad Concepts in Microbiology

Review

Achieving a Predictive Understanding of
Antimicrobial Stress Physiology through
Systems Biology

Sean G. Mack,¹ Randi L. Turner,² and Daniel J. Dwyer^{1,2,3,4,5,*}

www.nature.com/npjbsa

Cell Host & Microbe
Review

CellPress

The Gut Microbiome: Connecting Spatial Organization to Function



ARTICLE

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DOI: 10.1038/ncomms13096

OPEN

Multi-omics integration accurately predicts cellular
state in unexplored conditions for *Escherichia coli*

Minseung Kim^{1,2}, Navneet Raj^{2,*}, Violeta Zorraqino^{2,*} & Ilias Tagkopoulos^{1,2}

Ethnobotany,
Phylogeny, and
'Omics' for Human
Health and Food
Security

Teresa Garnatje,¹
Josep Peñuelas,^{2,3} and
Joan Vallès^{4,*}

Opinion

'Omics' and endocrine-disrupting chemicals — new paths forward

Carmen Messerlian, Rosie M. Martinez, Russ Hauser & Andrea A. Baccarelli✉

OMICS in basic and applied science

- **Genomics** benefitted from **next-generation sequencing** technologies to study genomes in more detail, e.g.
 - Single nucleotide polymorphism (SNP) analyses have helped to understand the basis of disease and disease resistance
 - Rapid and accurate sequencing of full genomes can be used in determining food borne pathogens
 - Comparative genomics and evolution
- **Transcriptomics** provides information on the transcription of genes, e.g.
 - RNA sequencing to determine chemically induced changes in gene expression (e.g. Cadmium stress in plants)

OMICS in basic and applied science

- **Proteomics** provides information on proteins and their interaction in a cell, e.g.
 - The proteome reflects on the dynamic state of a cell, tissue or organism and provides the possibility to identify biomarkers in toxicology
 - High-throughput proteomics can identify the molecular signature of a disease

- **Metabolomics** captures data for a large pool of metabolites, e.g.
 - Metabolomics to dissect plant responses to abiotic stress
 - Metabolomics to dissect the nutritional profile of food and feed
 - Metabolomics for the discovery of new biomarkers

"OMICS" studies in risk assessment

- Application of OMICS technologies in support of risk assessment is still in a more **initial phase**
- However, **OMICS datasets are starting to be used in some risk assessment areas** and have been accepted as a powerful tool to substitute or complement current studies
- In **2014 EFSA has published a review** of modern methodologies and tools for human hazard assessment of chemicals

Objectives of the 24th EFSA colloquium

- With this colloquium, EFSA aims to
 - Explore the potential use of OMICS datasets to support the scientific safety evaluation
 - Advance further on concrete paths of implementation
- The outcome of this colloquium aims at helping risk assessors in the process of incorporating OMICS tools into the risk assessment of food and feed products

Programme of the 24th EFSA colloquium

- 4 Plenary talks introducing the topics addressed in the different discussion groups
- 4 Discussion groups addressing challenges for the implementation of OMICs in the risk assessment
- Feed back from the discussion group to all participants in a final plenary session

Discussion groups

- **DG1:** Genomics for the identification and characterisation of microbial strains used in food and feed products
- **DG2:** The use of Metabolomics in the comparative risk assessment of GM plants
- **DG3:** The use of OMICS in human risk assessment of chemicals
- **DG4:** The use of OMICS in environmental risk assessment

Event report

- Summary of the **outcomes** of the different **discussion groups** and the **overall messages** from the colloquium will be presented in the colloquium's **event report**
- The **event report** is expected to be published by the **end of September 2018**

Acknowledgments

■ Colloquium Scientific programme committee

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- Justyna Slodek Wahlstrom, European Food Safety Authority, Italy



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