Nutrimetabolomics – a tool for humans and animals health management in One Medicine concept

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Metabolomics and Nutrimetabolomics…

… in Human Medicine

… in Veterinary Medicine

… in One Medicine context

Conclusions

References
Abstract:
The field of metabolomics is still under development, but it has an increased capacity for research applications, especially in the areas of nutrition and health. The relationship between nutrients and the organism’s functionality has increased the interest for nutritional metabolomics research. Nutrimetabolomics, is thus, more and more used for analyzing the correlation between dietary intake and disease occurrence. On the other hand, metabolic fingerprinting can help in understanding and development of personalized nutrition, which could contribute to the improvement of health status, well-being, animal growing or food security. The very close cohabitation of humans with animals, either for raising livestock for food, or as pets, makes most of the diseases known in medical sciences to be common to humans and animals. This makes nutrimetabolomics be the key tool for confirming the medium-animal-human relationship in order to achieve global unitary health. So, the aim of this review is to highlight the importance of nutrimetabolomics as the main tool in both human and veterinary medicine research.

Keywords: nutrimetabolomics; health; nutrition; animals; medicine
Metabolomics

Sample collection/processing & metabolite measurement

- Blood, urine, tissues, cells.
- Tissue homogenisation, metabolite extraction/derivatisation.
- Extracted/derivatised metabolites.
- Metabolite quantification using LC-MS, GC-MS, NMR, by targeted/untargeted approaches.
- Raw data.
- Data extraction, metabolite identification, normalisation and scaling.

Metabolomic data processing & analyses

- Heatmaps, metabolic markers, predictive models, pathway analysis, biological interpretation.
- Application of bioinformatic tools (univariate/multivariate statistics, identification of metabolite signatures and integration of information with existing knowledge/data).

Data matrix.
Nutrimetabolomics

Nutritional status

Metabolites
... in Human Medicine

Human diseases → Metabolic profile

Diagnostic biomarkers

Personalised treatment

Personalised nutrition
... in Veterinary Medicine

Animal welfare

Increased production
... in One Medicine context

One World - One Medicine - One Health
... in One Medicine context

- Environment health
  - Poluants
  - Toxines
  - Additives

- Animals health
  - Bacteria
  - Viruses
  - Parasites

- Human health
  - Hericides/Insecticides/Fungicides
  - GM plants*

* Genetically modified

One World - One Medicine - One Health
... in One Medicine context

Interdisciplinary collaborations:

Metabolomics/Nutrimetabolomics on plants → animal benefits

Metabolomics/Nutrimetabolomics on animals → human benefits

Metabolomics/Nutrimetabolomics on humans → animal benefits

Metabolomics/Nutrimetabolomics on plants, animals, humans → world benefits
... in One Medicine context

Metabolomics/Nutrimetabolomics

Tools in animal health management

Food safety

Food security
... in One Medicine context

Zoonoses: bacteria, viruses, parasites

NCDs*: obesity, diabetes, CVD**

Metabolomics/ Nutrimetabolomics

World health

Biological systems health

Human health

Animals health

* non-communicable diseases
** cardio-vascular diseases
... in One Medicine context

Lack of food

Prevent hunger

Nutrients deficiencies

Prevent hidden hunger

Nutrimetabolomics
Animals and human health
Conclusions

- Nutrimetabolomics - the role in nutrition and nutrient quality for the survival of organisms and health maintenance

- The close cohabitation of humans with animals - analysis in the context of One Health

- Medical researches → the existence of medical similarities between humans and animals → sharing the same environment → presenting the same categories of diseases → consuming the same types of food, etc.

- The results from the animal studies → extrapolated to humans

- The results obtained in human medicine → contribute to animal welfare

- The collaboration of human doctors with veterinarians and biologists → for increasing the quality of life for humans and animals (the idea of the One World - One Medicine - One Health concept)
Supplementary Materials

Links:

http://www.clinsci.org/content/124/5/289
http://www.onehealthinitiative.com/
http://www.who.int/mediacentre/factsheets/fs355/en
Thank you!