The concept of One Health

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Disclosure

In relation to this presentation, I declare the following, real or perceived conflicts of interest:

<table>
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<tr>
<th>Type</th>
<th>Company</th>
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<tr>
<td>Employment</td>
<td>None</td>
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<tr>
<td>Spouse / Family member</td>
<td>None</td>
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<td>Speakers Bureau / Honoraria</td>
<td>AstraZeneca, Novartis, Chiesi, Sanofi, Mylan, ALÈ</td>
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<td>Ownership interest [stock, stock options, patent or intellectual property]</td>
<td>None</td>
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<tr>
<td>Consultant / advisory board</td>
<td>Sanofi, Chiesi, Novartis, AstraZeneca</td>
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“Our relationship with nature is broken. But relationships can change,” Greta Thunberg on the International Day of Biological Diversity.

Holistic and interdisciplinary approaches to safeguard health

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<th>One Health</th>
<th>EcoHealth</th>
<th>Planetary Health</th>
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<td>Narrowest description: combines public health and veterinary medicine</td>
<td>EcoHealth is committed to fostering the health of humans, animals, and ecosystems and to conducting research which recognizes the inextricable linkages between the health of all species and their environments. Health and well-being cannot be sustained in a resource depleted, polluted, and socially unstable planet</td>
<td>Achievement of the highest attainable standard of health, well-being, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the Earth’s natural systems that define the safe environmental limits within which humanity can flourish</td>
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<td>Widest approach: “umbrella” depiction including environmental health, ecology, veterinary medicine, public health, human medicine, molecular, and microbiology, as well as health economics</td>
<td>Core values: 1. Respect for scientific specialties whilst emphasizing the need for cooperation between such disciplines 2. Application of multidisciplinarity in research and advisory projects.</td>
<td>Core values: 1. Focus on the relationship between health, ecosystem, and sustainable development based on equity 2. Participation from different sectors in the society such as policymakers, scientists, and those performing the fieldwork are favored 3. The concept of health is mainly used at the population level of health 4. Biodiversity is an important value within the idea of sustainability</td>
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Core values: 1. The health of living and future human generations, applied to individuals, communities, and populations. 2. A main goal is equity in health, which is related to socioeconomic, regional, and gender factors. 3. Requires sustainability based on natural resources and biodiversity


The biological effect

- binding to macromolecules
- inducing structural changes (DNA mutation, adducts, epigenetic modifications)
- disruption of enzyme function
- damage via reactive oxygen or nitrogen species

The biological response

1. The DNA repair system
2. Ubiquitination, autophagy, and proteolysis
3. Antioxidant systems
4. ....

The cumulative cost of the correction process (allostasis) is an important footprint of the exposome.

The level of resilience is key to maintaining health.

Key mechanisms

Diet, microbiome and the epithelial barrier are key regulators of the cross-talk that ensures that immune system adapts to challenges by establishing, maintaining and regulating an appropriate immune response.
Why exposomics

- The exposomic approach is particularly applicable to the study of environmental causes of chronic disease.

- Risk profile instead of single predictors

- Concomitant access to biological data, exposure data, and health outcomes evaluates the biologic plausibility of the hypothesis

Challenges: how to document exposure (1)

- **Classes:** Physical, Chemical, Biological, Psycho-social
- **Sources:** Air, Water, Soil, Food, Consumer Products, Medicines
- **Places:** Home, School, Work, Neighborhood, Community, City, State, Region
- **Time:** Fetal, Child, Adolescent, Young Adult, Adult, Elderly
- **Contact:** Skin, Lungs, Diet
- **Where:** Lungs, Neuro, Skin, GI, other organs
- **Targets:** Biological pathways
Challenges: how to document exposure (2)

- High dose, chronic – relatively easy
- Low dose, chronic – limited by the sensitivity of the assay
- Intermittent – limited by the frequency of testing
- Transient – the system should be in place at the time of exposure OR we measure the biologic response (allostasis)

Development of the exposome through biomarkers

The ideal biomarker

Validity

- Reproducible (inter- and intra- coefficient of variability)
- Usable as diagnostic test (easily measurable, affordable)

Relevance

- Pathway specific
- Related to a relevant clinical end point (surrogate end points)
Development of the exposome through biomarkers

**Biomarkers of exposure**
- Pollutant biomarkers
  - Cotinine
  - DNA methylation
  - Metabolite-sensing GPCRs
  - Cortisol
  - EBC
  - PAH DNA adducts/metabolites
  - BPA
  - LTE4
  - Antioxidants
  - YKL-40
  - TSLP
- Allergen biomarkers
- Viral/bacterial biomarkers
- Dietary biomarkers
- Drug biomarkers

**Biomarkers of response/disease**
- case and control,
  - target and non-target tissues,
  - dose- and time-to-response,
- A correlation between the biomarker and the biological effect needs to be demonstrated

**Biomarkers of susceptibility**
- Genetic factors
  - Age
  - Nutritional status
  - Lifestyle
  - = measure of resilience to the effect

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The best exposomics biomarker is related as many exposures as possible

*Agache I et al. Allergy. 2019;74(3):449-463*
Key questions

How is the exposome altering the biology to

• Generate allergies/asthma
• Complicate the evolution of allergy and asthma

Open Questions

▪ What is the population of interest (“the model”)

▪ What is the nature (duration, frequency, timing) and magnitude (concentration and dose) of relevant exposures

▪ Which associations are relevant for a particular allergic disease

▪ What are the mechanisms/environmental endotypes

▪ Population level value vs personalised medicine approach

EAACI resources

Available open access on www.eaaci.org

EAACI journals

EIC: Philippe Eigenmann

EIC: Cezmi Akdis

EIC: Jean Bousquet and Clive Grattan