COST-Action No. 15129: DiMoPEx (Diagnosis, Monitoring, Prevention of Exposure Related Non-Communicable Diseases); http://www.cost.eu/COST_Actions/ca/CA15129

WG-Final Meeting in Porto

DiMoPEx

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In recent years, enormous progress in the exploration of genetic and epigenetic factors and resulting disease risks has been made, the influence of environmental exposures and lifestyle factors, has received comparatively limited attention in research and teaching programs.

Why is it difficult to link environmental exposure to health effects?
DiMoPEx partners recognize an important research need: to link the living and working environment with disease prevalence in order to prevent the pandemic increase in NCD morbidity and mortality.

Public health benefits may range from effective preventative measures to early detection of possible adverse health outcomes.

Four of the currently identified emerging research tasks pursued by DiMoPEx include the following:
1. To face the difficulties in NCD diagnosis and monitoring of disease progress

Many ongoing long-term studies focusing on early signs of related chronic diseases insufficiently account environmental/occupational determinants of health (exposure is either not considered /or there is exposure misclassification).

The effects of multiple exposures (and effect measure modifications, EMM) with the same target organ is also an important knowledge gap which should be addressed.

Budnik et al., JOMT 2018
Budnik et al., STOTEN, 2019
1. **To face the difficulties in NCD diagnosis and monitoring of disease progress**

To take a closer **look at the living and working environment** and **focus on evidence-based exposure data** closing the gap between the **exposure and disease**, which provides an obstacle to evidence-based recommendations for primary and secondary NCD prevention.
2. **Carcinogenicity bioassays**: To focus on biomarkers of **early response** and appropriate human equivalent animal models (carcinogenicity bioassays) in order to provide basis for evidence based interventions.

Use of different surrogate tissues

- Peripheral blood lymphocytes
- Exfoliated buccal mucosa cells
- Urine derived cells

from: C Bolognesi

from: F Belpoggi

2. **Carcinogenicity bioassays:**

Evidence-based interventions have already successfully limited exposures to many known and probable carcinogens including tobacco, arsenic, asbestos, benzene, vinyl chloride and air pollution. However, among NCDs, cancer is still the second leading cause of death.

*To provide solid scientific basis for cancer prevention, it is necessary to increase our knowledge on cancer etiology,* well designed experimental animal studies and biomarkers of early response should play a central role.

Budnik et al., JOMT 2018
3. To focus on air pollution as one of the major factors responsible for the mortality due to NCDs

J Øvrevik et al., Biomolecules. 2015

Budnik et al., JOMT 2018
3. **air pollution as one of the major factors responsible for the mortality due to NCDs**

**There is a strong link between** both indoor and outdoor air pollution exposure and cardiovascular disease, as well as **between air pollution and cancer**. Knowledge on what makes a particle toxic may provide better exposure metrics in epidemiology studies, lead to more efficient abatement strategies to reduce emissions of the most hazardous air pollutants.
4. To recognize the need for the public health protection through cooperation with policy makers

There is a need to catalyze and stimulate interaction between scientists with policy-makers on exposure-related diseases of concern to society. The predominant goal should be to help scientists, physicians and health officials to prevent and reduce health impacts associated with various exposure scenarios and train highly skilled researchers for the future labor market.
4 major focus areas

**WG3/ WG 6**

*Overarching all other WGs*

**Environmental & occupational epidemiology**

**Health effects: global NCD burden**

Courtesy: K. Bromberg
Pollution = unwanted, often dangerous, material that is introduced into the Earth’s environment as the result of human activity, that threatens human health, and that harms ecosystems
Pollution-related diseases are an increasing global problem responsible for 9 million premature deaths—three times as many deaths as AIDS, tuberculosis and malaria combined.

World Health Organization (WHO) has ranked exposures to air pollution among the top risk factors for chronic disease mortality

- with 7 million premature deaths (2016)
- Water pollution caused 1.75M deaths.
- Occupational pollutants caused 0.85M deaths.

http://www.thelancet.com/commissions/pollution-and-health

Global Burden of Disease Study (GBD); thelancet.com: 2015 http://dx.doi.org/10.1016/S0140-6736(15)00129-4
Pollution index depends on the measured parameter (and later applied in pollution models): Example PM10

The 20 Worst Cities Worldwide For Air Pollution
Annual mean micrograms per cubic metre of PM10 in cities worldwide

- Onitsha, Nigeria: 594
- Peshawar, Pakistan: 540
- Zabol, Iran: 527
- Rawalpindi, Pakistan: 448
- Kaduna, Nigeria: 423
- Aba, Nigeria: 373
- Riyadh, Saudi Arabia: 368
- Al Jubail, Saudi Arabia: 359
- Mazar-e Sharif, Afghanistan: 334
- Gwalior, India: 329
- Hamad Town, Bahrain: 318
- Allahabad, India: 317
- Shijiazhuang, China: 305
- Karachi, Pakistan: 290
- Dammam, Saudi Arabia: 286
- Umuahia, Nigeria: 274
- Raipur, India: 268
- Kabul, Afghanistan: 260
- Ma’amee, Bahrain: 257
- Boshehr, Iran: 255

Source: WHO
Industrial processes enhance more environmental pollution

Global chemical production is projected to continue growing—about 3% per year, with a doubling rate of 24 years, rapidly outpacing the rate of global population!
Because of their wide distribution throughout the economy and environment, many industrial chemicals enter the earth’s ecosystems and come in contact with people (already in uteri and throughout the life time).

This occurs in the workplace, in homes, through the use of products, and via air, water, food, and waste streams.

Further, many workers are at particular risk from chemical exposures because, depending on their occupation, they can be more highly exposed to hazardous substances than the general public.
Environmental/Background Exposure + Occupational Exposure = Increased Risk
ARD Mortality Rate (2016): Global: 3.04; Italy: 25.49; Belgium: 24.62; Denmark: 22.10; Germany: 18.62; USA: 12.20; Turkey: 5.4
The nature of pollution is changing.

The connection between air pollution and NCD could be underestimated:

We are still discovering links between pollution and ill health.
Pollution and climate change are closely linked.

Climate change worsens the health impacts of pollution, and pollution accelerates climate change.
Thank you