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The Neonatal Environment and Health Outcomes (NEHO) birth cohort

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Introduction

Industrial areas are characterized by the dispersion of environmental stressors possibly compromising for long time both human health and the environment. Toxic substances released by industrial activities such as heavy metals (HMs), persistent organic pollutants (POPs) and gaseous air pollutants are able to infiltrate the human body through different exposure pathways and routes.

Environmental stressors can interfere with the early stages of fetal development leading to diseases later in postnatal life. Chemical compounds, social stress and life-style habits can lead to a permanent alteration of fetal development that can result in an increase in susceptibility to adverse health outcomes over a person's lifetime (Figure 1). The placenta is the interface between the maternal/external environment and the embryo and have an active role in fetal development.

Toxicant can cause an impairment of placental formation, differentiation, and/or function severely affects fetal development and is associated with a wide range of pregnancy complications, including pregnancy loss. The effects of environmental pollution on pregnant women living in heavily polluted areas is of special interest and, in this context, the Neonatal Environment and Health Outcomes (NEHO) cohort focuses on the investigation of: i) toxicants transferred from the environment to the mother and from the mother to the developing fetus; ii) the influence of toxicants on pregnancy outcomes, fetal development, and health status during infancy.

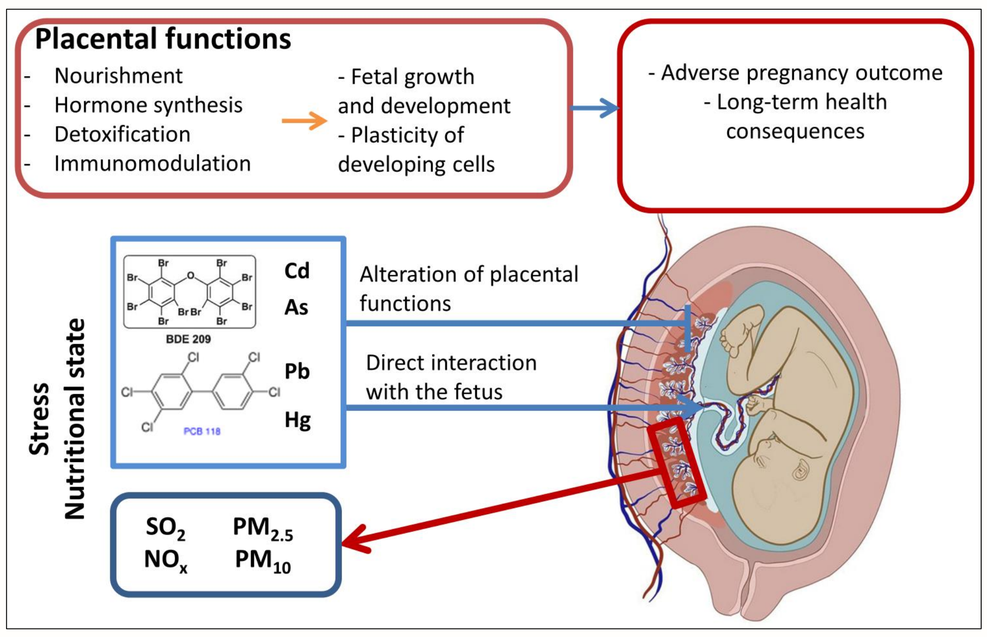

Figure 1. Schematic representation of interactions among environmental stressors, placental domain, and possible negative health outcomes.

Methods

The NEHO cohort will enroll an estimated total of 900 pregnant women in three selected National Priority Contaminated Sites in southern Italy (Figure 2). Epidemiological data collection concerning maternal health status, lifestyle, and pregnancy are obtained through survey questionnaires provided to mothers starting from the last two months of pregnancy. At the time of delivery, maternal blood, umbilical cord blood, and placenta tissue are collected to assess contaminant levels and to clarify how toxicants interact with the placental domain. We will evaluate fetal exposure analyzing POPs – PCBs, PBDEs and HMs such as As, Cd, Cu, Mn, Hg, Pb, Se, Zn as a means to: i) build exposure models based on the association between maternal residence and environmental pollutant dispersion data; ii) estimate exposure evaluating dietary intake using a food frequency questionnaire in which information about food categories frequency of recruitment, origin of the product and packaging are requested.

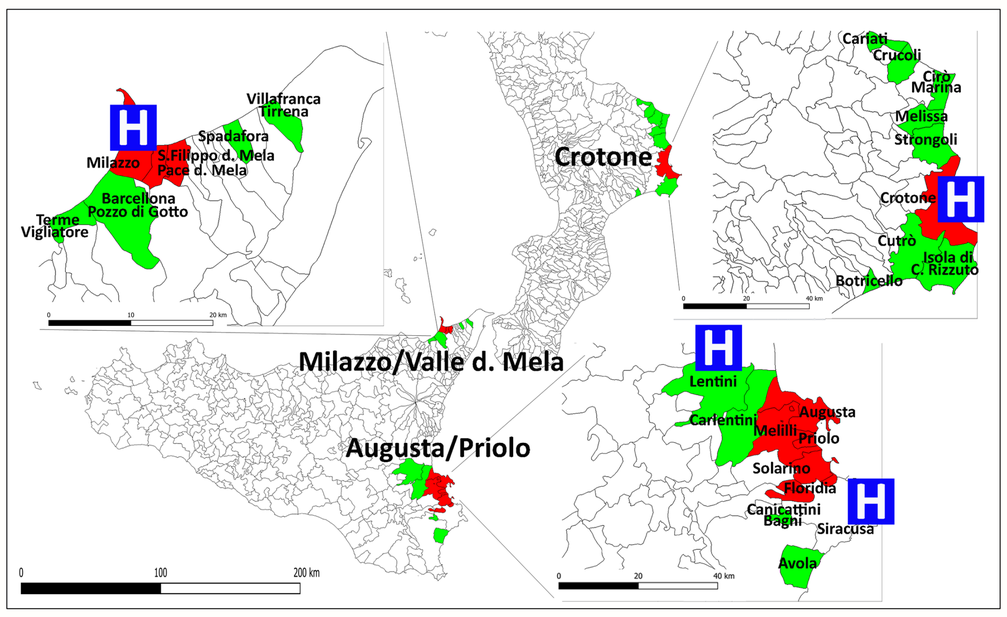

Figure 2. The study areas of the CISAS project and NEHO cohort

Placental transcriptome is studied in order to explore the interference of toxicants on the role of the placenta in maternal/fetal interplay.

Regular follow-up is planned at 6, 12, and 24 months.

Moreover, in collaboration with ISAC and IASI, we will estimate the exposure of pregnant women in relation to the trimesters of pregnancy and the possible association with the outcome of childbirth (Figure 3).

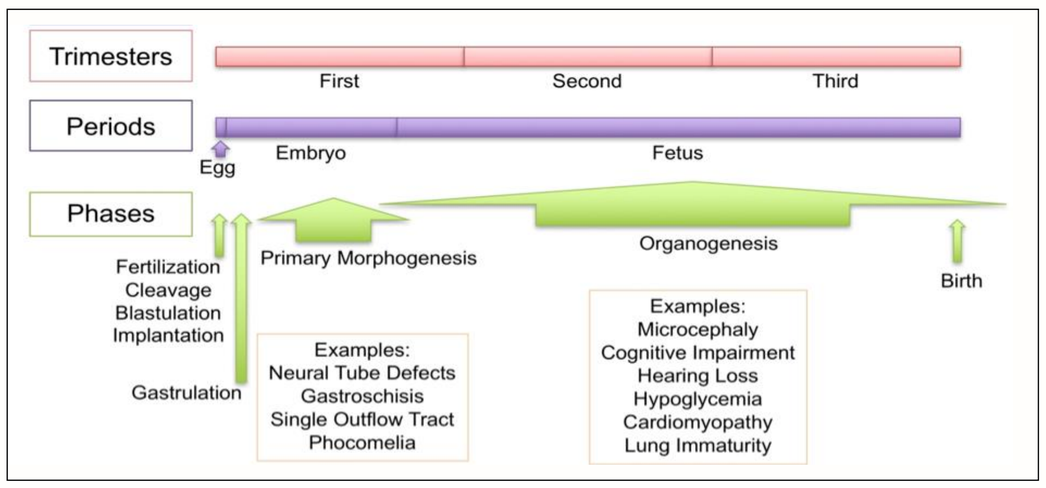

Figure 3. Scheme of toxicants exposures and their possible effects in the three different pregnancy trimesters.

NEHO cohort will provide new insights into toxicant transfer routes from the environment to the human fetus. Particular attention will also be paid to the possible interaction between environmental exposures and the low socioeconomic status which often characterizes the investigated population. Moreover we will characterize placental transcriptome in relation to maternal toxicant exposure to discover specific placental informative biomarkers of fetal exposure.

www.neho.it
www.cisas.cnr.it