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«How do lifestyle and environment of previous generations impact on the health of our children today?»

The concept that pregnancy is a critical time window with regard to future health and disease, is established and impacts on public health policies. Mechanistic research and animal models suggests that environmental exposures may also have impact across generations, both intergenerationally through direct effect on germ cells and transgenerationally by epigenetic inheritance. Scarce human studies, partly with historic exposure assessment, support this concept. However, human studies are a challenge since generations span decades.

The RHINESSA multi-generation multi-centre study (www.rhinessa.net) has been established in order to meet this challenge. The study is based on the ECRHS (www.ecrhs.org) and RHINE (www.rhine.nu) studies, which are population-based longitudinal studies of young adults followed over 20 years, during a time period in which the study participants have got thousands of offspring. The RHINESSA investigates the offspring of the ECRHS and RHINE participants, as well as their parents and offsprings' offspring – thus covering four generations born since 1898 and until today. By today, more than 12000 persons has been investigated by questionnaire and >2000 with clinical measurements, from Norway, Denmark, Sweden, Iceland, Estonia, Spain and Australia. The Nordic countries with excellent national registries provided a unique setting for such a study.

We find that smoking in young boys, starting before the age of 15 years, is associated with asthma and lower lung function in future offspring – this finding is now confirmed in four study populations. Grandmother's smoking, maternal as well as paternal, also appears to be of importance for asthma. Very preliminary results suggests that father's smoking may impact on DNA methylation in offspring, and we speculate that smoking in male puberty could possibly impact offspring health through epigenetic effects on germ cells. Obesity in male puberty also appear to increase asthma risk in future offspring.

Our early results suggest that the preconception environment is of importance for health and disease, that the intrauterine environment may be important for several generations, that fathers' environment might possibly be as important as mothers' environment for the health of future generations, and that early adolescence may be a particularly important susceptibility window in men.

With further evidence, this research should have profound impact on policies, focusing resources to improved conditions in adolescence as well as pregnancy, with relevance for health services as well as school systems, regulations on foods, the built environment, etc etc.