

Prenatal exposure to polyunsaturated fatty acids and child health

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Valorization addendum

Among the health issues that the youth of today is facing in developed countries, obesity and allergic disease are two of the most serious ones, with life-long consequences. Indeed, the European Commission classifies childhood obesity and allergy as two chronic conditions of major public health importance.¹ It is estimated that around 50 million girls and 74 million boys worldwide are currently obese, while 213 million children are in the range of overweight, but below the obesity threshold.² Moreover, according to the most recent estimates, approximately 1 in every 10 children aged 14 years or less worldwide suffer from asthma.³ Hence, there is an urgent need to identify modifiable determinants that can be targeted for preventive strategies. Such strategies are likely to bring substantial benefits over the whole lifespan (Figure 10.1).

Relevant statements from stakeholders:



Council conclusions on prevention, early diagnosis and treatment of chronic respiratory diseases in children, 2011:
 "...conditions before birth and in early childhood influence health in adult life; therefore it is important to protect pregnant women and children against negative influences of environmental factors..."



Global action plan for the prevention and control of noncommunicable diseases 2013-2020:
 "Opportunities to prevent and control noncommunicable diseases occur at multiple stages of life; interventions in early life often offer the best chance for primary prevention".



European guidelines on cardiovascular disease prevention in clinical practice 2016:
 "There is consensus in favour of an approach combining strategies to improve CV health across the population at large from childhood onward..."

Figure 10.1. Stakeholder statements on the importance of noncommunicable disease prevention in early life.

Our work strengthens the evidence that nutrition during pregnancy, which is a highly modifiable lifestyle factor, can influence child obesity and asthma. We focused on prenatal polyunsaturated fatty acid concentrations and fish intake, for which previous research has yielded largely inconsistent results (see Chapter 1), thus limiting health risk assessments. Our work has relevance for a number of policy documents including the European food Action Plan 2015-2020⁴ and the European policy framework Health 2020⁵, both of which underscore the importance of providing healthy food and nutrition across the lifecourse as a means for promoting population health. Moreover, it addresses the recent European Council's conclusions towards halting childhood obesity, which highlight the need for further research to understand the drivers of childhood overweight and obesity to explore approaches to a healthy diet across the life course.⁶

Potential end-users of our research can be identified at various ecological levels: individual level (e.g. parents, future parents), community level (e.g. physicians,

local communities), national level (food industry, think-tanks, public health institutes), European and international level (e.g. patient organizations, food industry, EFSA, WHO, Schools for Public Health Europe).

Claims about the numerous potential health benefits of omega-3 fatty acids have contributed substantially to the increase of the global omega-3 supplement market, with its value being estimated at around USD 33.04 billion in 2016.⁷ Our findings on n-3 long-chain PUFA supplementation in the perinatal period (Chapter 2) and those on cord blood PUFA biomarker levels (Chapters 3, 4, and 5), in addition to findings of other studies, may have implications for productive and commercial activities used by the food industry.

Nutrient-based studies using biomarker levels may provide more insight on mechanistic pathways through which food products containing numerous nutrients can affect health and development. In our studies on cord blood PUFA biomarker levels, we did not have information on prenatal dietary intake so as to unravel the amount of dietary PUFAs or PUFA-containing foods (see Chapter 1) needed in order to achieve a change in biomarker levels. Together with prior research findings, our results could jointly be used for formulating dietary recommendations for pregnant woman. Currently, a number of health or patient organization produce such recommendations, including but not limited to the World Health Organization (WHO), Health Council of the Netherlands,⁸ Greek Institute of Preventive Medicine, Environmental and Occupational Health (Prolepsis),⁹ U.S. Department of Health and Human Services and U.S. Department of Agriculture,¹⁰ and Public Health England.¹¹

In 2015, the European Food Safety Authority (EFSA) in its statement on the benefits of fish/seafood consumption compared to the risks of methylmercury in fish/seafood concluded that pregnant women should consume up to 3-4 servings of fish per week.¹² In January 2017, the US Food and Drug Administration (FDA) and Environmental Protection Agency (EPA) issued their final updated advice on fish consumption for women of childbearing age, encouraging women who are pregnant, breastfeeding, or likely to become pregnant to consume more fish, but no more than 3 servings/week.¹³ Notably, fish advisories have focused on the potential neurocognitive harms associated with exposure to methyl-mercury but have not considered other childhood outcomes, including obesity and asthma, areas where evidence is generally quite limited. Hence, our international studies on fish intake during pregnancy aimed to address this knowledge gap (Chapters 7 and 8). Our findings that fish intake of more than 3 times per week during pregnancy is associated with an increased risk of rapid infant growth and childhood overweight/obesity are in line with the limit proposed by FDA and EPA, but not with the EFSA conclusion.

We used a wide range of tools to disseminate knowledge generated from this work (Figure 10.2). We published our work in leading international fully peer-reviewed journals and one book chapter to increase awareness and communicate our study findings within the scientific community. Our study results were also presented at the Dutch Epidemiological Society (WEON) conferences (2014, 2015, 2016), with an audience consisting mostly of researchers and clinicians. Moreover, we showed our results to The Obesity Society (TOS) Obesity Week (2015), the International Society for the Study of Fatty Acids and Lipids (ISSFAL) congress (2016) and the Euro Fed Lipid Congress (2016), in which food industry had also an active participation. Additionally, we developed the MEFAB birth cohort website (www.mefab.org), with links to specific pages for scientific and non-scientific audiences. An example of the latter is a page (www.mefab.org/wist-je-dat) that explains in lay language the health issues surrounding early-life nutrition and our most recent research findings. Furthermore, we developed a documentary about the paradigm of “developmental origins of health and disease” and the contribution of the MEFAB cohort in this research field (<https://youtu.be/Bc6MEAULY08>). Given that social media constitute an effective way of reaching the lives of many people and sharing knowledge nowadays, we created social media accounts (Facebook, twitter) for the MEFAB cohort, where we disseminated knowledge generated from this work in a simple and direct way. Furthermore, our findings on fish intake during pregnancy and childhood growth and obesity received international press coverage, being mentioned in prominent news media including but not limited to CNN (<http://cnn.it/2hxe43l>), Reuters (<http://reut.rs/2jAPrQv>), and TIME (<http://ti.me/1PMES7S>).

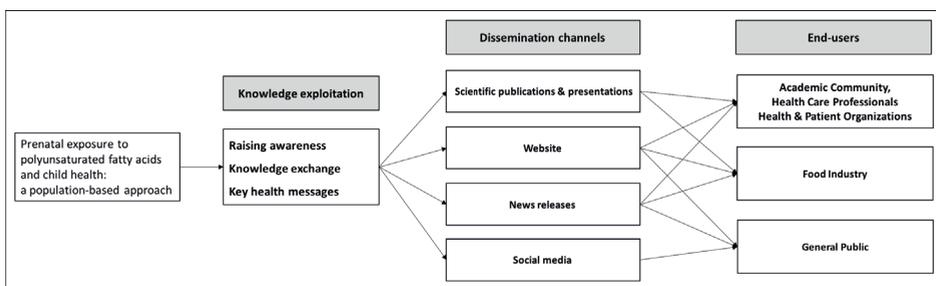


Figure 10.2. Dissemination channels used for our work and potential end-users.

To conclude, our work focused on childhood obesity and asthma, which constitute public health priorities, and therefore, has major potential for translational utilization. It examined the influence of two highly modifiable lifestyle factors (PUFA levels and fish intake) during the prenatal period, which is critical period

of developmental plasticity. Evidence from this work are positioned to inform (future) parents for dietary advice, and better policy- and decision-making for public health interventions. Interventions specifically targeting this early-life period are considered to have a large and long-lasting impact across the life course, and thus, give substantial long-term social and economical returns on investment.