

The role of human milk in the developmental origins of health and disease

Associate Prof Donna Geddes

Faculty of Science, The University of Western Australia, Crawley, Western Australia 6009

Chronic noncommunicable diseases (NCDs), have reached epidemic proportions and as a consequence the UN has assembled an interagency task force dedicated to the prevention and control of NCDs. Recent statistics place the number of deaths per year from NCDs at more than 38 million, 16 million of which are classed as premature (before 70 years of age). In order of incidence, heart disease, cancer, respiratory disease and diabetes account for 82% of all deaths from NCD.

The development of many NCDs is linked to prenatal and antenatal nutrition. Evidence is mounting that environmental factors during pregnancy, lactation, and early childhood impact physiological, structural, immune, metabolic, and behavioral development. Thus, this life period, from conception through the first years of infancy, offers a window of opportunity for intervention to reduce development of later NCDs.

Different modes of early nutrition show vast differences in the growth and development of the infant as well as susceptibility to disease both in the short and long term. It is not clear whether metabolic derangements, psychosocial factors, or both cause these differences.

Human milk is the natural species-specific nutrition for human infants and contains a multitude of bioactive molecules including hormones, growth factors, neuropeptides, and anti-inflammatory and immunomodulatory agents, many of which have multiple functions and work in concert. Human milk provides not only the ideal nutrition for infants, but also the components of milk affect multiple physiological systems.

Breastfeeding is associated with a lower risk of developing metabolic syndrome, which predisposes individuals to developing diabetes (type 1 and 2) and cardiovascular disease (CVD). Recent data suggest the quality and/or type of fat consumed by infants may be integral to this effect, suggesting that the protective effect of breastfeeding is mediated through this pathway. Further, breastfeeding for longer than 6 months appears to provide increase protection from metabolic syndrome.

Obesity is linked to both metabolic syndrome and almost all NCDs. Breastfeeding is associated with a reduction in the risk of obesity (7 to 11%) despite rapid changes in nutrition and environment. Several factors have been considered to contribute to this effect including milk composition, slower growth of the breastfed infant and the mode of feeding (direct breastfeeding compared with bottle feeding expressed milk). With respect to milk composition fat, protein and carbohydrates have all been associated with risk of NCD. Relatively newly-discovered appetite control hormones in milk (e.g. leptin and ghrelin) have also been implicated in the favorable growth trajectory of the breastfed infant and the early development of appetite regulation.

Less well-known benefits of lactation are those for the mother, including short-term effects such as more rapid uterine involution, weight loss postpartum and lactational amenorrhea. Longer-term effects such better metabolic profiles and lower risk of cardiac disease, lower risk of breast and ovarian cancer and are also prevalent and often dose dependent.

Early life is an ideal time to intervene to reduce the incidence of NCDs. When the infant and maternal advantages of lactation are considered together, the promotion and continued support of breastfeeding is arguably one of the most cost effective prevention strategies available.