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Title: MiRNAs in breast milk for premature and mature babies

Principal Investigator: Shimon Reif

PI's Institute: Hadassah Medical Center

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ABSTRACT

Background: Milk is the main nutritional source for newborn mammals and breastfeeding is recognized as one of the most valuable contributors to infant health. Moreover, there are evidences to support that breastfeeding protects from neonatal necrotizing enterocolitis and other infections. Milk components have been reported to exert biological effects on the neonatal small intestine and neonatal intestinal epithelial cells and provide protection against early infections in neonates. Milk was found to contains exosomes, which are membranous vesicles packaging proteins, mRNA and microRNAs (miRNAs). Micro RNA are small RNAs involved in post transcriptional regulation of targets RNAs and play crucial role in regulating a wide range of cellular functions such as cell differentiation, proliferation and cell death. Milk miRNAs were found to be stable to acidic conditions and resistant to RNase or freeze-thaw cycle degradation, tempting us to speculate that these miRNAs have the ability to transfer from the mother's milk and to affect the infant intestine and immune system development.

Research Hypothesis: previous finding of miRNAs presents in milk, triggered the hypothesis that these miRNAs may regulate immune-related mRNA expressions and contributes to infant's intestinal maturation

Aims: Therefore, our aims are: 1. To diagnoses miRNAs profile of human milk at different time points after delivery; 2.To compare miRNAs expression in human milk from mother of premature infants and full term babies; 3.To investigate miRNAs expression in bovine and goat milk and to examine miRNAs expression in different infant formulas.

Methods: We perform Analysis of the profile expression of miRNA in human breast milk, bovine and goat milk by next generation sequencing (NGS).

Results: We found the profile expression of the miRNA in milk exosomes and fat globles, of 20 mothers of term and pre-term babies at different time of lactation. We found that miRNAs related to immune system development and diseases prevention such as 148a-3p have different levels of expression at different periods of lactation.

Discussion and Conclusions: This study will determine the profile expression of miRNA in milk from different sources and also the differences of the profile miRNA expression in the whey fraction of the milk compared to the fat fraction in each case. From this analysis we expect to found miRNA expressed in a different manner in human, cow, goat and infant formulas. These miRNAs can regulate target genes with potential molecular and physiological functions, which might account for the observed nutritive and immunity-based benefits that breast-fed infants are known to receive. Moreover, this study may assist us in developing new formulas that are closer to human milk to nourish our children.

Key words (Up to 5): miRNA, preterm, milk, breastfeeding



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Publications associated with the project (PubMed Format):

1. Shiff YE, Reif S, Marom R, Shiff K, Reifen R, Golan-Gerstl R. MiRNA-320a is less expressed and miRNA-148a more expressed in preterm human milk compared to term human milk. *J Funct Foods*. 2019;57:68-74. doi:10.1016/j.jff.2019.03.047
2. Golan-Gerstl R, Elbaum Shiff Y, Moshayoff V, Schecter D, Leshkowitz D, Reif S. Characterization and biological function of milk-derived miRNAs. *Molecular Nutrition and Food Research*. <http://doi.wiley.com/10.1002/mnfr.201700009>. Published July 31, 2017. Accessed October 4, 2017.