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Consumption of probiotic *Lactobacillus rhamnosus* (MTCC:5897) fermented milk plays a key role on newborn mice immune system development and alleviates ovalbumin induced allergic sensitization during suckling-weaning transition

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At birth, the newborn's immune system is immature though it consists essentially of the innate and adaptive immune system. As all newborns are born with Th2 biased immune response and it must be a rapidly down-regulated postnatally otherwise it will lead to uncontrolled inflammatory consequences with the onset of allergy. Neonatal is a critical period for the development of immunological memory, while the T helper (Th) balance shifts from the Th2-skewed immunity to Th1-cell type responses under the influence of genetic and environmental factors. Thus, early infancy is the critical period for immune system development when offspring not only rely on their own immunity to combat food born antigens but also acquire it through maternal sources (via transplacental routes and breast milk). The acquisition of passive immunity through breast-feeding may influence the newborn immune system development. Hence the present study was designed to evaluate the effect of probiotic fermented milk (PFM) prepared with *Lactobacillus rhamnosus* (MTCC 5897) on offspring after its administration either to mothers during suckling period or to their offspring after weaning separately otherwise subsequently. Enzymes (β-galactosidase, β-glucuronidase) in peritoneal fluid and nitric oxide production in culture supernatant of activated macrophages. Further, remarkably ($p<0.01$) reduced levels of inflammatory markers (TNF-α, MCP-1) and allergic antibodies (total and milk specific IgE) were observed in offspring where PFM was fed either to them or to their mothers. However, considerably increased ($p<0.05$) levels of SIgA in gut of animals were assessed in control and experimental groups irrespective of their exposure to probiotic fermented milk. Restoration in Th1/Th2 homeostasis has further confirmed the useful effects of PFM supplementation by shift in cytokine profile (IL-4, IFN-γ and IL-10) with increased IFN-γ/IL-4 and reduced IgE/Ig2a ratios. The anti-allergic effects have also been established in newborns mice on feeding probiotic *Lactobacillus rhamnosus* fermented milk against ovalbumin (OVA) induced allergy. Consumption of PFM by mothers and offspring showed a reduction ($P<0.01$) in physical allergic symptoms in newborns with an increase ($P<0.01$) in numbers of goblet and IgA+ cells in the small intestine. Similarly, considerable ($p<0.001$) decrease in OVA specific antibodies (IgE, IgG, IgG1), ratios of IgE/IgG2a and IgG1/IgG2a in the sera of newborn mice was recorded. A decrease in IL-4 and an increase in IFN-γ levels further confirmed the shift from Th2 to Th1 pathway in PFM fed mice. Hence, it is logical to conclude that the administration of *Lactobacillus rhamnosus* (MTCC 5897) fermented milk to mothers during suckling period and to their offspring after weaning has beneficial effects on newborn's immune system development. Likewise, the timing of probiotic fermented milk intervention in alleviating allergic symptoms was found to be more effective when mothers were fed during suckling period.

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