

Leukaemic inhibitory factor in human milk

Human milk provides the breast-fed infant not only with nutrients, but also furnishes a wide array of molecules that restrict microbes and kill all transformed cells¹. Among the many bioactive substances^{2,3} detected in the human milk that have immunomodulatory potential are cytokines such as TNF α , IL-1 β , IL-6, IL-8, IL-10, IL-12, TGF- β and IFN- γ . Leukaemia inhibitory factor (LIF) has not previously been detected in human milk. This cytokine has been shown to exert pleiotropic biological activities⁴ shared with IL-6. LIF was initially isolated as a cytokine with the ability to induce macrophage differentiation of murine myeloid leukaemia cells¹. Cytokine also plays an

important role in inducing differentiation and growth inhibition in leukaemic cells and differentiation in embryonic stem cells¹. LIF production can be enhanced by cytokines (IL-1 β , TNF α or TGF- β) released by activated macrophages, T-lymphocytes, astrocytes and endothelial cells at the sites of inflammation⁴.

Based upon these studies, an attempt was made to explore whether or not human milk contains LIF. Milk samples (2–5 ml) were collected from ten mothers (at 8 to 12 weeks postpartum) who planned to breast-feed for at least 12 weeks and who had delivered healthy term infants. All samples were stored at 4°C and processed within 2 h of collection. After centrifugation at 690 g for 20 min, the aqueous phase was collected and stored at –80°C until analysed for the cytokine (LIF) content. The protein fraction from each sample was subjected to SDS-PAGE followed by Western blotting and immunodetection procedure⁵, using specific antibodies (obtained from Santa Cruz Biotechnology Inc., USA) for human LIF. The results revealed that LIF was present in all the samples tested (Figure 1). The immunoblot pattern unambiguously shows the presence of mature form of human LIF that is known to be a highly glycosylated molecule, varying in molecular weight from 19 to 67 kDa (Figure 1).

The presence of LIF in human milk may have broad implications for the recipient infant. LIF plays a major role in the host response to inflammation, tissue injury and septic shock. LIF

mRNA is constitutively expressed in human foetal lung, fibroblasts, human umbilical vein endothelial cells and human bone-marrow cells. We propose that supply of exogenous LIF from milk of breast-feeding mother may protect the recipient child against degenerative diseases, especially atherosclerosis⁶. However, further investigation is required to test such a possibility.

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D. KAUL*
JOGENDER SINGH

*Department of Experimental Medicine
and Biotechnology,
Post Graduate Institute of Medical
Science and Research,
Chandigarh 160 012, India*
*For correspondence.

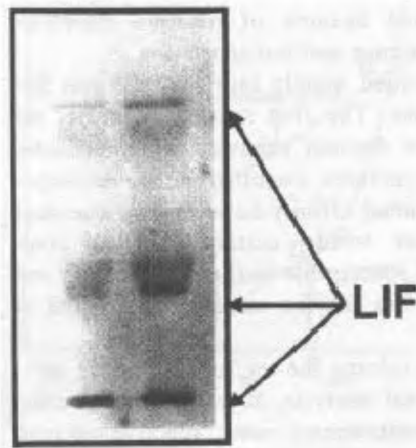


Figure 1. Representative Western-blot showing the presence of leukaemia inhibitory factor (LIF) in human milk. The same pattern (varying in its molecular weight from 19 to 67 kDa) was observed in all the milk samples tested.