人奶或上皮生長因子對人腸細胞生長的影響及可能之機轉

Effects and Mechanism of Human Milk or Epidermal Growth Factor on Cell Growth in Human Colon Adenocarcinoma (Caco-2) Cells

中文摘要

為研究母乳中的上皮生長因子(epidermal growth factor，EGF)對人類腸道生長發育的影響，先收集的 20 件台北地區產後 8--20 天母乳樣本，以酵素免疫分析法 (enzyme linked immunosorbent assay，ELISA)定量其 EGF 平均濃度約為 7.5 nM，再以 人類結腸腺癌細胞 Caco-2 為模型，分別添加 5%人奶及相當於 5%人奶生理濃度 EGF (0.375 nM，0.05x EGF)、人奶生理濃度 EGF(7.5 nM，1x EGF)以及控制組 4 組，培養 0、1、3、12、24、36、48 小時，觀察人奶及 EGF 對 Caco-2 細胞生長的影響，及其生長 調節作用與 c-Jun 表現之關係。 結果發現：細胞總數方面，與 0 小時控制組比較，5%人奶組培養 24 及 36 小時細胞數 顯著增加；1x EGF 組培養 12 小時細胞數即開始明顯增加，36 小時幾乎可倍增。12 小時 培養後，5%人奶、0.05x 及 1x EGF 組細胞 RNA 含量分別比控制組增加 62%、20%、40%， 細胞 DNA 含量分別比控制組增加 21%、18%、30%，細胞蛋白質含量分別比控制組增加 32% 、35%、67%。促進 c-Jun 表現方面，5%人奶組於 12 小時最強（為 0 小時控制組 6.9 倍）， 0.05x 及 1x EGF 組於 12 小時後漸增、36 小時最強（分別為 0 小時控制組 6.9 及 5.4 倍）。

故人奶與 EGF 均可能經由增加 c-Jun 表現之路徑，促進腸細胞之生長，且 EGF 與人奶 的效果相近，推論人奶中主要影響腸細胞生長的因子為 EGF，未來值得再研究 EGF 應用 腸道發育尚未完整的早產兒或低體重初生兒。

英文摘要

To investigate the effects of epidermal growth factor (EGF) in human milk on growth and development of human intestine, the mean concentration of EGF (7.5 nM) in twenty collected human milk samples from 8-20 days postpartum in Taipei was determined by enzyme linked immunosorbent assay (ELISA). Furthermore, the effects of human milk or EGF on growth of human intestinal cells, and the relation between growth regulation and c-Jun expression were studied after the addition of 5% human milk, 0.375 nM EGF (relevant to EGF concentration in 5% human milk, 0.05x EGF), or 7.5 nM EGF (relevant to EGF concentration in human milk, 1x EGF) for 1, 3, 12, 24, 36, and 48 h. The results showed that the cell numbers were significantly increased after 24 and 36 h in the 5% human milk group as compared to the control group at 0 h. Whereas the 1x EGF group had significantly greater cell numbers after 12 h, and almost had twice cell numbers after 36 h. After 12 h incubation, cellular RNA content was increased by 62, 20, and 40% in the 5% human milk, 0.05x EGF, and 1x EGF groups, respectively. Cellular DNA content was elevated by 21, 18, and 30% in the 5% human milk, 0.05x EGF, and 1x EGF groups, respectively. Cellular protein content was raised by 32, 35, and 67% in the 5% human milk, 0.05x EGF, and 1x EGF groups, respectively, as compared to the control group. The 5% human milk group had the greatest c-Jun expression (6.9 times of the control group at 0 h) after 12 h, whereas, the 0.05x and 1x EGF groups tended to increase c-Jun expression after 12 h and reached to the greatest (6.9 and 5.4 times of the control group at 0 h, respectively) after 36 h. In conclusion, both human milk and EGF may enhance the growth of intestinal cells through an increase in c-Jun expression, and the effectiveness was similar between human milk and EGF. Therefore, the factor affecting intestinal growth was mainly contributed by EGF. In the future, the application of EGF to the immature development of intestine in preterm or low-birth-weight infants is required further studies.