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Calcium effect on gene expression of proteins involved on iron absorption by Caco 2 cells

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Abstract

Calcium is the only dietary factor that affects both non-heme and heme iron absorption in humans. Mechanisms behind this effect are not elucidated. An hypothesis is that calcium may modify gene expression of proteins involved in iron absorption. An interesting experimental model for evaluating this effect is the human cell line Caco-2, which is easy to use and produces results that strongly correlate with the absorption of iron in humans

Objective

To evaluate the effect of calcium on expression of proteins involved on both heme, and non-hemeiron absorption by Caco-2 cells.

Methodology

Caco-2 cells were seeded by 1h in a 2 μM de iron solution (ferrous sulfate) and calcium (chloride); calcium: iron molar ratios 0:1 to 1000:1. Iron absorption was determined by ferritin method, and gene expression by qRT-PCR. Changes in ferritin and gene expression were reported as increment respect to a control

(calcium: iron molar ratio=0:1). Differences between experimental conditions were evaluated by a *one-way ANOVA* test; $p<0.05$ was considered significant.

Results

Calcium does not affect iron absorption. Calcium increases genes involved in non-heme iron uptake: DcytB ($p=0.003$), and DMT1 ($p=0.016$). Otherwise, calcium decreases genes involved in heme iron uptake: HCP1 ($p=0.002$), and HMOX-1 ($p=0.012$). Expression of FPN gene (efflux protein for both heme, and non-heme iron) decreased by calcium exposition ($p<0.0001$).

Conclusion

The calcium effect of calcium on expression of gene involved on heme, and non-heme iron uptake is opposite. Nevertheless, it decreases FPN expression which is the only protein involved on two iron types efflux from the enterocytes. This effect may explained the negative effect of calcium on iron absorption previously described in humans.

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