Vitamin A deficiency aggravates iron deficiency by upregulating the expression of iron regulatory protein-2.

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OBJECTIVE: The aim of this study was to investigate the mechanism between vitamin A deficiency and anemia.

METHODS: In this study, we performed animal and in vitro experiments to investigate the effect of vitamin A deficiency on iron regulator protein-2 (IRP2). In animal experiments, four parallel groups of rats were fed a control diet, a diet completely deficient in vitamin A, a diet marginally deficiency in vitamin A, and a diet marginally deficient in iron and vitamin A, respectively, for 8 wk. In the in vitro experiments, the primary hepatocytes were acquired from the livers of vitamin A- and iron-depleted rats. Ferritin (Fn), transferrin receptor (TfR), and IRP2 mRNA were measured by semiquantitative reverse transcription polymerase chain reaction.

RESULTS: As expected, a decrease in the serum retinol concentration and an imbalance of iron metabolism existed in the vitamin A-deficient rats. The IRP2 mRNA level of the rats in the test groups was approximately two times that of the control group, whereas the Fn mRNA level and the TfR mRNA level were downregulated and upregulated, respectively, by the vitamin A deficiency. In the in vitro experiments, all-trans-retinoic acid induced a decrease of the IRP2 mRNA level in hepatocytes, whereas the Fn, TfR, and IRP2 mRNA levels regulated by all-trans-retinoic acid were reversed by the vitamin A receptor blocker Ro41-5253.

CONCLUSION: Taken together, our results indicate that vitamin A is involved in the regulation of IRP2, subsequently affecting iron metabolism gene expressions, such as Fn and TfR. Investigating the mechanistic connection between vitamin A and iron metabolism would be helpful to characterize the importance of this nutrient-nutrient interaction.

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