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## Introducing fish as an animal model to study insulin-induced hypoglycemic coma

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**Introduction:** In spite of physiologic differences with mammals, fish shows many similarities in the metabolism of nutrients with mammalian species. In this study, the clinical manifestations of hypoglycemic shock, induced by insulin, were studied on Guppy fish as an experimental model. **Materials & Methods:** Fifty adult Guppy fish of either sex were kept under controlled conditions with de-chlorinated tap water, commercial feed, and sufficient oxygenation. Three concentrations of two different forms of insulin (regular and NPH; 2, 4, 6 IU/ml) were added to water, and fish were transferred to these buckets. Effects of insulin, including an early hypermotility and a later hypomotility, immobility, and coma were observed and recorded. **Results:** NPH insulin did not produce a reliable effect in a reasonable period of time at concentrations up to 6 IU/ml. However, regular insulin was able to produce clear effects in the fish. Within 60 min after administration, 4 IU/ml of regular insulin produced immobility only in 1 fish out of 6. However, 6 IU/ml of this compound affected all fish in the group so that within  $25.13 \pm 1.47$  min all animals showed manifestations of immobility and coma. They returned to normal situation in less than 5 min after being transferred to insulin-free water. **Conclusion:** Guppy fish seems to be a good model in the research activities on insulin physiology and pharmacology. Due to the ease of administration of drugs and lower expenses of purchase and keeping, Guppy may be considered as an alternative to laboratory animals in this field of scientific work.

**Keywords:** Fish, Guppy, Insulin; Coma, Hypoglycemia

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## Synergistic effect of magnesium with insulin in Guppy fish

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**Introduction:** Magnesium salts are expected to cause muscle paralysis due to an antagonistic effect with calcium and, therefore, inhibition of acetylcholine release in the neuro-muscular junction. Insulin, on the other hand, may lead to immobility in the animal because of hypoglycemic shock. In the present study, we aimed at investigating a possible interaction between magnesium and insulin in the fish. **Materials & Methods:** Twenty four adult Guppy fish of either sex were divided into 4 groups of 6 each. They were kept under controlled conditions with de-chlorinated tap water, commercial feed, and sufficient oxygenation. Effect of MgSO<sub>4</sub> alone was studied preliminarily on the fish. Group one received regular insulin in water at a concentration of 6 IU/ml. Groups 2, 3, and 4, received in addition to insulin concentrations of 1%, 5%, and 10% of MgSO<sub>4</sub>, respectively. **Results:** Surprisingly, even very high concentrations of MgSO<sub>4</sub> (up to 20%) did not lead to immobilization on the fish. Incubation with insulin alone caused immobility and coma in all animals in  $25.13 \pm 1.47$  min). Simultaneous application of 1%, 5%, and 10% MgSO<sub>4</sub> decreased the time needed to cause coma to  $16.08 \pm 1.79$  min,  $7.06 \pm 0.93$ , and  $4.77 \pm 0.51$  min, respectively ( $P < 0.05$  for all 3 groups compared with group 1). Effect of MgSO<sub>4</sub> had a negative correlation with the time of coma ( $r = -0.892$ ). **Conclusion:** Although an increased concentration of magnesium in medium does not affect the physical activity of the fish, lower concentration of this substance shows a significant synergism with the effect of insulin. It is concluded that an altered status of magnesium in the body may affect the response of diabetic patients to insulin-therapy.

**Keywords:** Fish, Insulin; Diabetes mellitus, Hypoglycemia, Magnesium