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The mechanism of diabetes-associated Heinz body anemia in cats

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The complication of diabetes also occurs in animals. Recently, diabetes-associated Heinz body anemia was reported in cats. The purpose of the present study is to clarify the mechanism of diabetes-associated Heinz body anemia in cats, and to show a novel index for glycemic control in diabetic cats.

The concentrations of plasma glucose and fructosamine in diabetic cats and dogs were significantly higher than those in clinically normal cats and dogs. Heinz body count in diabetic cats was significantly higher than that in normal cats, while there was no significant difference between those of diabetic and normal dogs. There were significant positive correlations between plasma glucose concentration and Heinz body count, and between plasma fructosamine concentration and Heinz body count. In addition, negative correlations between Heinz body and erythrocyte counts, and between Heinz body count and hematocrit value were recognized in diabetic cats.

Superoxide dismutase (SOD) activity in erythrocytes was significantly lower in diabetic cats than that in normal cats. The activities of the antioxidant enzymes in erythrocytes: catalase (CAT), glutathione peroxidase (GSH-Px), glutathione S-transferase (GST), NADH methemoglobin reductase (MR) and FAD-independent

glutathione reductase (GR) were significantly higher in diabetic cats than those in normal cats. In diabetic dogs, only the activity of GR in erythrocytes was significantly higher than that in normal dogs, besides SOD activity in erythrocyte significantly lower in diabetic dogs than that in normal dogs.

The production rate of a superoxide (O_2^-) was measured using erythrocytes from normal cats, dogs and human beings. As the result, the increase of glucose concentration (5–30 mM) in the incubation medium led to the increase of the production rate of O_2^- in feline erythrocyte. The increase of O_2^- observed in feline erythrocyte was not influenced by several inhibitors of glycolytic and polyol pathway. In addition, the activity of erythrocyte SOD decreased significantly at one hour after the onset of incubation with a high concentration of glucose.

These results suggest that a high concentration of glucose causes the decrease of SOD activity and the production of O_2^- in erythrocytes, which could be responsible for diabetes-associated Heinz body anemia. In addition, Heinz body count, erythrocyte count and hematocrit value, and the activities the antioxidant enzymes may be useful indexes for glycemic control in diabetic cats.