Metabolome study on canine insulin resistance and diabetes onset

（犬におけるインスリン抵抗性と糖尿病発症に関するメタボローム研究）

Abstract

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Canine diabetes is classified as type 1 diabetes in human needing the insulin dosage of the life for treatment. Type 2 diabetes by the insulin resistance caused by the obesity is common in human, and it is thought that diabetes onset mechanism is greatly different from a dog in human. The aims of this study are to analyse a characteristic of the diabetes onset in the dog, and discover the differences between the hyperadrenocorticism (HAC) dog and the obesity dog. In this study, the metabolome analysis mainly performed on the above characterisation.

Serum BCAA decreased with serum insulin increase in the normal dogs, and the decrease of BCAA showed what was taken in a cell depending on insulin. In canine myotube-like cells which added dexamethasone, because intracellular BCAA in comparison with control group significantly decreased, it is suggested that insulin resistance increased. Furthermore, in canine myotube-like cell which added dexamethasone, glucose uptake ability was inhibited, and a catabolic reaction of the glucose tended to decrease. Also the decrease of glucose catabolic reaction was shown by the analysis result of the metabolites of canine peripheral blood mononuclear cells which added dexamethasone. On the other hand, with canine myotube-like cells which added TNF-α, β-amino-isobutyric acid reinforcing insulin sensitivity significantly increase, and it is thought that it is action to compensate insulin resistance. In addition, serum metabolites of HAC group and the Obesity group compared it with the Control group, and serum BCAA showed significantly high value. This suggests that insulin resistance generated in comparison with Control group in both groups of HAC group and Obesity group, but in the HAC group, the decreased of serum glutamine which is an index of the insulin hyposensitivity and gluconeogenesis sthenia were showed in comparison with Obesity group.

Difference of these metabolites which it is recognized for HAC, but are not recognized for the obesity shows the cause that the HAC of the dogs leads to the diabetes onset, and the cause that the obesity of the dogs does not lead to diabetes. Thus, these results may be useful for further study of the diabetes onset mechanism in dogs. In addition, it is thought that the metabolome study using the cultured canine skeletal muscle cells is useful means to parse diabetes onset mechanism peculiar to the dogs.