Changes in plasma free amino acids concentration in dogs with cancer

Abstract

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Cancer is the leading cause of death in humans and dogs in Japan. Up to the present date, a great deal of clinical examination and therapy of cancer has been investigated. In particular, early detection and treatment of cancer are recognized as important challenges. Recently, analysis of plasma free amino acids (PFAAs) using liquid chromatography-mass spectrometry (LC/MS) had been developed in human medicine. PFAAs enables risk assessment of multiple types of cancer with only one blood sampling. However, PFAAs have not ever been clinically applied in veterinary medicine. Furthermore, there are few studies investigating the relationship between cancer and PFAAs using an exhaustive analysis. Purpose of the current study was to investigate the changes in PFAAs in dogs with cancer and to obtain new findings showing the relationship between cancer and PFAAs.

We evaluated accuracy and reproducibility of PFAAs using LC/MS in dogs, and excellent accuracy and reproducibility were confirmed. Dietary effects were not observed in PFAAs after postprandial 14 hours. Furthermore, different daily fluctuation between daytime and nighttime was observed in some kinds of PFAAs. We recommend that dogs should be fasted over 14 hours, and blood sampling for PFAAs measurement should be performed in the morning. And the assay should be made as soon as possible after blood collection. Some PFAAs, such as Glycine, which would be consumed in energy production processes, significantly decreased in cancer dogs. The PFAAs that decreased in cancer dogs might be ingested by cancer cells aggressively, and the PFAAs that increased might be produced by protein catabolism, but not used in cancer cells, or produced

in cancer cells and secreted into circulation. Significant increase in some PFAAs related to skeletal muscle metabolism might reflect catabolism of muscle proteins in cancer dogs. In addition, we investigated the difference in PFAAs with each type of cancer. Isoleucine was significantly lower in thyroid cancer and significantly higher in hepatocellular carcinoma. Thus, different PFAAs profiles were observed in different types of cancer. Finally, we investigated the change of PFAAs after chemotherapy in dogs, focusing on transitional cell carcinoma (TCC), because chemotherapy is recommended as treatment of TCC. Significant changes were observed in mean plasma Cystathionine concentrations between before and after chemotherapy. It was suggested that PFAAs is affected by administration of anticancer drugs.

In conclusion, we have performed an exhaustive measurement of PFAAs with different types of cancer and their changes before and after chemotherapy in dogs. We obtained new findings on the relationship between cancer and PFAAs in dogs. The results indicates that the PFAAs assay is useful for early detection and risk assessment of cancer, and the monitoring of treatment in dogs.