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Mini Review

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Effects of dyslipidemia on blood and saliva components in rats

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Abstract

Saliva testing provides considerable information and is noninvasive. Although dyslipidemia alters blood components, its effects on saliva remain unclear. We investigated these changes using a dyslipidemia rat model. Three-week-old male rats were fed with high-fat or control diet for 10 weeks. Blood, saliva, salivary gland, and liver were collected for histological and biochemical analyses. We showed that dyslipidemia causes fatty liver and increases levels of triglycerides and brain-derived neurotrophic factor (BDNF) in blood and saliva, suggesting BDNF regulates lipid metabolism.

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Saliva components provide much information[1], and can be useful as biomarkers of several disorders, similarly to blood[2]. Dyslipidemia causes changes in the components of blood, including triglycerides, leptin, and cholesterol[3]. However, the effects of this impairment on saliva components remain unclear. To determine whether dyslipidemia has an effect on saliva components, we used a rat model of dyslipidemia. For this purpose, we investigated differences in various markers between the two groups of rats, by using biochemical tests.

Male Sprague-Dawley rats (3-weeks-old) were given free access to control or high-fat diet and water (n = 6 per group). All experimental procedures were performed in accordance with the Guideline for Animal Experimentation of Kanagawa Dental University and approved by the Committee of Ethics on Animal Experiments of Kanagawa Dental University (8-200). After 10 weeks of feeding, rats were deeply anesthetized with sodium pentobarbital (50 mg/kg, intraperitoneally), and blood, saliva, and liver were collected for biochemical and histological analyses. The levels of brain-derived neurotrophic factor (BDNF) in the blood and saliva were quantified by using sandwich enzyme-linked immunosorbent assay (ELISA), according to the manufacturer's instructions (ChemiKine™, Cat. No CYT306, MERCK MILLIPORE)[4].

Results are shown in Figure 1. The histological analysis showed that the experimental group (fed with high-fat diet) had a fatty liver, and we detected lipid droplet formation by Oil Red O staining. No changes were observed in the liver of the control group (fed with normal diet). In blood, total protein, HDL cholesterol, LDL cholesterol, triglyceride, leptin, and BDNF ($P < 0.05$) levels were significantly different between control and dyslipidemic rats. In saliva, triglycerides and BDNF levels were significantly higher in the experimental than the control group ($P < 0.05$).

In this study, we established an experimental model for dyslipidemia. The changes in blood biochemical markers, observed in this model, are consistent with the respective human pathology. Our previous study

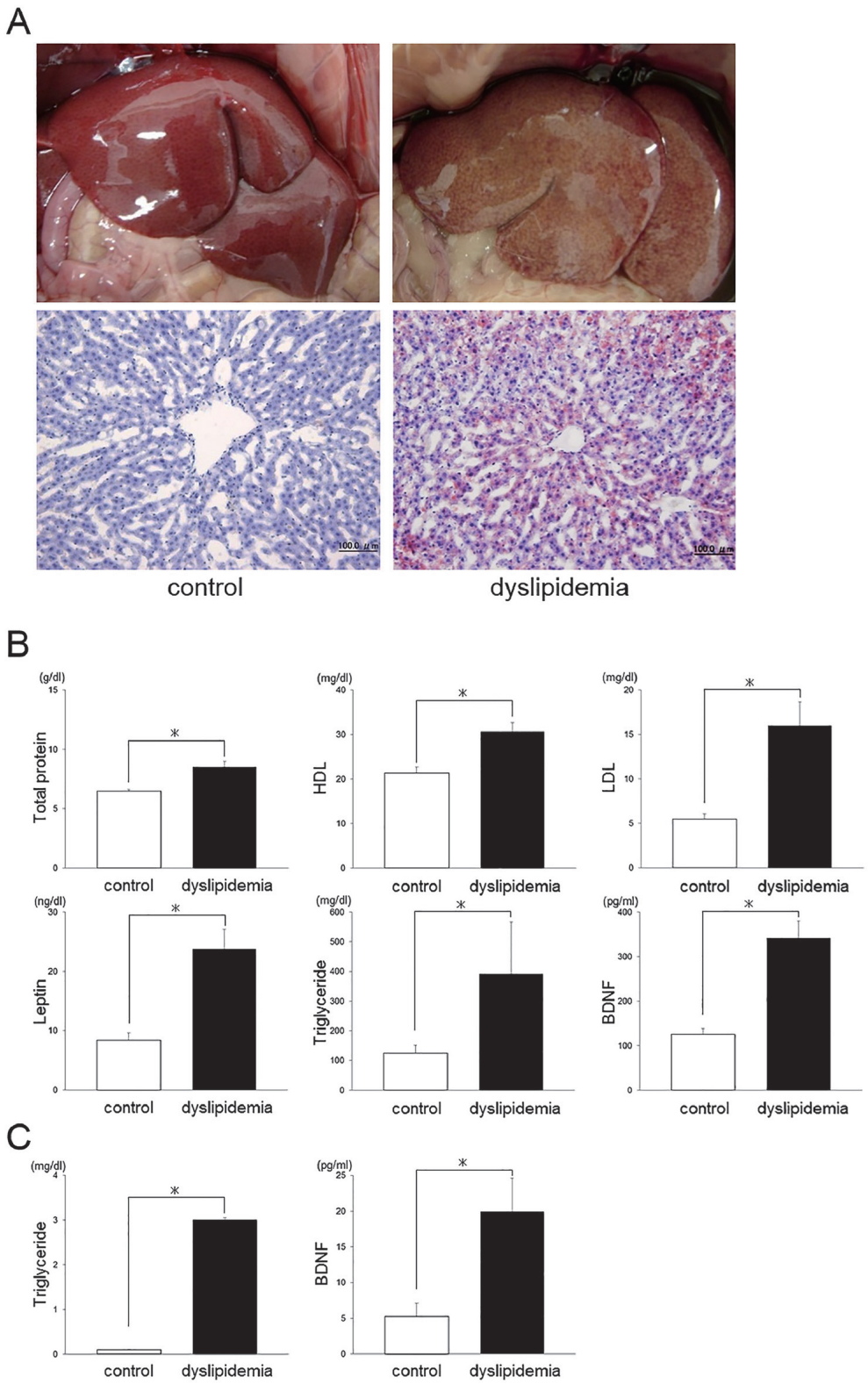

Figure 1. Histological and biochemical observations in the rat model of dyslipidemia.

(A) Representative photomicrographs show the fatty liver (upper panels) and lipid droplet formation (bottom panels, Oil Red O staining) in control (left panels) and dyslipidemic (right panels) rats. (B, C) Biochemical analysis of several blood and saliva components, as indicated. Triglyceride and BDNF levels in blood (B) and saliva (C) were significantly higher in dyslipidemic rats than in control rats. Each bar represents mean ± SEM. $n = 6$; *, $P < 0.05$, Student's t-test.

showed that salivary gland-derived BDNF exerts systemic effects[4]. The current study using a rat model of dyslipidemia demonstrates that obesity affects saliva components including BDNF. Our findings suggest that BDNF is involved in the regulation of lipid metabolism.

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Conflict of Interest Statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

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