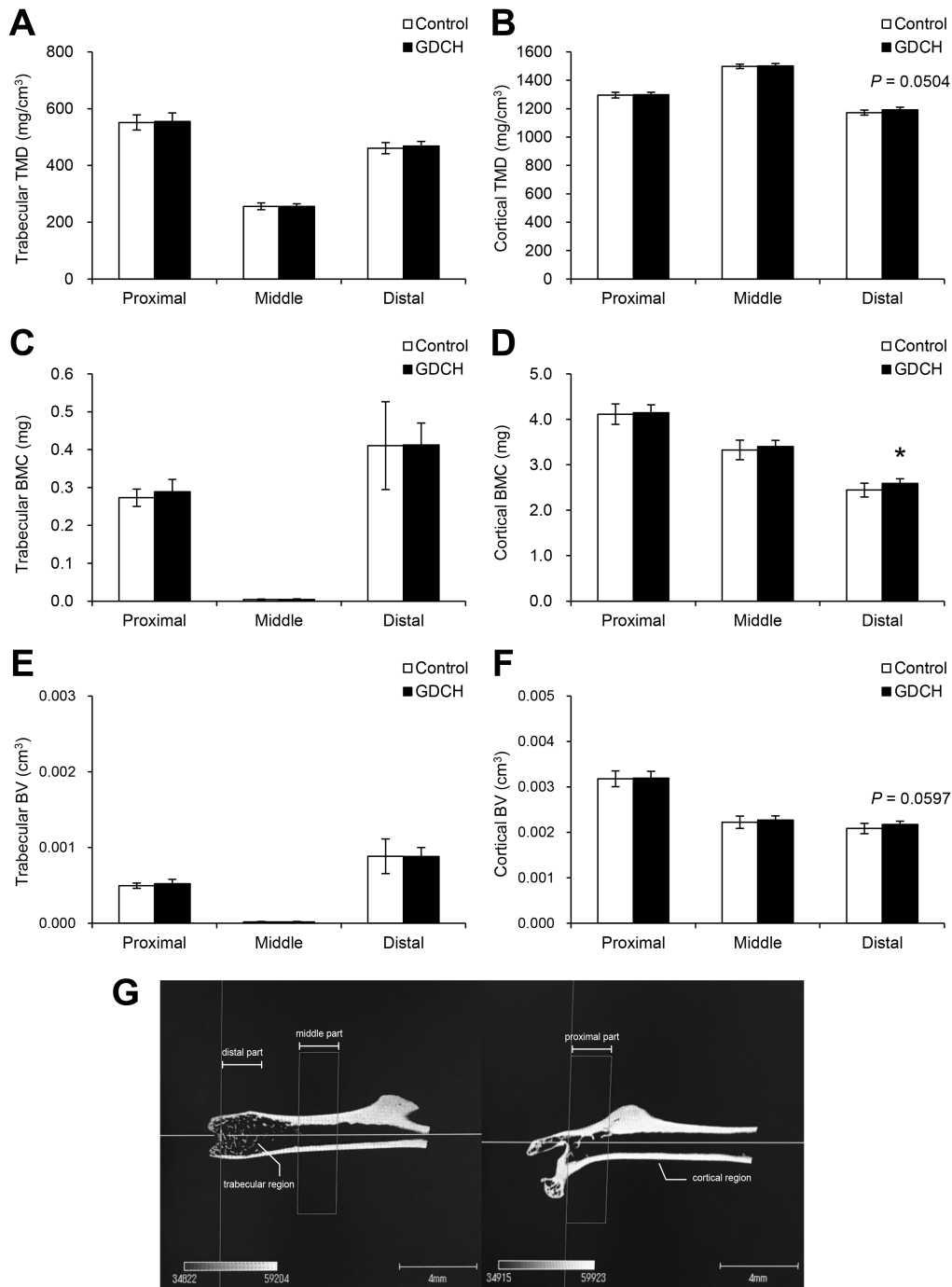# Supplementary materials



**Supplemental Figure 1. Micro-computed tomography analysis of the femur**

The mineral composition of 2-mm areas in the proximal, middle and distal parts of trabecular (A, C and E) and cortical (B, D and F) regions was measured using inspeXio SMX-100CT (Shimadzu Co., Ltd., Kyoto, Japan). Representative 3D images indicating analysis sites of the femur are shown in (G). Tissue mineral density of bone [TMD; bone mineral content (BMC)/bone volume (BV)] (A and B), BMC (C and D) and BV (E and F) were calculated using TRI/3D-BON software (Ratoc System Engineering Co., Ltd., Tokyo, Japan). Regions where cracks were observed were excluded from the analysis. The TMD of each region was calculated using the calibration curve prepared with the pseudo-bone of known density. Significant difference between the two groups (control and GDCH) is indicated by asterisks (*, $P < 0.05$). $P$ values are noted where the data are close to the cut-off value of significance.

**Supplemental Table 1. Concentrations of blood lipoproteins**

| | Control group | | GDCH group | |
|---|---|---|---|---|
| TG concentration of each lipoprotein class | Mean | SD | Mean | SD |
| CM-TG (mg/L) | 66.3 | 65.7 | 24.6 | 11.9 |
| VLDL-TG (mg/L) | 498.2 | 208.0 | 305.8[*] | 107.6 |
| LDL-TG (mg/L) | 115.8 | 18.7 | 89.6[**] | 14.9 |
| sdLDL-TG (mg/L) | 42.3 | 8.3 | 32.5[**] | 5.0 |
| HDL-TG (mg/L) | 41.0 | 9.6 | 28.8[**] | 7.5 |
| CHO concentration of each lipoprotein class | | | | |
| CM-CHO (mg/L) | 4.7 | 3.9 | 2.8 | 1.1 |
| VLDL-CHO (mg/L) | 55.1 | 17.9 | 39.8[*] | 10.6 |
| LDL-CHO (mg/L) | 86.8 | 12.1 | 75.5 [a] | 16.3 |
| sdLDL-CHO (mg/L) | 57.1 | 9.4 | 47.7[**] | 4.2 |
| HDL-CHO (mg/L) | 1012.8 | 73.2 | 926.4[**] | 43.5 |

a) $P = 0.095$.

The concentrations of triglyceride (TG) and cholesterol (CHO) contained in each class of lipoproteins in blood serum were measured by the LipoSEARCH® analytical service (Okazaki & Yamashita, 2016) of Skylight Biotech Inc. (Akita, Japan). Almost all lipoprotein parameters, including very low density lipoprotein (VLDL), low density lipoprotein (LDL), small dense LDL (sdLDL) and high density lipoprotein (HDL), were significantly decreased in the GDCH group. sdLDL is a subclass of LDL and has been reported as a severe risk factor of various diseases, including arterial disease, diabetes and rheumatoid diseases (Gerber, Nikolic, & Rizzo, 2017). There were no significant differences in chylomicron (CM) values between the two groups (control and GDCH). Significant differences between the two groups for each parameter are indicated by asterisks (*, $P < 0.05$; **, $P < 0.01$).

**References**

Gerber, P. A., Nikolic, D., & Rizzo, M. (2017). Small, dense LDL: an update. *Current Opinion in Cardiology, 32*(4), 454-459.

Okazaki, M., & Yamashita, S. (2016). Recent advances in analytical methods on lipoprotein subclasses: calculation of particle numbers from lipid levels by gel permeation HPLC using "spherical particle model". *J Oleo Sci, 65*(4), 265-282.