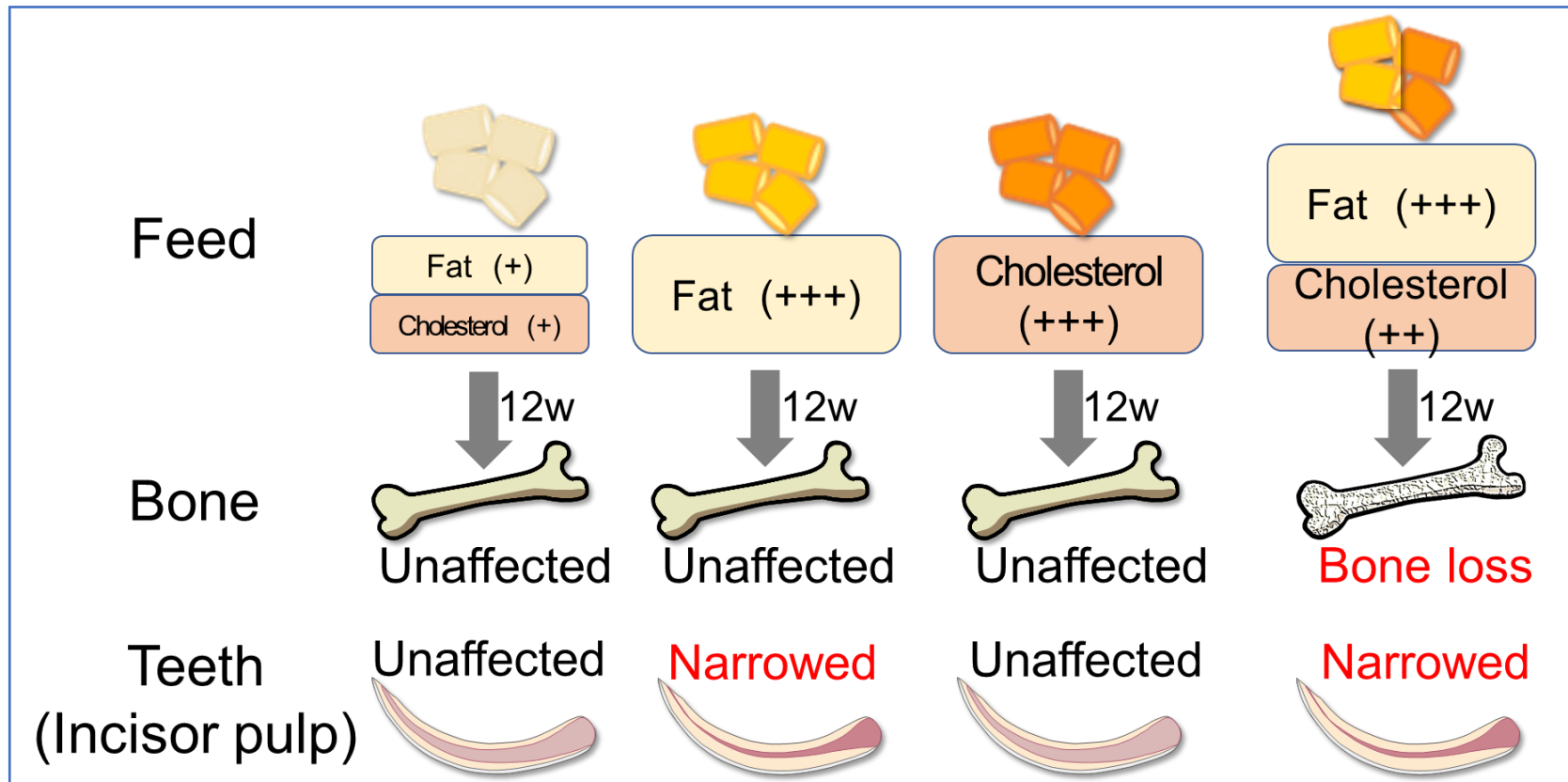


脂質およびコレステロール摂取量がマウスの歯と骨の恒常性に及ぼす影響

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Japanese Association for Oral Biology

Conflict of Interest

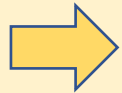
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The authors declare no conflicts of interest associated with this manuscript

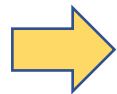
Introduction

Problem of dietary intake for handicapped children

- ① Tendency to prefer high calories
- ② Difficult to limit the amount of food



Excessive fat intake



Dyslipidemia

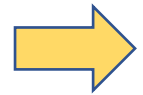


Disruption of bone homeostasis maintenance

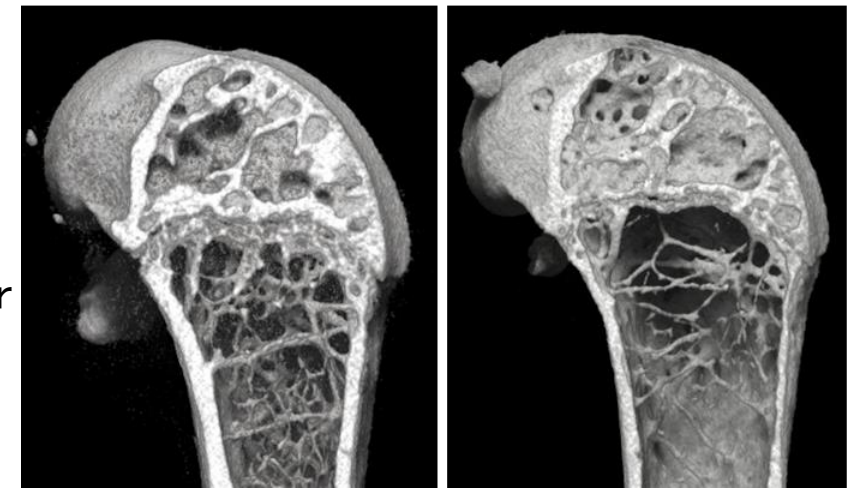
Aim

This study was conducted to examine the effects of dietary lipids and cholesterol on bone homeostasis maintenance.

High Fat diet



Femur



Scientific Report., 10(1):5102.(2020)

narrowed incisor pulp

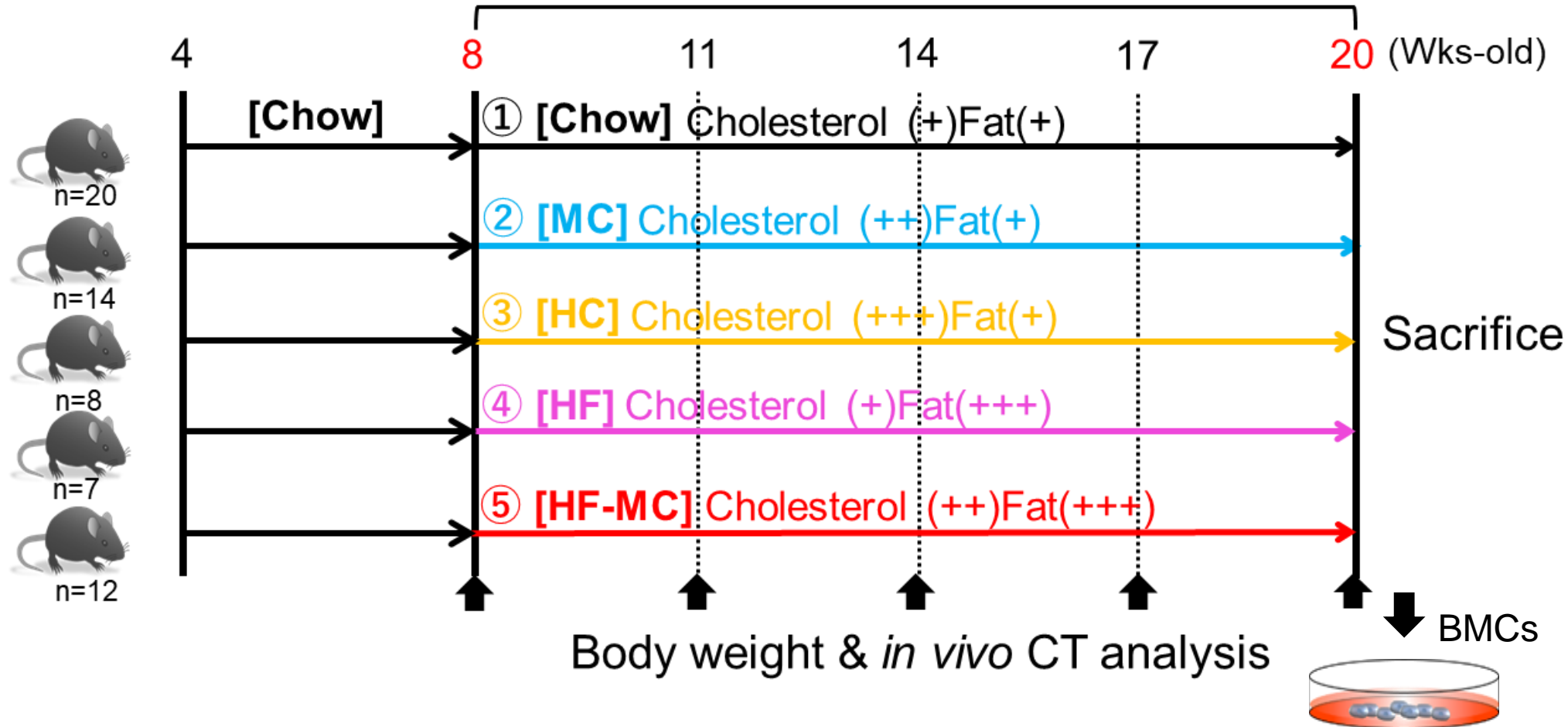
Method**<Table of ingredients : 5 type of feed>**

Mice were fed 5 types of feed with different amounts of fat and cholesterol

Type	Cholesterol (%)		Fat (%)		Total calories (kcal)
① [Chow] Standard diet	<0.01	+	13.6	+	357.0
② [MC] Middle cholesterol	1.25	++	13.6	+	357.0
③ [HC] High cholesterol	5.00	+++	13.6	+	357.0
④ [HF] High fat	<0.01	+	33.0	+++	410.6
⑤ [HF-MC] High fat-middle cholesterol	1.25	++	36.0	+++	414.0

Method <Experimental plan>

12 weeks: 5 types of feed



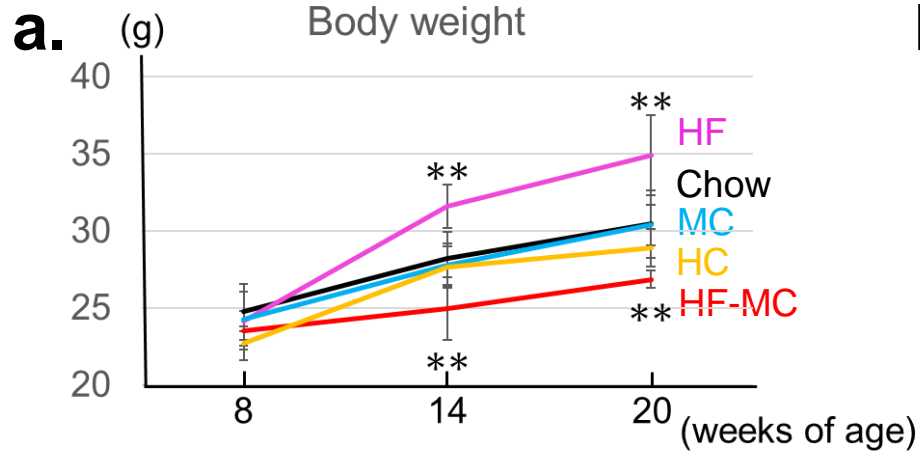
8-week-old male mice (C57BL/6J) were fed five types of feed for 12 weeks. Blood, femur, tibia, and tooth samples were examined, and serum lipid markers and bone morphology were determined using μ CT and histological analysis. Additionally, bone marrow cells (BMCs) were cultured and osteoclast differentiation markers analyzed using qPCR.

Analysis items

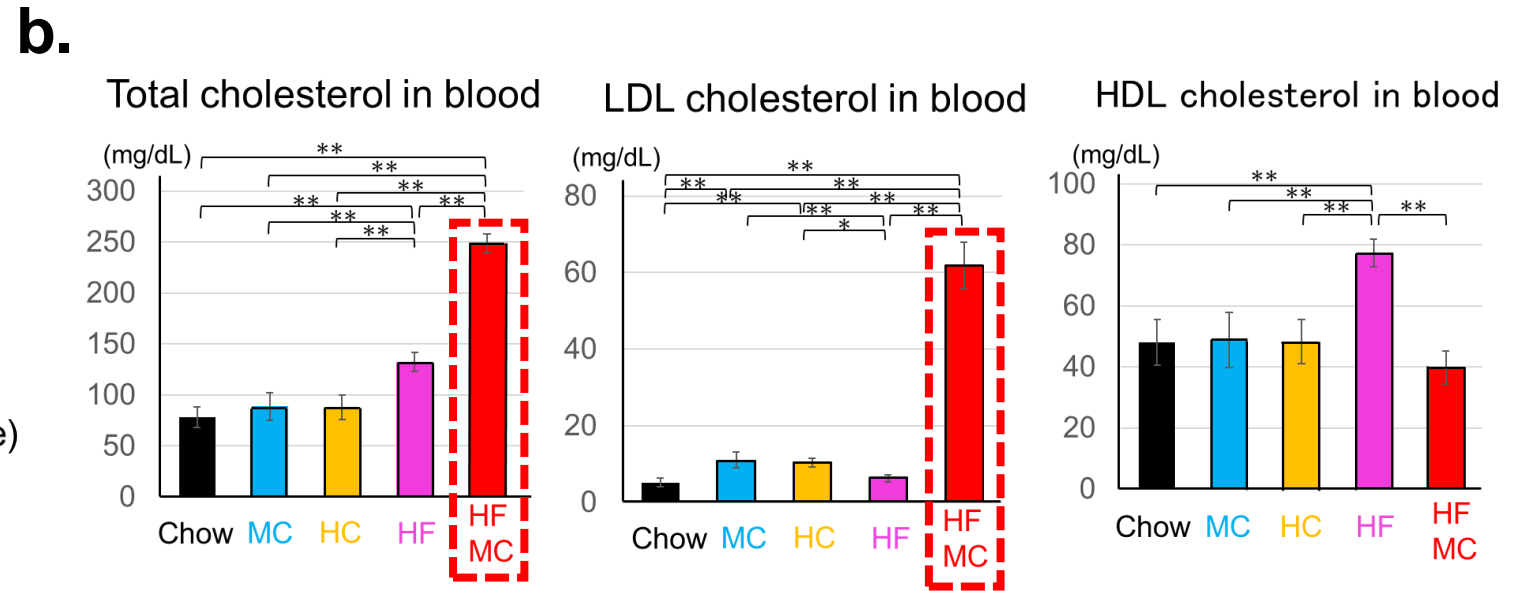
- ▼ Body weight
- ▼ Bone morphometry (μ CT)
- ▼ Blood Examination
- ▼ Bone morphometry (*in vivo* CT)
- ▼ Tissue section
- ▼ Osteoclast differentiation

Figure 1. Body weight & Blood Examination

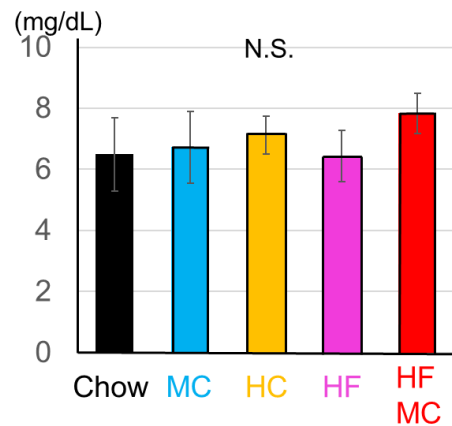
(*t*-test, **p* < 0.05 ***p* < 0.01)



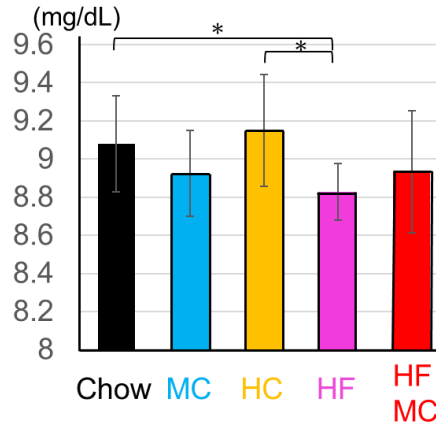
HF (high fat only group)
⇒ Large amount of weight gain



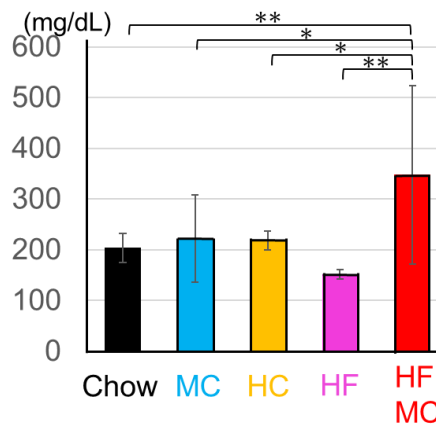
Inorganic phosphorus in blood



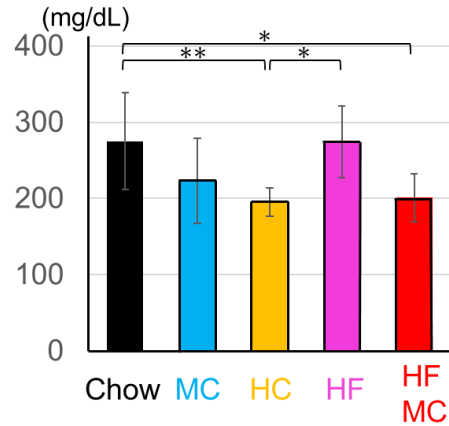
Calcium in blood



Alkaline phosphatase in blood



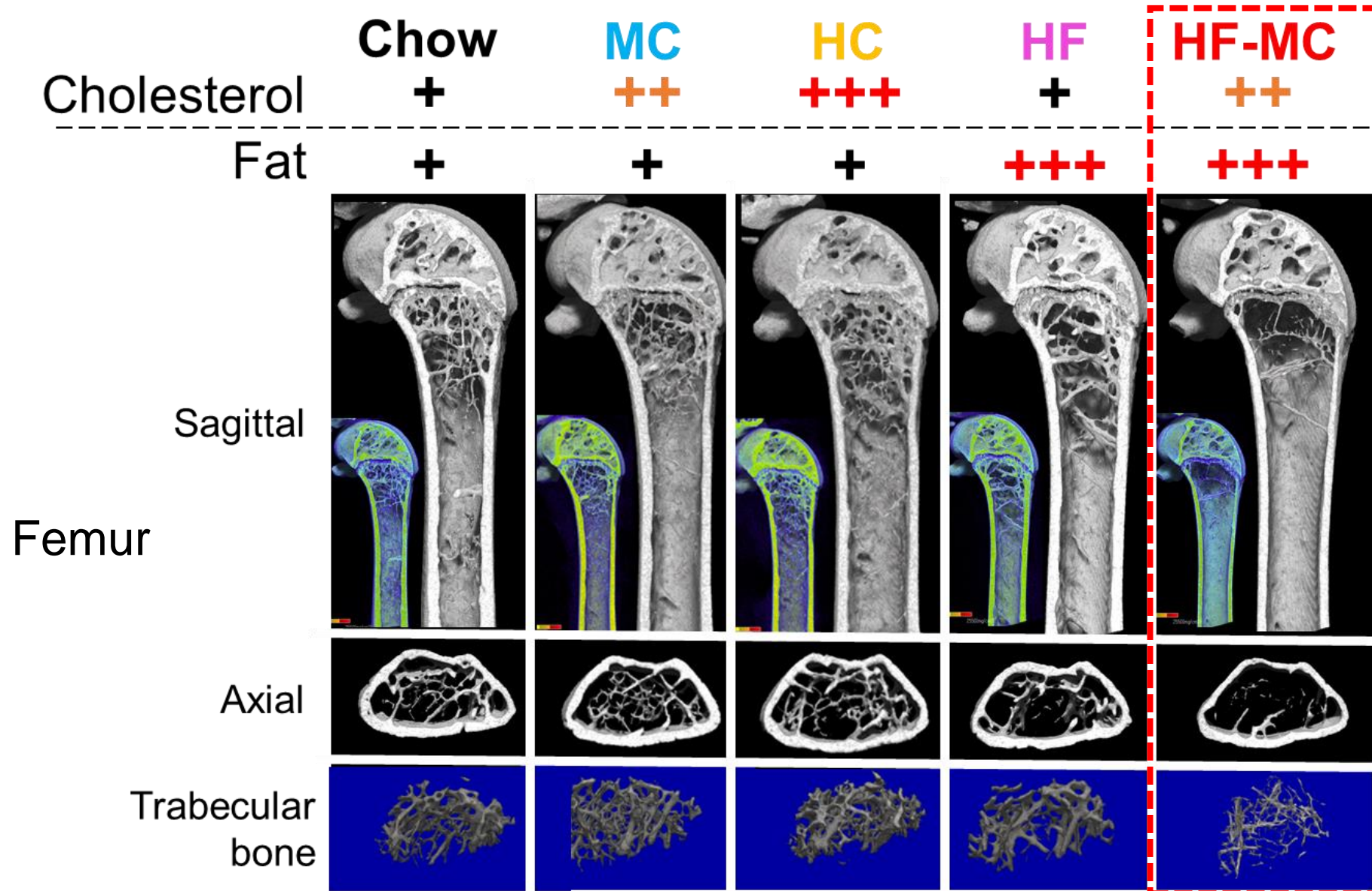
Glucose in blood



HF-MC (a diet high in both fat and cholesterol)
⇒ increased total cholesterol and LDL cholesterol in blood

Figure 2. Mice fed HF-MC showed decreased trabecular bone

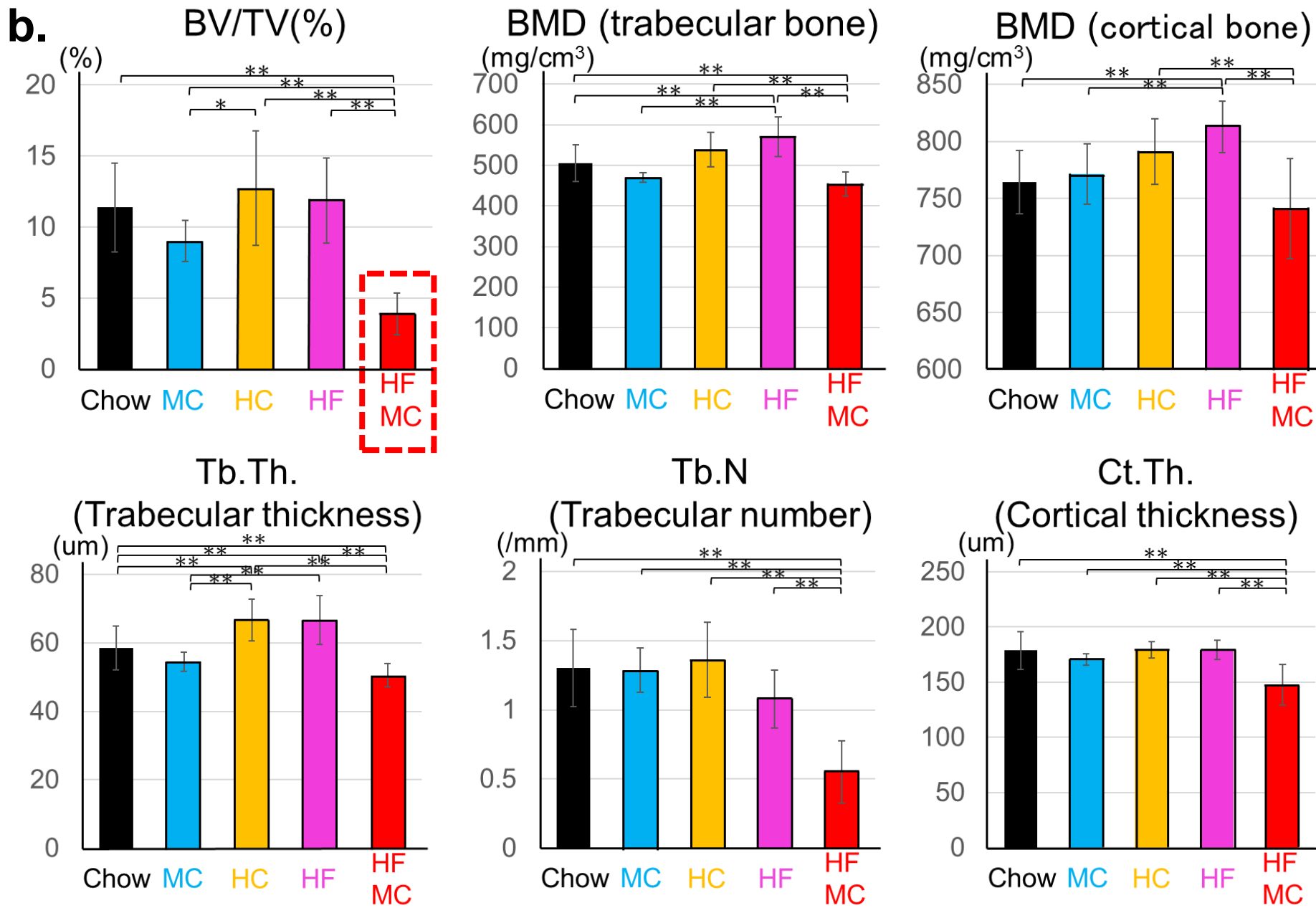
a. μ CT images of femurs (20 weeks of age)



Femur from mice fed 5 type of feed were determined using μ CT. Mice fed **HF-MC** decreased bone mass.

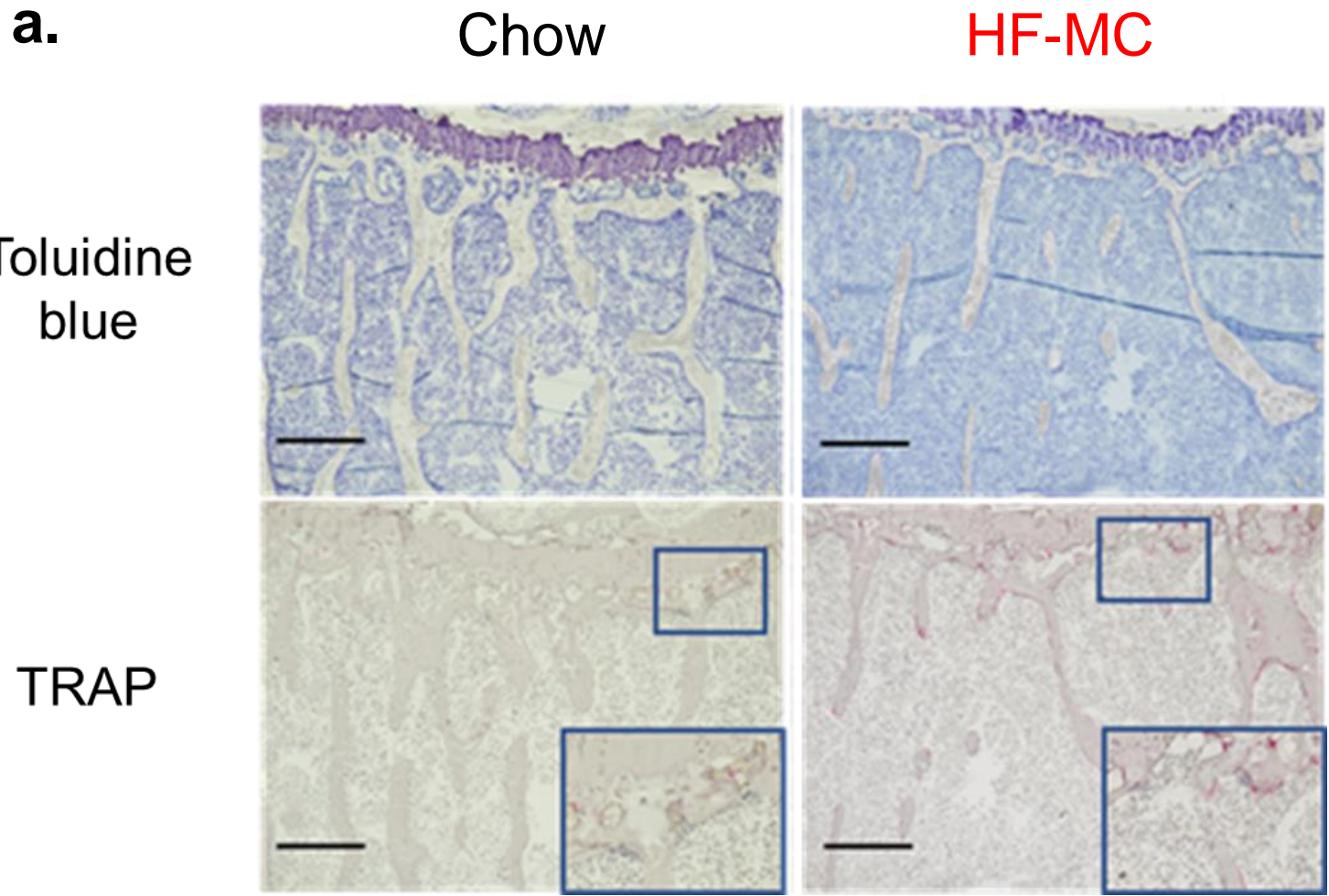
Figure 3. Mice fed HF-MC showed decreased bone mass

(*t*-test, ** $p < 0.05$ ** $p < 0.01$)



Bone morphology were quantitated using μ CT in mice fed 5 types of feed. Mice fed **HF-MC** significantly decreased all parameter.

Figure 4. Osteoclast number was not significantly different.



We showed tissue section stained toluidine blue and TRAP from mice fed standard diet(Chow) and **HF-MC**. Osteoclast in tissue section were unaffected.

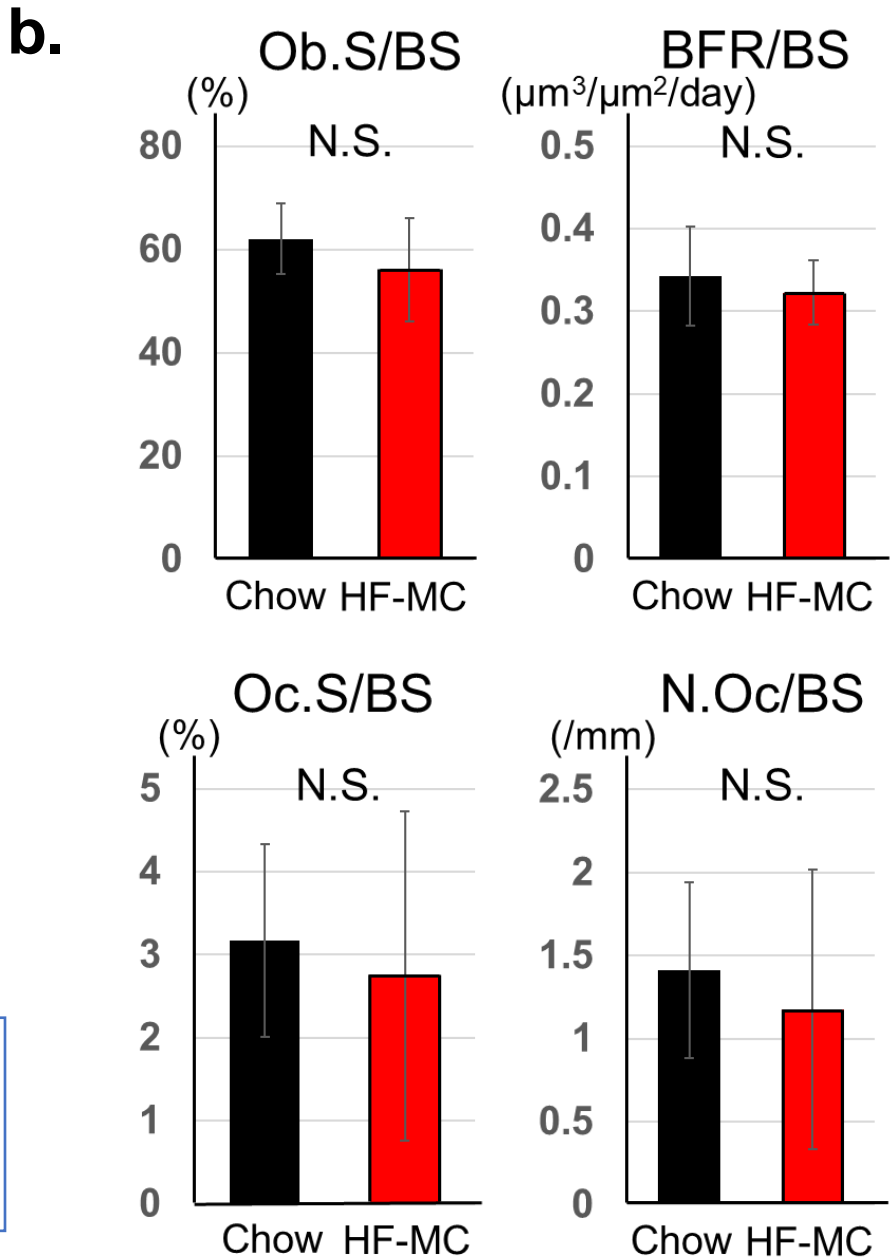
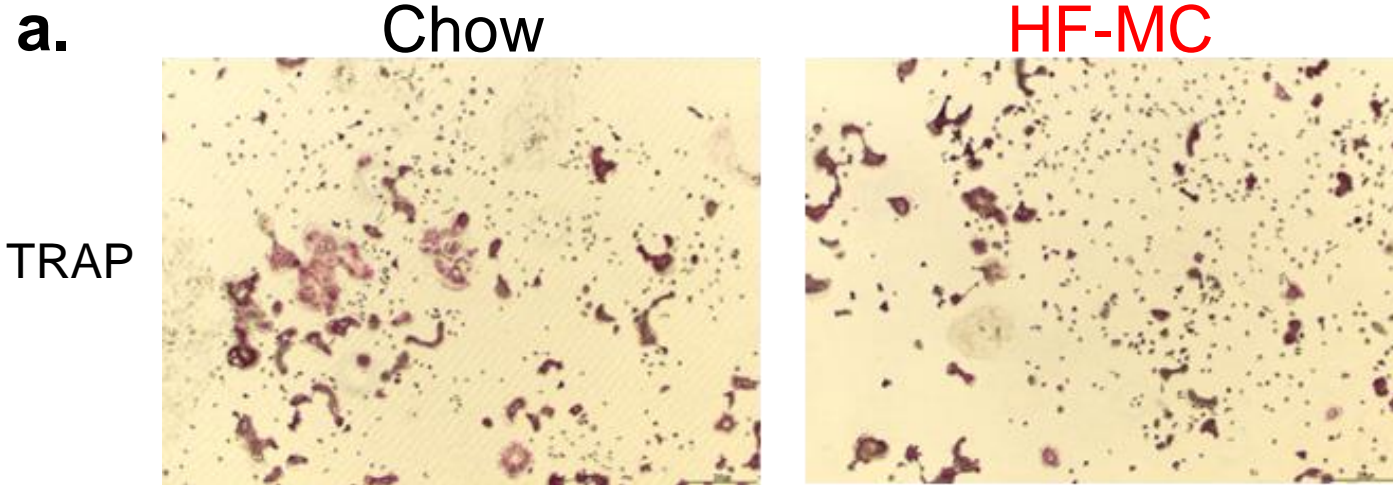
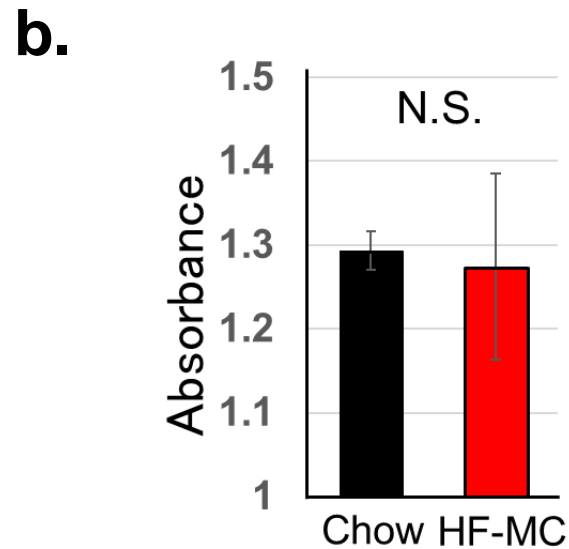


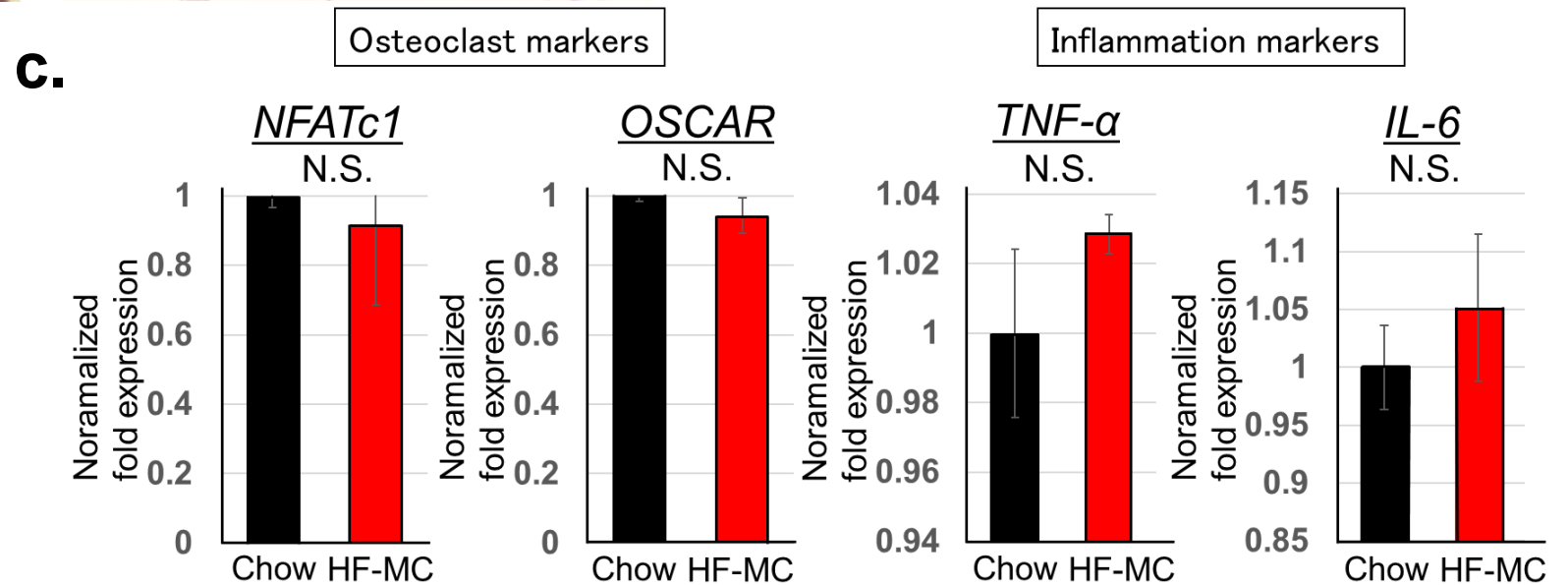
Figure 5. Osteoclast formation was not significantly different among the groups.



Bone marrow cells from 8-week-old male mice (C57BL/6J) fed standard diet (Chow) or HF-MC were cultured. Osteoclast formation was unaffected.

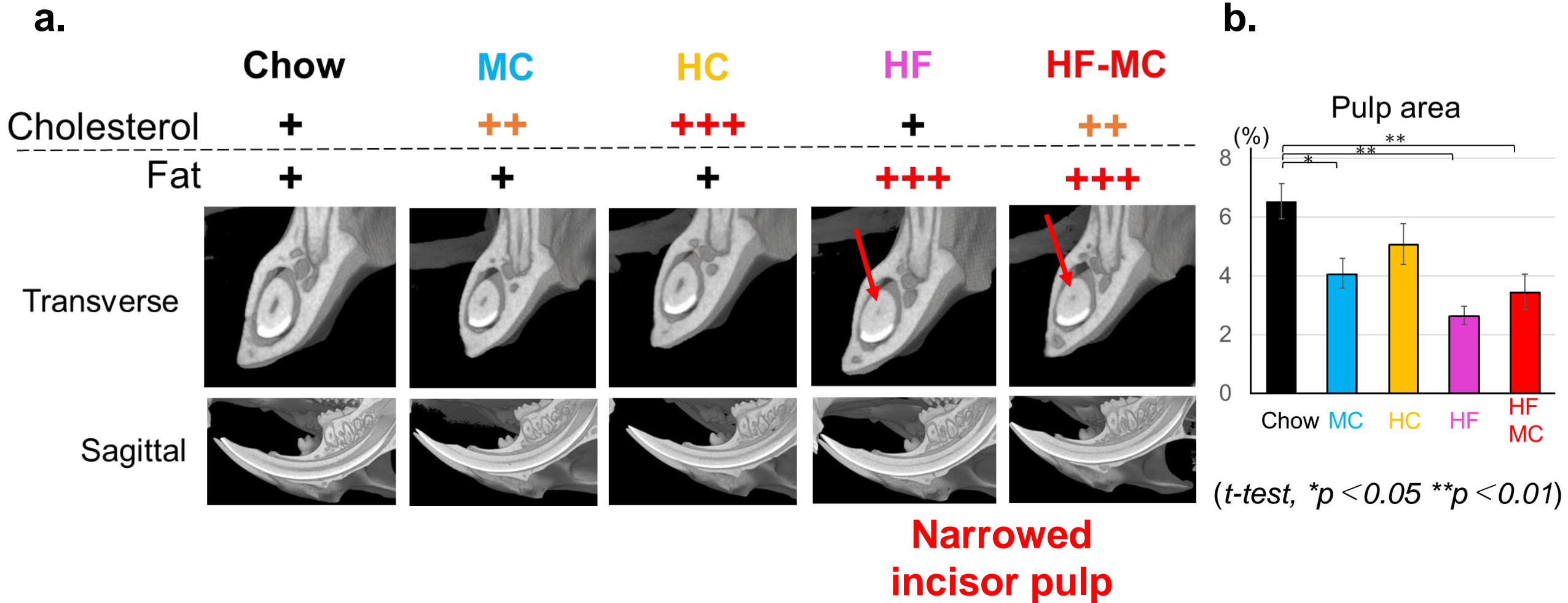


Absorbance in TRAP staining



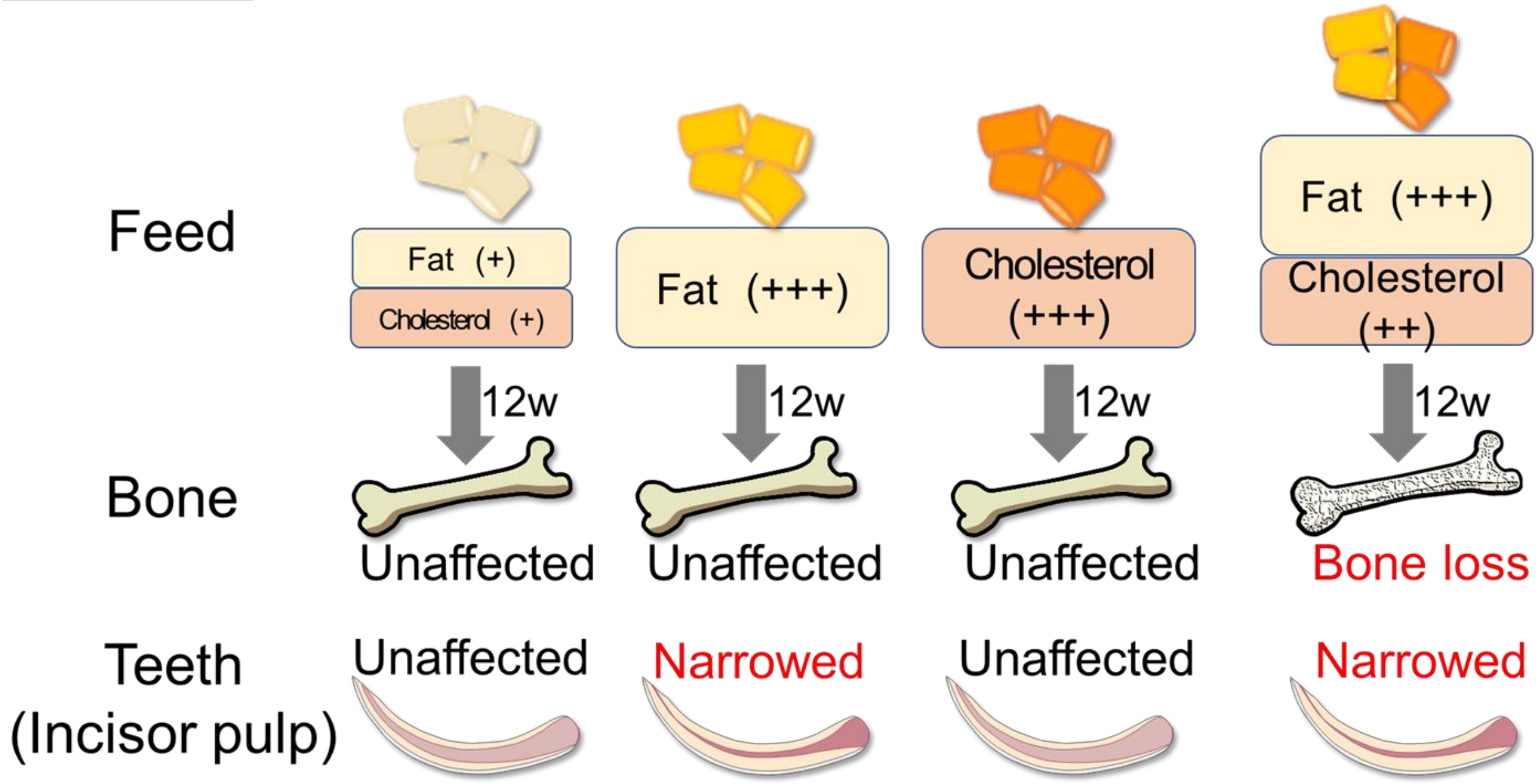
Osteoclast markers and Inflammation markers were determined using qPCR

Figure 6. Mice given a high fat diet showed significantly narrowed incisor pulp.



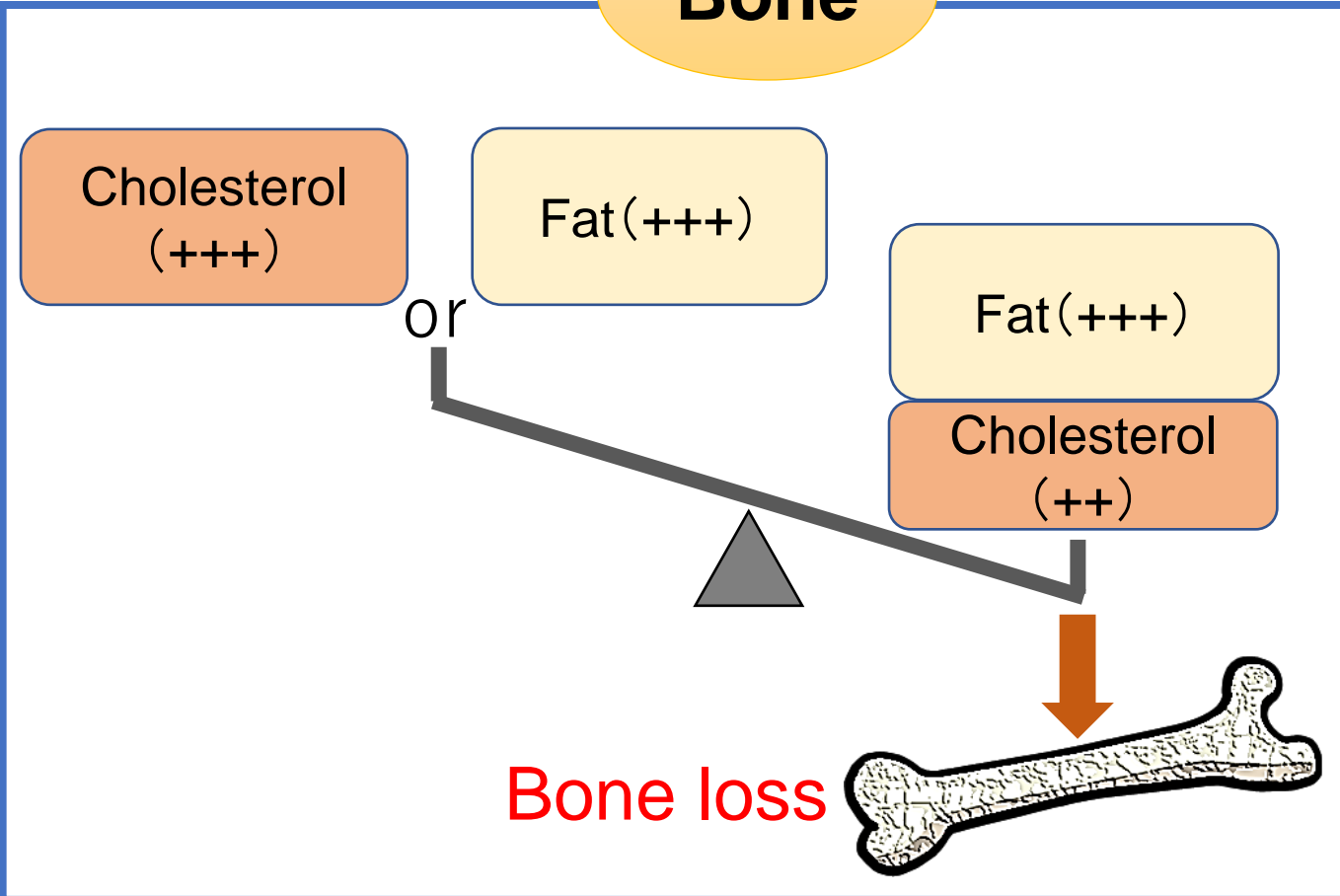
Lower incisor were determined using μ CT in mice fed 5 type of feed .
 Mice fed a high fat diet (HF and HF-MC) were significantly narrowed incisor pulp.

Summary

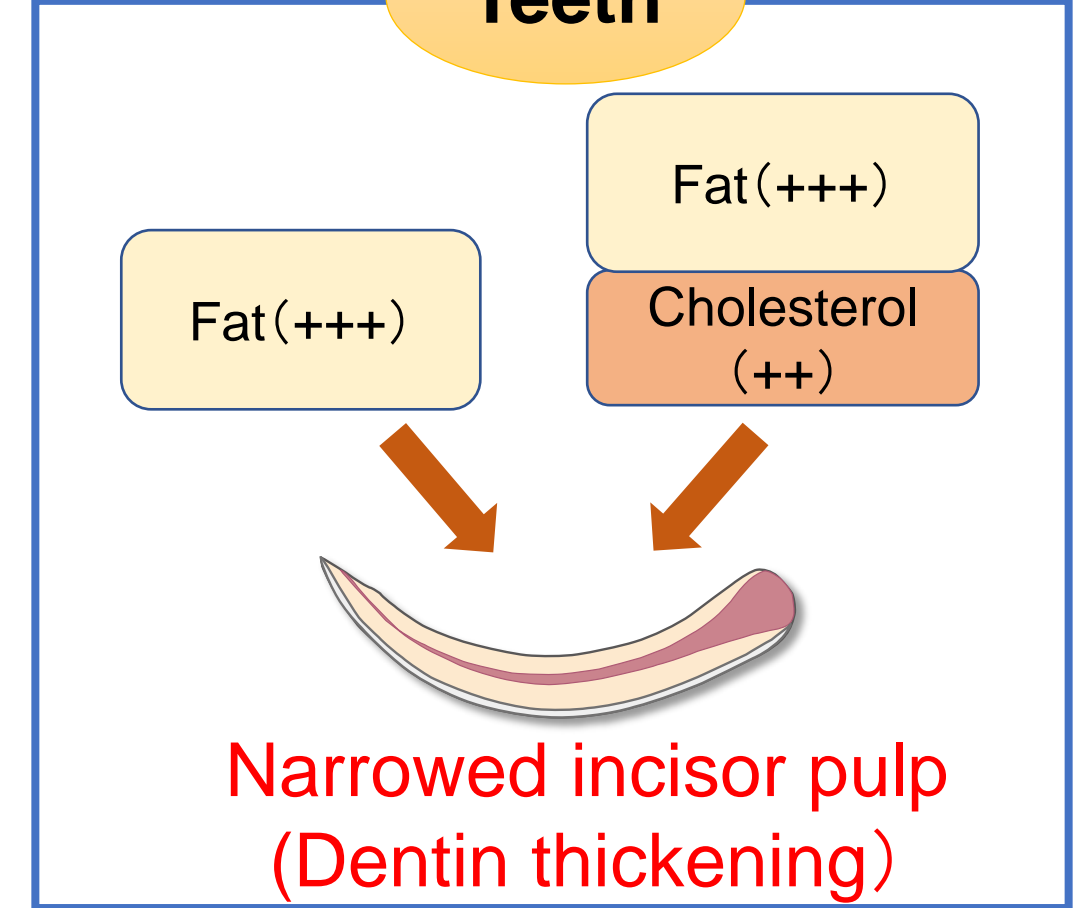


Conclusion

Bone



Teeth



- A diet with high amounts of both fat and cholesterol induces bone loss
- Deflection of dietary for handicapped children can affect bone mass