Table 2-1-1. Composition of the experimental diets (g/100 g).

Ingredients		CE	CH
Cornstarch		41.3192	41.3192
Casein		14	14
D-cornstarch		15.5	15.5
Sucrose		10	10
Soybean oil		4	4
Chitosan		—	10
Cellulose		10	—
Mineral mixture(Ca Free)[*1]		3.5	3.5
Vitamin mixure[*2]		1	1
L-Cystine		0.18	0.18
Choline bitartrate		0.25	0.25
T-butyhydroquinone		0.0008	0.0008
$CaCO_3$		0.25	0.25
Total		100	100
Measured value of Ca and P in each diet (mg/ 100g diet)	Ca[*3]	95.8	99.1
	P[*4]	537	374

Composition of diets are prepared according to the AIN-93M prescription. (Reeves PG, Nielsen FH, Fahey GC. AIN-93 purified diets for laboratory rodents: final report of the American Institute of Nutrition ad hoc writing committee on the reformulation of the AIN-76A rodent diet. J Nutr. 1993;123(11):1939-51.)
[*1]: AIN-93M mineral mixture without Ca. [*2]: AIN-93M vitamin mixture.
[*3]: by atomic absorption spectrometry. [*4]: by molybdenum blue method.
CE: cellulose, CH: chitosan.

Table 2-1-2. Conditions for semi-quantitative RT-PCR.

		Sequence	Product size (bp)	Cycles	Tm (℃)
CaBP-D9K	(+)	5'-ATGAGCGCTAAGAAATCTCCC-3'	237	24	51
	(-)	5'-TTGTGATAACTTTTTGAAGAAA-3'			
VDR	(+)	5'-GTGACTTTGACCGGAACGTG-3'	280	24	53
	(-)	5'-ATCATCTCCCTCTTACGCTG-3'			
GAPDH	(+)	5'-CCATGGAGAAGGCTGGGG-3'	194	26	53
	(-)	5'-CAAAGTTGTCATGGATGACC-3'			

Table 2-1-3. Body weight, food intake and organ weights of OVX rats fed the experimental diets for 6wk.

	CE	CH
Initial body weight (g)	188±3	193±4
Final body weight (g)	230±4	232±5
Body weight gain (g)	42±3	40±3
Food intake (g/ 6wk)	570±6	576±11
Liver (g)	5.66±0.17	5.23±0.20
Abdominal fat (g)	7.99±0.48	7.53±1.01
Uterus (g)	0.12±0.02	0.10±0.01

Values are means ± SE (CE: n=6, CH: n=7). CE: cellulose, CH: chitosan.

Table 2-1-4. Calcium and phosphorus balances of OVX rats fed the experimental diets for 6wk.

	CE	CH
Ca (mg/ 4d)		
Intake	46.4±1.3	52.4±2.1
Fecal excretion	28.7±1.6	29.7±1.9
Urinary excretion	5.2±0.3	12.6±0.6***
Total excretion	33.9±1.6	42.4±2.0
Absorption	17.8±0.9	22.7±1.8
Absorption rate(%)	38.4±2.2	43.3±2.8
Retention	12.6±0.8	10.1±1.8
Retention rate(%)	27.3±2.0	19.0±3.1*
P (mg/ 4d)		
Intake	260.5±7.1	197.9±8.1***
Fecal excretion	32.4±2.5	42.3±2.1*
Urinary excretion	82.8±2.4	83.8±3.3
Total excretion	115.2±2.9	126.1±4.4
Absorption	228.2±6.1	155.6±7.5***
Absorption rate(%)	87.6±0.8	78.5±1.1***
Retention	145.4±5.2	71.8±4.8***
Retention rate(%)	55.8±0.8	36.1±1.4***

Values are means ± SE (CE: n=6, CH: n=7). *: P<0.05, ***: P<0.001 vs CE. Feces and urine were collected for 4 days. Absorption: Intake-fecal excretion. Absorption rate(%): {(Intake-fecal excretion)/intake} ×100. Retention: Intake-total excretion. Retention rate(%): {(Intake-total excretion)/intake} ×100. CE: cellulose, CH: chitosan.

Table 2-1-5. Effects of the experimental diets on serum mineral levels in OVX rats

	CE	CH
Calcium (mg/dL)	10.4±0.1	9.6±0.3*
Phosphate (mg/dL)	4.0±0.8	6.7±1.1*
Magnesium (mg/dL)	2.3±0.1	2.0±0.1

Values are means ± SE (CE: n=6, CH: n=7). *: $P<0.05$ vs CE. CE: cellulose, CH: chitosan.

Table 2-1-6. Biochemical parameters in serum and urine of OVX rats fed the experimental diets for 6wk.

	CE	CH
Serum		
Alkaline phosphatase (IU/L)	142.7±20.1	67.8±2.9***
PTH (pg/mL)	26.2±9.9	46.2±6.3
1,25-Dihydroxyvitamin D(pg/mL)	102.4±12.7	359.7±18.6***
Urine		
DPD/creatinine (nmol/mmol)	418.5±19.0	447.0±26.8

Values are means ± SE (CE: n=6, CH: n=7). ***: *P*<0.001 vs CE. PTH: parathyroid hormone, DPD: deoxypyridinoline. CE: cellulose, CH: chitosan.

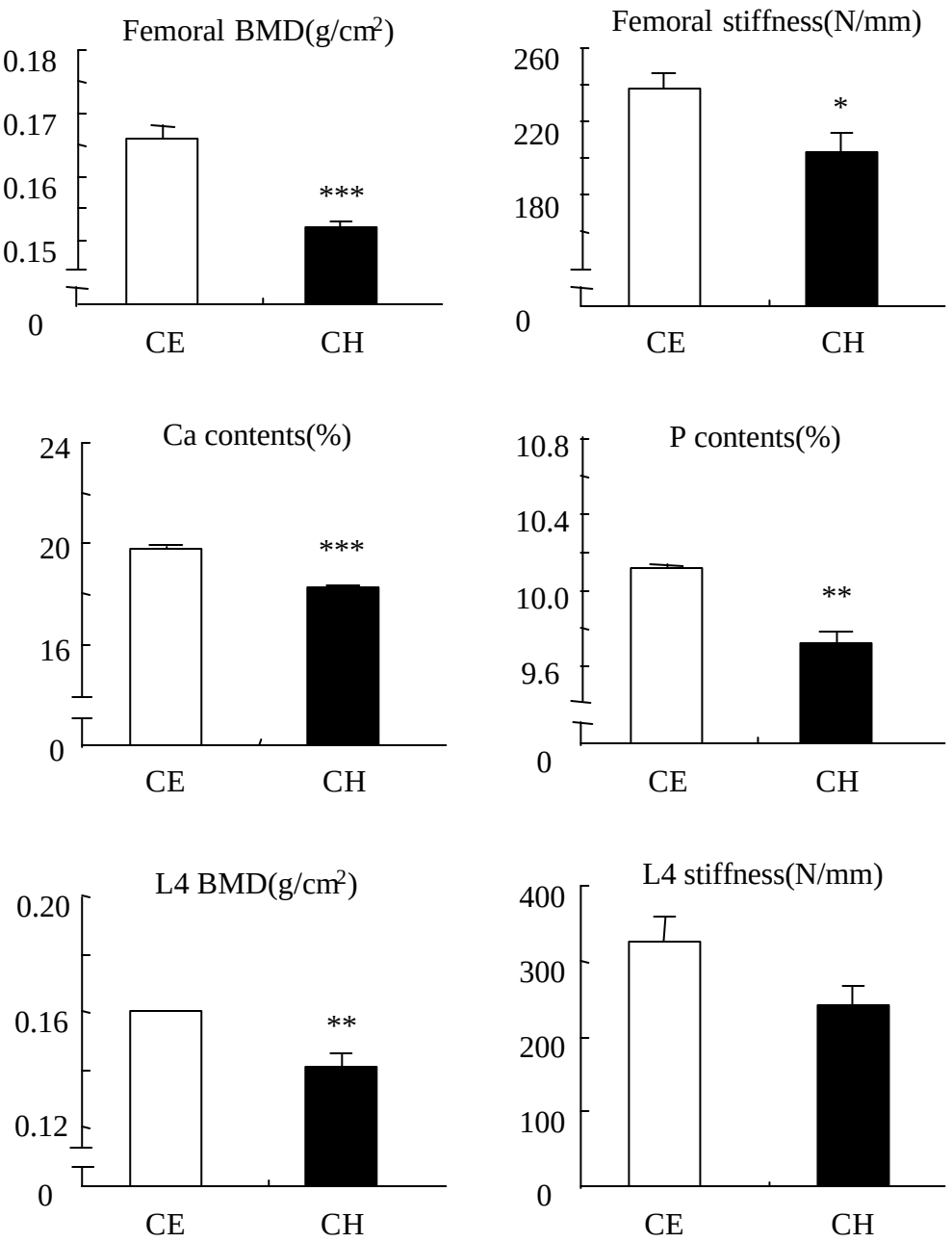


Fig. 2-1-1. Effects of the experimental diets on bone properties of femurs and the fourth lumbar vertebrae (L4) in OVX rats. Values are means ± SE (CE: n=6, CH: n=7). *: $P<0.05$, **: $P<0.01$, ***: $P<0.001$ vs CE. CE: cellulose, CH: chitosan. Femoral Ca contents: {Ca (mg)/dry femur weight (mg)} ×100. Femoral P contents: {P (mg)/dry femur weight (mg)} ×100. BMD(g/cm^2): Bone mineral density.

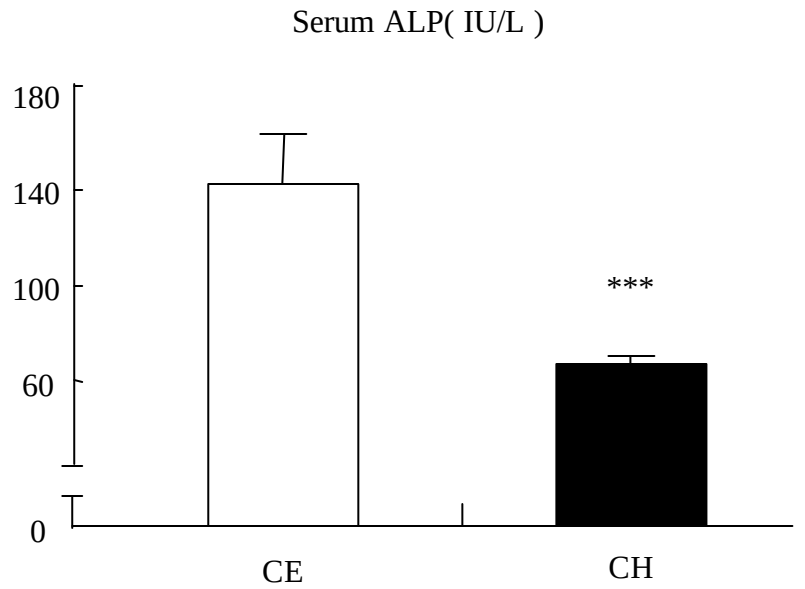
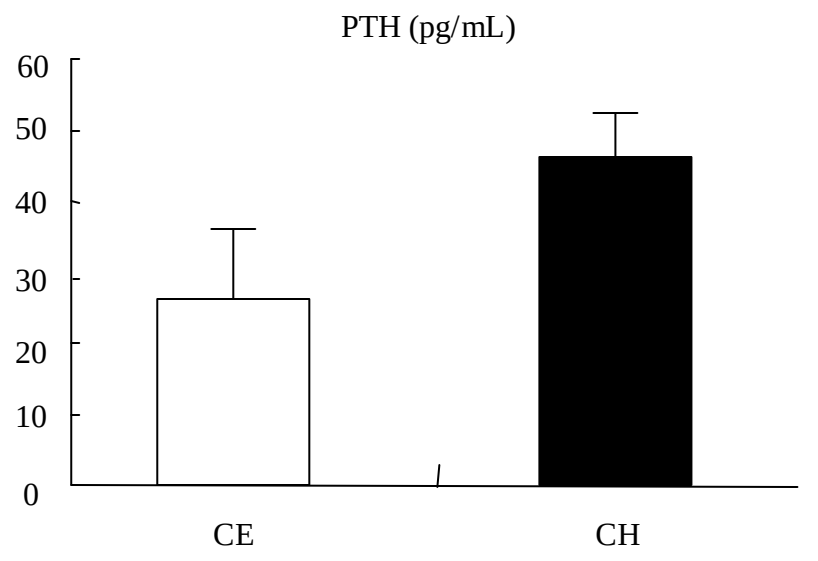


Fig. 2-1-2. Effects of the experimental diets on serum Alkaline phosphatase and urinary DPD levels in OVX rats. Values are means ± SE (CE: n=6, CH: n=7). ***: $P<0.001$ vs CE. CE: cellulose, CH: chitosan. DPD: deoxypyridinoline



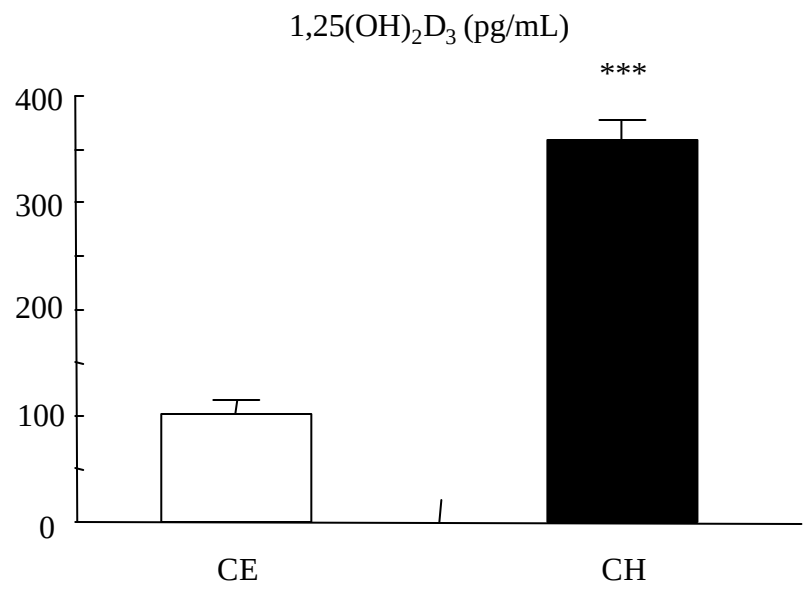


Fig. 2-1-3. Effects of the experimental diets on serum PTH and $1,25(OH)_2D_3$ levels in OVX rats. Values are means ± SE (CE: n=6, CH: n=7). ***: *P*<0.001 vs CE. CE: cellulose, CH: chitosan. PTH: parathyroid hormone.

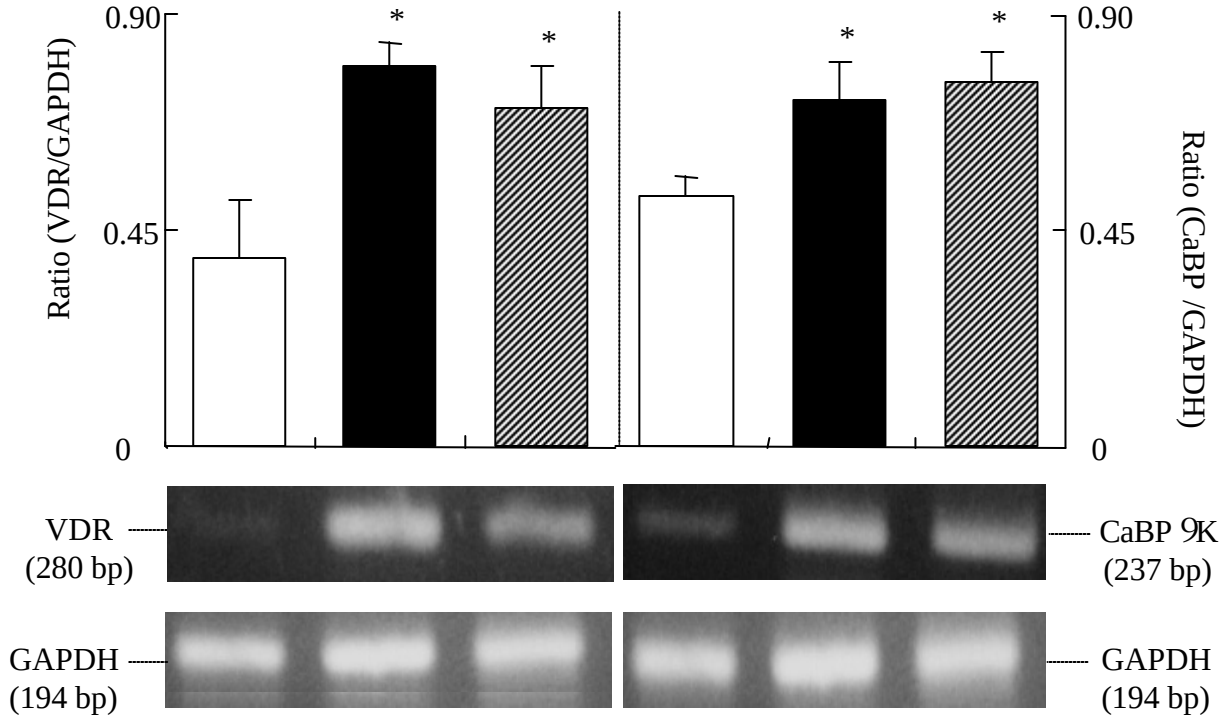


Fig. 2-1-4. Expression of VDR mRNA and CaBP D9K mRNA in duodenum of rats fed the experimental diets for 6 wk.
Values are means ± SE , * : P<0.05 vs CE group. □ : CE, ■ : CH, ▨ : CHVC group.
RT-PCR was performed to detect VDR and CaBP D9K transcripts. The results were evaluated as the relative ratio in mRNA of VDR and CaBP D9K to that of GAPDH.

Table 2-2-1. Composition of the experimental diets (g/100 g).

Ingredients	LP	P
Cornstarch	50.8792	49.9992
Casein	14	14
D-cornstarch	15.5	15.5
Sucrose	10	10
Soybean oil	4	4
Fiber	—	—
Mineral mixture(Ca, P Free)[*1]	3.5	3.5
Vitamin mixure[*2]	1	1
L-Cystine	0.18	0.18
Choline bitartrate	0.25	0.25
T-butyhydroquinone	0.0008	0.0008
$CaCO_3$	0.25	0.25
KH_2PO_4	0.44	1.32
Total	100	100

Composition of diets are prepared according to the AIN-93M prescription. (Reeves PG, Nielsen FH, Fahey GC. AIN-93 purified diets for laboratory rodents: final report of the American Institute of Nutrition ad hoc writing committee on the reformulation of the AIN-76A rodent diet. J Nutr. 1993;123(11):1939-51.)

[*1]: AIN-93M mineral mixture without Ca and P. [*2]: AIN-93M vitamin mixture. LP: 0.1% P diet, P: 0.3% P diet.

Table 2-2-2. Body weight, food intake and organ weights of OVX rats fed the experimental diets for 4wk.

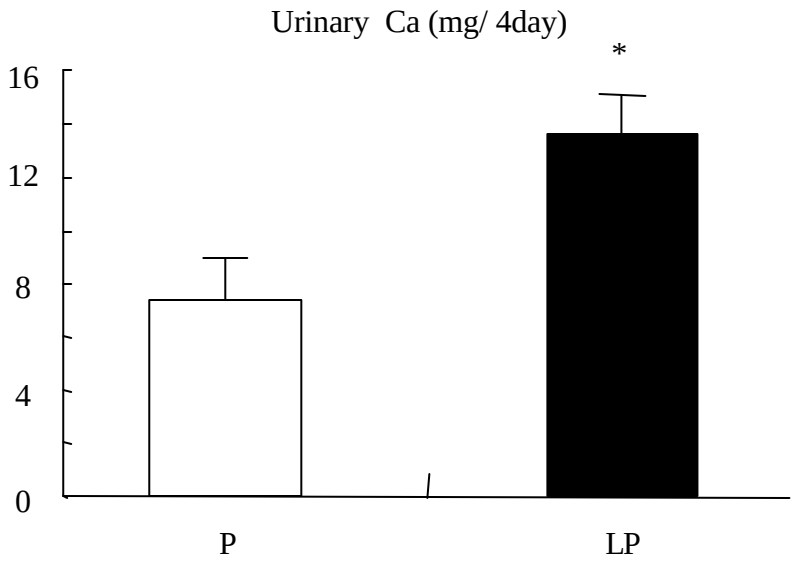
	P	LP
Initial body weight (g)	195±5	184±3
Final body weight (g)	226±6	225±3
Body weight gain (g)	31±2	41±3*
Food intake (g/ 4wk)	260±5	278±6
Liver (g)	5.35±0.12	5.30±0.12
Abdominal fat (g)	4.54±0.39	4.88±0.40
Uterus (g)	0.12±0.02	0.12±0.01

Values are means ± SE (P: n=6, LP: n=6). *: $P<0.05$ vs P. P: 0.3% P diet, LP: 0.1% P diet.

Table 2-2-3. Effects of the experimental diets on serum mineral levels in OVX rats

	P	LP
Calcium (mg/dL)	8.8±0.6	9.7±0.4
Phosphate (mg/dL)	4.7±0.8	4.5±0.4

Values are means ± SE (P: n=6, LP: n=6). P: 0.3% P diet, LP: 0.1% P diet.



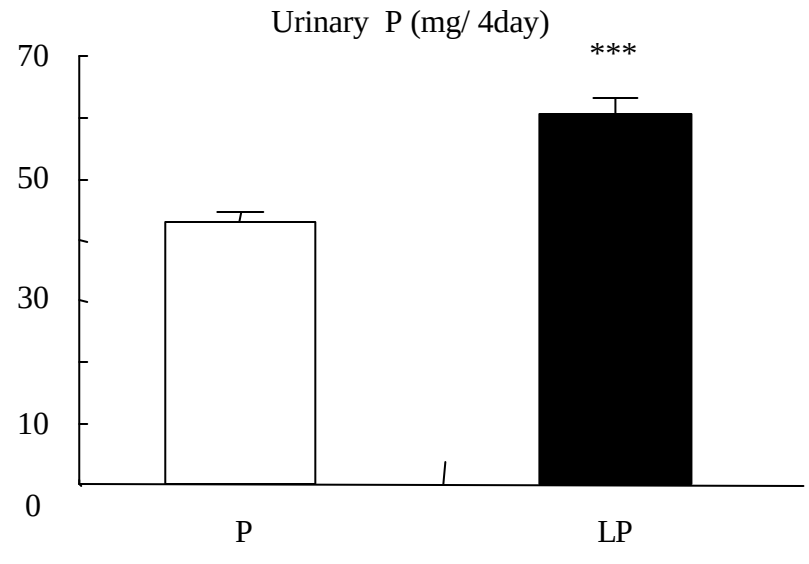


Fig. 2-2-1. Effects of the experimental diets on urinary Ca and P levels in OVX rats. Values are means ± SE (P: n=6, LP: n=6). *: $P<0.05$, ***: $P<0.001$ vs P . P: 0.3% P diet, LP: 0.1% P diet.

Table 2-3-1. Composition of the experimental diets (g/100 g).

Ingredients	FF	CE	CH
Cornstarch	51.3192	41.3192	41.3192
Casein	14	14	14
D-cornstarch	15.5	15.5	15.5
Sucrose	10	10	10
Soybean oil	4	4	4
Cellulose	—	10	—
Chitosan	—	—	10
Mineral mixture(Ca Free)[*1]	3.5	3.5	3.5
Vitamin mixure[*2]	1	1	1
L-Cystine	0.18	0.18	0.18
Choline bitartrate	0.25	0.25	0.25
T-butyhydroquinone	0.0008	0.0008	0.0008
$CaCO_3$	0.25	0.25	0.25
Total	100	100	100

Composition of diets are prepared according to the AIN-93M prescription. (Reeves PG, Nielsen FH, Fahey GC. AIN-93 purified diets for laboratory rodents: final report of the American Institute of Nutrition ad hoc writing committee on the reformulation of the AIN-76A rodent diet. J Nutr. 1993;123(11):1939-51.)
[*1]: AIN-93M mineral mixture without Ca. [*2]: AIN-93M vitamin mixture. FF: fiber-free. CE: cellulose, CH: chitosan.

Table 2-3-2. Body weight, organ weights and food intake of OVX rats fed the experimental diets for 6w.

	FF	CE	CH
Initial body weight (g)	168±7	168±4	168±5
Final body weight (g)	212±13	223±4	216±6
Body weight gain (g)	43±10	55±4	48±3
Food intake (g/ 45days)	489±31	563±9*	534±13
Liver (g)	7.08±0.52	6.14±0.23	6.09±0.15
Abdominal fat (g)	3.60±0.88	3.49±0.51	3.16±0.38
Uterus (g)	0.14±0.04	0.12±0.01	0.12±0.01

Values are means ± SE (FF: *n*=5, CE: *n*=6, CH: *n*=7). *: *P*<0.05 vs FF. FF: fiber-free. CE: cellulose, CH: chitosan.

Table 2-3-3. Effects of the experimental diets on cecal pH value and the volatile fatty acid pool

(μ mol/ cecum)	FF	CE	CH
Succinic acid	0.62±0.24	1.07±0.40	0.87±0.11
Lactic acid	0.05±0.05	0.07±0.05	0.03±0.03
Acetic acid	4.71±1.25	8.29±1.56	13.25±1.50**#
Propionic acid	1.70±0.44	2.31±0.47	4.94±0.48***##
Butyric acid	0.56±0.22	1.78±0.54	1.70±0.47
Total	7.49±2.67	14.48±2.88	21.35±2.57**
Water	82.43±1.03	73.54±0.51***	84.88±0.20*###
Cecal pH	6.98±0.18	6.86±0.12	7.40±0.08*##

Values are means ± SE (FF: n=5, CE: n=6, CH: n=7). *: P<0.05, **: P<0.01, ***: P<0.001 vs FF, #: P<0.05, ##: P<0.01, ###: P<0.001 vs CE. FF: fiber-free. CE: cellulose, CH: chitosan.