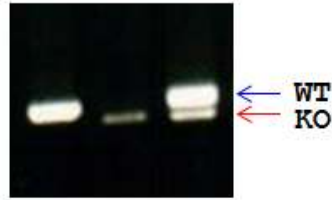




질환모델동물 정보서

관리번호		
질환모델동물 정보		
질환모델동물명	FVB/N-Rag2 ^{em1hwl} /Korl	
유전자 조작 방법	KO created by RGEN-induced NHEJ	
Background Strain	FVB/NTac	
개발자	성명	이 한 웅
	연락처	02-2123-7642 / hwl@yonsei.ac.kr
분석자	성명	강 병 철 / 최 양 규
	연락처	02-2072-0841 / bckang@snu.ac.kr 02-3049-6113 / yangkyuc@konkuk.ac.kr
개발일	2014-09-15	
이관동물 세대수		
Live animal	F3	
수정란/정자		
Genetic Engineering 정보		
유전자명	Rag2 ; recombination activating gene 2	
유전자 기능	The initiation of V(D)J recombination during B and T cell development	
유전자 조작 위치(Chr/gene/exon no. 포함)		
<input type="checkbox"/> Chromosome Location : Chr 2		
<input type="checkbox"/> NCBI Gene ID : 19374		
<input type="checkbox"/> Targeting Region : Exon 3 (This transcript has 3 exons)		
Construct/Mutation Map		
<p>○ The sequence in red denotes PAM and that in blue indicate RGEN target sequence just downstream of the start codon of mouse Rag2 gene. 22-bp deletion induces a premature stop codon (*).</p>		
Genotyping Strategy		
Genotyping Primer 정보 및 결과		
Primer	F	5'-CTCCCAGAACTTCAGGATGGGCT-3'
Sequence	R	5'-AGTCAGGAGTCTCCATCTCACTGA-3'

Loading: 3% agarose gel



PCR result: +/+ -/- +/-

○ PCR product는 3% agarose gel에서 구별됨

Genotyping Protocol

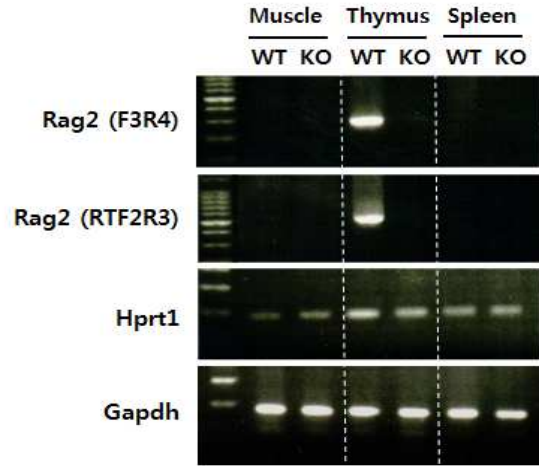
PCR 반응액 조제	구성물		농도		양	
	Sterile water			-	13.6	μl
	Genomic DNA		100	$\text{ng}/\mu\text{l}$	1	μl
	dNTP		10	mM	0.4	μl
	PCR buffer		10	x	2	μl
	Forward primer		10	pM	1	μl
	Reverse primer		10	pM	1	μl
	Taq polymerase		1	$\text{U}/\mu\text{l}$	1	μl
PCR 반응 조건	단계		온도		시간	
	Pre-denaturation		95	$^{\circ}\text{C}$	3 min	00 sec
	Denaturation		95	$^{\circ}\text{C}$	0 min	30 sec
	Annealing		62	$^{\circ}\text{C}$	0 min	30 sec
	Elongation		72	$^{\circ}\text{C}$	0 min	30 sec
	Post-elongation		72	$^{\circ}\text{C}$	3 min	00 sec
	Hold		12	$^{\circ}\text{C}$		
cycle 수	32 Cycles					
증폭 산물 크기	WT		330		bp	
	KO		305		bp	
특이사항	○ 반응액 조성에 필요한 dNTP, PCR buffer, Taq polymerase는 PCR Premix로 대체하여 사용할 수 있음. 본 결과의 PCR 조건 확립에는 PCR Premix (SuperBio., LTD. Cat#P3003)가 사용되었음					

Expression test 정보 및 결과

RT-PCR 정보 및 결과

Primer Sequence (Set 1)	F	'5-TTCACATCCACAAGCAGGAAGT-3' (F3R4)				
	R	'5-GAGGTGGGAGGTAGCAGGAA-3' (F3R4)				
Primer Sequence (Set 2)	F	'5-CCCCTCTGGCCTTCAGTGC-3' (F2R3)				
	R	'5-TGGTGTTTTCCCTCCGTGAA-3' (F2R3)				
PCR 반응 조건	단계		온도		시간	
	Pre-denaturation		94	$^{\circ}\text{C}$	3 min	sec

Denaturation	94	°C	min 30 sec
Annealing	62	°C	min 30 sec
Elongation	72	°C	min 20 sec
Post-elongation	72	°C	5 min sec
cycle 수	30 cycles		



Western blot 정보 및 결과

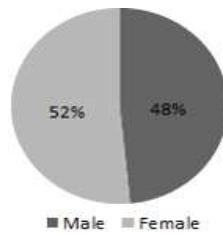
antibody

Antibody is not available for WB

해당 없음

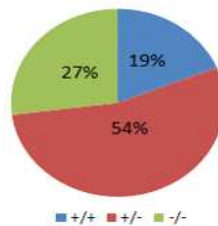
Phenotype 정보 (hetero x hetero 기준)

○ 평균산자수 및 성비(n=159)



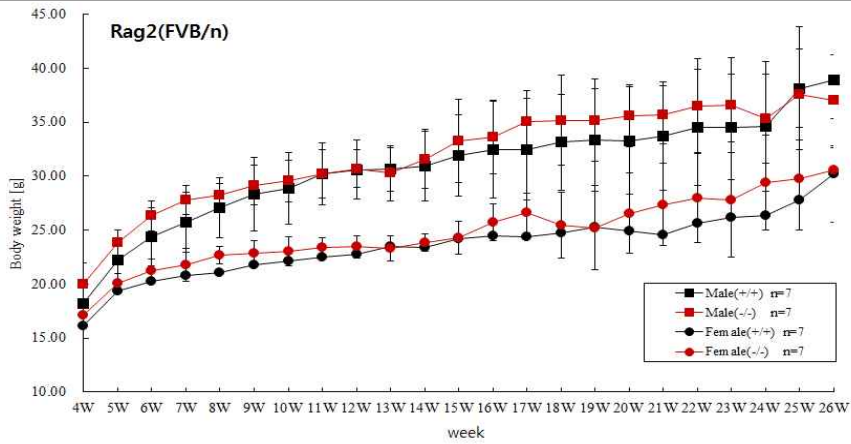
총산자수	159	모체수	14	평균산자	11
성비	Male			77	
	Female			82	
암수비율	Male : Female			≅ 1 : 1.06	

○ 유전형비(n=159)



유전형비율	Wild	30
	Hetero	86
	Homozygous	43
	WT : HT : HO	≅ 1 : 2.86 : 1.43

○ 성장그래프



Ani. No.		4W	5W	6W	7W	8W	9W	10W	11W	12W	13W	14W	15W	16W
Wild male	MEAN	18.19	22.19	24.41	25.74	27.05	28.33	28.88	30.19	30.60	30.62	30.97	31.92	32.43
	S.D	1.787	1.904	2.712	2.782	2.763	3.417	3.295	2.888	2.751	1.994	3.237	3.751	4.491
Homo male	MEAN	19.94	23.81	26.31	27.78	28.25	29.17	29.56	30.18	30.67	30.27	31.58	33.25	33.63
	S.D	2.040	1.222	1.348	1.346	1.097	1.814	1.919	2.245	1.747	2.547	2.712	3.849	3.427
Wild female	MEAN	16.12	19.37	20.27	20.79	21.06	21.75	22.15	22.49	22.78	23.51	23.41	24.22	24.44
	S.D	1.543	2.063	1.746	1.891	1.991	2.286	2.134	1.774	2.206	2.086	1.895	2.367	2.703
Homo female	MEAN	17.15	20.10	21.22	21.80	22.66	22.88	23.05	23.40	23.47	23.32	23.86	24.23	25.73
	S.D	0.886	0.886	1.125	1.543	0.831	1.115	1.328	0.912	1.025	1.186	0.802	1.532	1.731

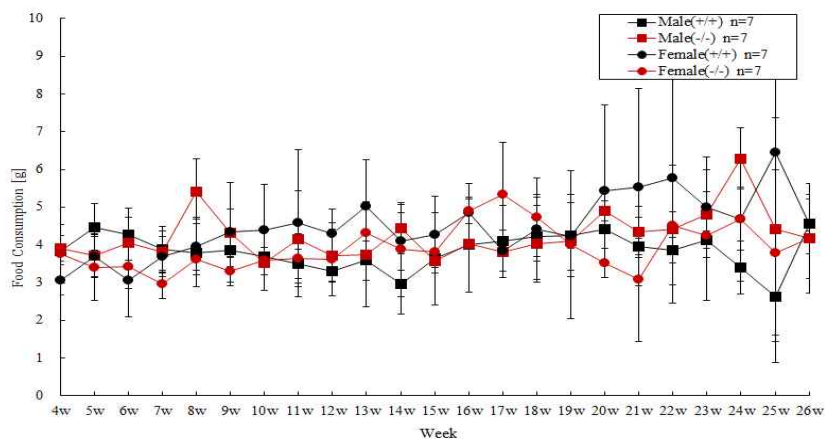
17W	18W	19W	20W	21W	22W	23W	24W	25W	26W
32.49	33.15	33.34	33.30	33.71	34.49	34.54	34.60	38.13	38.92
4.678	4.434	4.776	4.968	5.039	5.384	4.878	5.981	5.678	6.265
35.03	35.19	35.18	35.63	35.72	36.49	36.58	35.31	37.56	37.00
2.853	4.173	3.804	2.870	2.686	4.400	4.363	4.153	4.197	4.224
24.43	24.76	25.30	24.94	24.52	25.64	26.21	26.32	27.81	30.21
2.378	2.824	2.788	2.911	4.418	4.222	4.590	5.184	4.835	7.792
26.60	25.47	25.22	26.56	27.38	28.01	27.82	29.39	29.79	30.53
1.856	3.053	3.923	3.712	3.801	4.191	5.366	4.410	4.745	4.816

- WT male/female, KO male/female

○ 사료섭취량 그래프

- WT male/female, KO male/female

- 사료명 : 2918C Harlan



		4w	5w	6w	7w	8w	9w	10w	11w	12w	13w	14w	15w	16w
Wild Male	MEAN	3.84	4.48	4.28	3.88	3.78	3.85	3.69	3.50	3.30	3.58	2.96	3.64	4.01
	S.D.	0.695	0.613	0.684	0.612	0.894	0.425	0.231	0.389	0.290	0.516	0.803	1.222	1.256
Homo male	MEAN	3.91	3.71	4.04	3.82	5.42	4.31	3.52	4.16	3.72	3.75	4.45	3.57	4.03
	S.D.	0.334	0.558	0.699	0.553	0.856	0.637	0.103	1.262	0.692	1.384	0.622	0.115	0.130

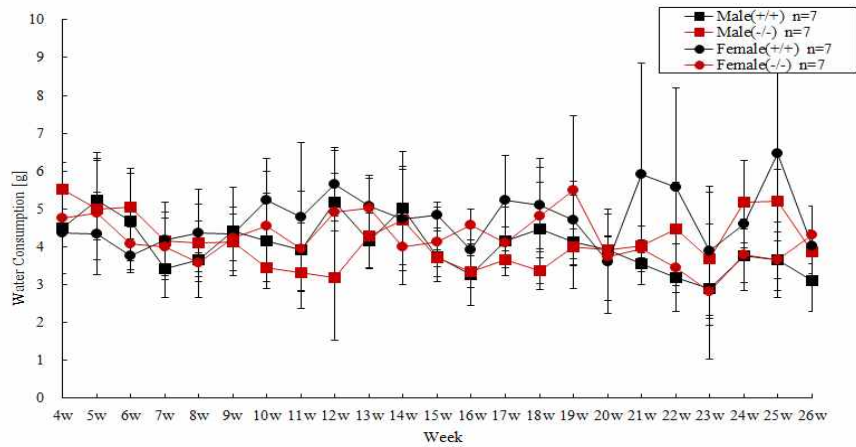
		4w	5w	6w	7w	8w	9w	10w	11w	12w	13w	14w	15w	16w
Wild Female	MEAN	3.07	3.69	3.06	3.69	3.97	4.33	4.40	4.58	4.30	5.02	4.09	4.28	4.86
	S.D.	0.403	0.544	0.971	0.528	0.770	1.319	1.193	1.951	0.656	1.237	0.770	1.013	0.771
Homo female	MEAN	3.76	3.41	3.42	2.96	3.61	3.91	3.58	3.64	3.61	4.33	3.88	3.82	4.90
	S.D.	0.778	0.887	0.592	0.380	0.286	0.385	0.796	0.645	0.970	0.829	1.250	0.412	0.331

17w	18w	19w	20w	21w	22w	23w	24w	25w	26w
4.10	4.22	4.25	4.41	3.95	3.86	4.13	3.40	2.62	4.56
0.955	1.123	1.089	0.975	0.224	0.337	0.236	0.692	1.744	0.790
3.81	4.04	4.11	4.91	4.35	4.43	4.80	6.29	4.41	4.17
0.030	1.011	0.202	0.262	0.674	0.446	0.615	0.814	2.970	1.058

17w	18w	19w	20w	21w	22w	23w	24w	25w	26w
3.84	4.42	4.23	5.43	5.53	5.76	5.01	4.69	6.44	4.53
0.545	0.855	0.904	2.288	2.621	3.333	1.333	0.837	3.756	0.156
5.34	4.74	4.01	3.52	3.07	4.52	4.26	4.69	3.80	4.17
1.376	1.046	1.968	0.382	1.645	1.584	1.735	1.649	2.192	1.446

○ 음수섭취량 그래프

- WT male/female, KO male/female



		4w	5w	6w	7w	8w	9w	10w	11w	12w	13w	14w	15w	16w
Wild Male	MEAN	4.49	5.23	4.67	3.41	3.67	4.41	4.16	3.91	5.18	4.17	5.01	3.75	3.27
	S.D.	0.501	1.055	1.279	0.763	1.013	1.177	1.256	1.548	0.764	0.735	1.496	0.680	0.809
Homo male	MEAN	5.52	4.99	5.05	4.15	4.10	4.12	3.44	3.32	3.18	4.29	4.71	3.71	3.35
	S.D.	0.712	1.338	1.012	1.025	1.022	0.743	0.042	0.498	1.640	0.834	1.338	0.221	0.417

17w	18w	19w	20w	21w	22w	23w	24w	25w	26w
4.15	4.48	4.12	3.91	3.56	3.19	2.90	3.75	3.65	3.10
0.910	1.617	1.230	0.344	0.137	0.891	0.786	0.713	0.997	0.825
3.67	3.37	4.00	3.91	4.01	4.46	3.68	5.19	5.22	3.87
0.220	0.346	0.486	0.379	0.161	1.246	1.757	1.085	0.825	0.574

17w	18w	19w	20w	21w	22w	23w	24w	25w	26w
5.24	5.09	4.71	3.61	5.92	5.58	3.90	4.59	6.46	4.01
1.182	1.231	1.016	1.374	2.923	2.602	1.711	0.625	3.622	0.021
4.10	4.82	5.50	3.73	3.95	3.44	2.81	3.79	3.65	4.32
0.433	0.881	1.979	1.149	0.604	0.648	1.778	0.946	0.506	0.758

		4w	5w	6w	7w	8w	9w	10w	11w	12w	13w	14w	15w	16w
Wild	MEAN	4.38	4.35	3.77	4.17	4.36	4.33	5.24	4.79	5.65	5.08	4.74	4.85	3.92
Female	S.D.	1.078	1.061	0.451	0.742	1.149	0.702	1.102	1.957	0.976	0.732	1.375	0.341	0.574
Homo	MEAN	4.77	4.88	4.08	3.98	3.59	4.24	4.54	3.96	4.91	5.02	4.01	4.13	4.58
female	S.D.	0.781	1.624	0.437	0.761	0.250	0.156	1.462	0.677	1.629	0.864	1.019	0.917	0.405

○ 임상증상

- WT male/female, KO male/female

Rag2(FVB)	Wild Male	Homo Male	Wild Female	Homo Female
활동성 증가 (activity increased)	N	Y	N	Y
활동성 감소 (activity decreased)	N	N	N	N
진전 (tremors)	N	N	N	N
입모 (piloerection)	Y	N	N	N
탈모 (loss of hair)	N	N	N	N
털의 황변 (yellow colour of hair)	N	N	N	N
유루 (lacrimation)	N	N	N	N
혈루 (eye of bleeding)	N	N	N	N
염증 (inflammation)	N	N	N	N
코의 배출물 (nasal discharge)	N	N	N	N
비혈 (nasal bleeding)	N	N	N	N
발의 종창 (swelling)	N	N	N	N
호흡량 증가 (respiratory increased)	N	N	N	N
호흡량 감소 (respiratory decreased)	N	N	N	N
타액분비 (salivation)	N	N	N	N
설사 (diarrhea)	N	N	N	N
구토 (vomiting)	N	N	N	N

○ 안과학적 검사

- WT male/female, KO male/female

검사부위	WT	KO
망막반사	N	N
눈꺼풀	N	N
누관	N	N
각막	N	N
홍채	N	N
수용성체액	N	N
렌즈	N	N
유리액체	N	N
망막	N	N
시신경유두	N	N
멜라판 Tapetum	N	N
흑색 Tapetum	N	N

※N : 정상

○ 뇨검사

- WT male(n=6)/female(n=3), KO male(n=7)/female(n=6)

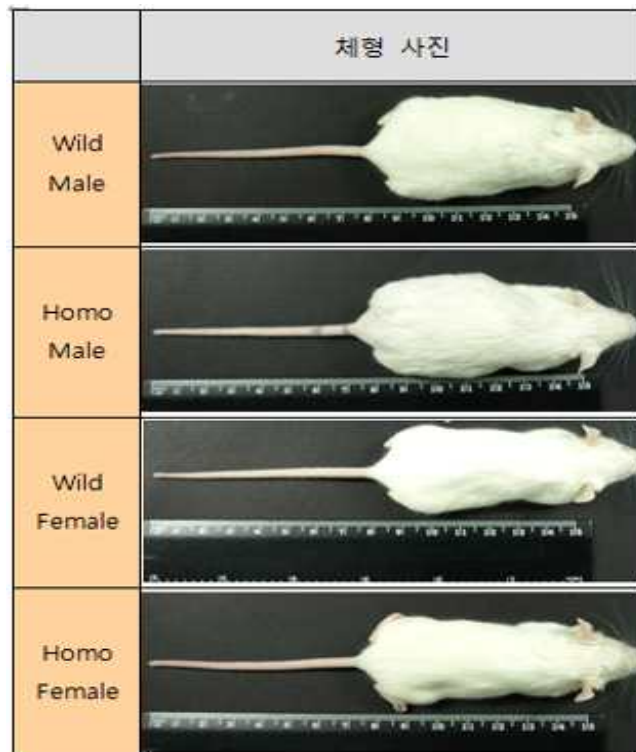
- 분석기기 : Urine Analyzer(CLINITEK Advantus, Siemens, USA)

- 항목 : Specific gravity, Glucose(mg/dl), Bilirubin(+/-), Ketone(mg/dl), Blood(+/-), pH, Protein(mg/dl), Urobilinogen(E.U/dl), Nitrite(+/-), Leucocytes(+/-)

Rag2(FVB)		Wild Male	Homo Male	Wild Female	Homo Female
No. of animals exam.		6	7	3	6
Specific gravity	1.010	0	0	1	0
	1.015	0	1	0	0
	1.020	0	0	0	0
	1.025	1	2	0	0
	≥1.030	5	4	2	6
Glucose (mg/dl)	negative	6	7	3	6
	positive	-	-	-	-
Bilirubin	negative	6	6	2	1
	small	-	1	1	5
Ketone (mg/dl)	negative	3	3	-	-
	trace	2	3	3	4
	15	1	1	-	2
Blood	negative	6	7	3	5
	LARGE	-	-	-	1
pH		6.3	6.1	6.0	6.1
Protein (mg/dl)	negative	1	1	2	2
	trace	-	3	1	3
	30	5	3	-	1
Urobilinogen (E.U./dl)		0.3	0.4	0.2	0.2
Nitrite	negative	6	7	3	-
	positive	-	-	-	6
Leucocytes	negative	5	6	3	6
	trace	1	1	-	-
	small	-	-	-	-
	positive	-	-	-	-

○ 체온 및 체형

Rag2(FVB)	Wild Male	Homo Male	Wild Female	Homo Female
체온 (°C)	38.0	35.6 ± 1.39	38.5	37.5 ± 0.87
몸통길이 (mm)	94.0	95.0 ± 1.00	94.0	95.2 ± 2.68
꼬리길이 (mm)	82.0	75.3 ± 1.15	80.0	77.8 ± 4.27

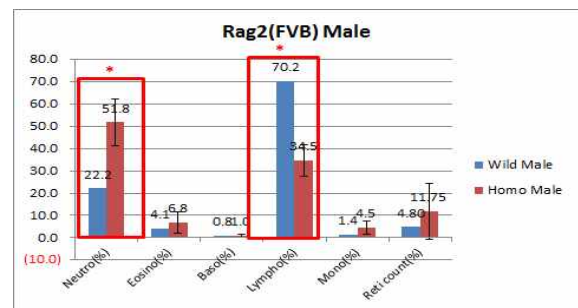
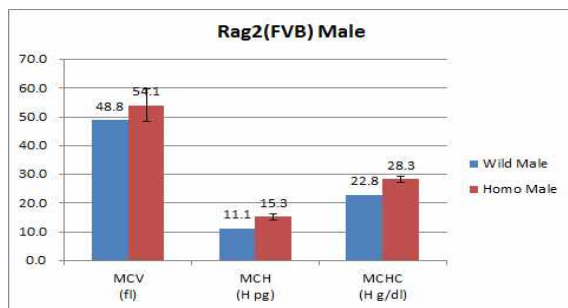
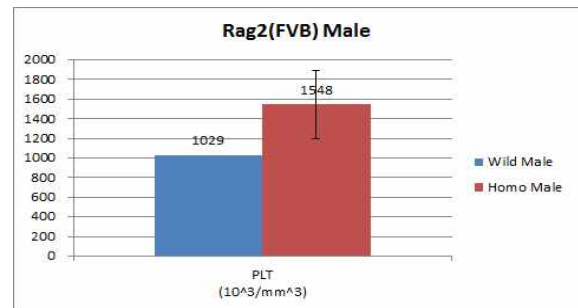
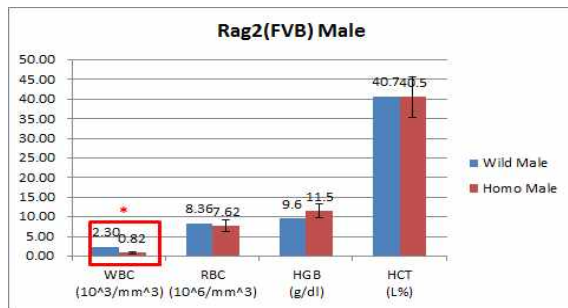


○ 혈액학적 검사

- 분석기기 : Animal Blood Counter (ADVIA2120i, Siemens Healthcare Diagnostics)
- 항목 : WBC(White blood cells), RBC(Red blood cells), HGB(Hemoglobin), HCT(Hematocrit), MCV(Mean corpuscular volume), MCH(Mean corpuscular hemoglobin), MCHC(Mean corpuscular hemoglobin concentration), Platelet, Neutrophils, Lymphocytes, Eosinophils,

Basophils, Monocytes, Reticulocyte count

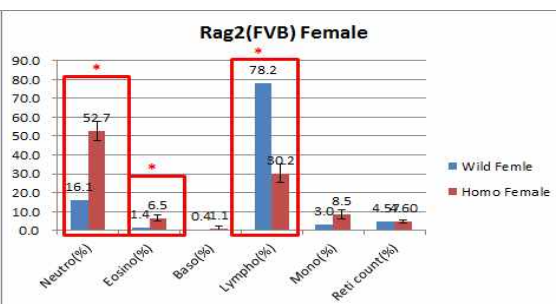
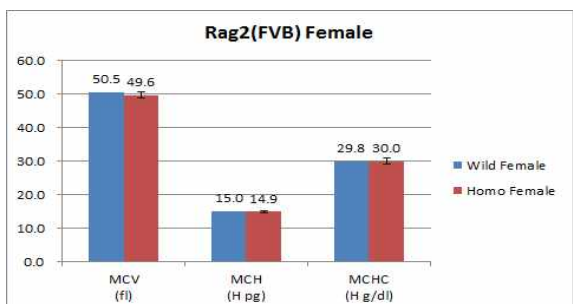
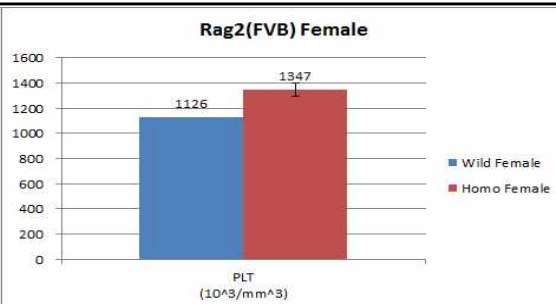
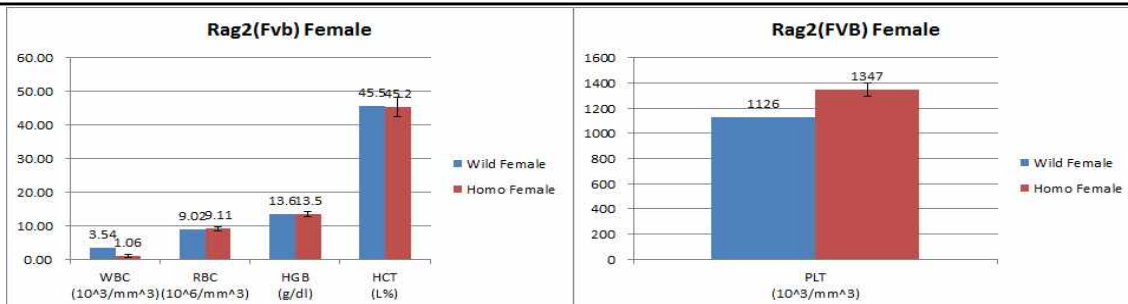
- WT male(n=6), KO male(n=7)



Rag2(FVB)		WBC ($10^3/mm^3$)	RBC ($10^6/mm^3$)	HGB (g/dl)	HCT (L%)	PLT ($10^3/mm^3$)	MCV (fl)	MCH (H pg)
Wild male	MEAN	2.75	8.53	10.6	41.3	1113	48.5	12.2
	S.D	1.345	0.717	4.61	2.85	309.3	1.52	5.14
Homo male	MEAN	0.82	7.62	11.5	40.5	1548	54.1	15.3
	S.D	0.19	1.52	1.9	5.1	349	5.7	1.1
Wild female	MEAN	4.25	9.03	13.6	45.5	676	50.5	15.1
	S.D	1.101	0.292	0.38	0.96	618.4	1.14	0.17
Homo female	MEAN	1.06	9.11	13.5	45.2	1347	49.6	14.9
	S.D	0.405	0.573	0.75	2.91	52.7	0.97	0.20

Rag2(FVB)		MCHC (H g/dl)	Neutrophils (%)	Eosinophils (%)	Basophils (%)	Lymphocytes (%)	Monocytes (%)	Reticulocyte count (%)
Wild male	MEAN	25.2	21.4	3.3	0.7	71.1	21	4.55
	S.D	10.64	7.01	2.31	0.53	9.00	1.63	0.977
Homo male	MEAN	28.3	51.8	6.8	1.0	34.5	4.5	11.75
	S.D	1.2	10.3	4.8	0.6	7.0	2.8	12.72
Wild female	MEAN	23.9	16.4	1.8	0.4	77.6	2.8	4.46
	S.D	0.50	1.37	1.15	0.19	1.61	0.92	0.162
Homo female	MEAN	30.0	52.7	6.5	1.1	30.2	8.5	4.60
	S.D	0.89	5.33	1.72	1.01	4.77	2.56	0.758

- WT female(n=5), KO female(n=7)

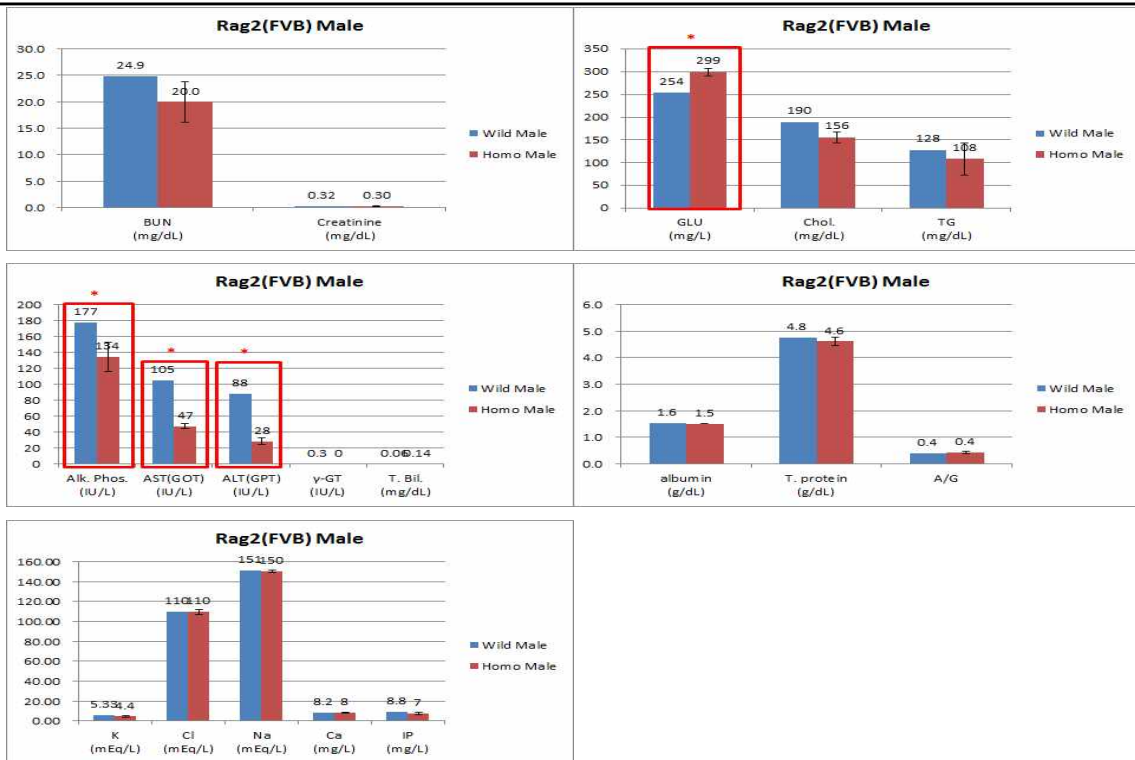


Rag2(FVB)		WBC (10 ³ /mm ³)	RBC (10 ⁶ /mm ³)	HGB (g/dl)	HCT (L%)	PLT (10 ³ /mm ³)	MCV (fl)	MCH (H pg)
Wild male	MEAN	2.75	8.53	10.6	41.3	1113	48.5	12.2
	S.D	1.345	0.717	4.61	2.85	309.3	1.52	5.14
Homo male	MEAN	0.82	7.62	11.5	40.5	1548	54.1	15.3
	S.D	0.19	1.52	1.9	5.1	349	5.7	1.1
Wild female	MEAN	4.25	9.03	13.6	45.5	676	50.5	15.1
	S.D	1.101	0.292	0.38	0.96	618.4	1.14	0.17
Homo female	MEAN	1.06	9.11	13.5	45.2	1347	49.6	14.9
	S.D	0.405	0.573	0.75	2.91	52.7	0.97	0.20

Rag2(FVB)		MCHC (H g/dl)	Neutrophils (%)	Eosinophils (%)	Basophils (%)	Lymphocytes (%)	Monocytes (%)	Reticulocyte count (%)
Wild male	MEAN	25.2	21.4	3.3	0.7	71.1	2.1	4.55
	S.D	10.64	7.01	2.31	0.53	9.00	1.63	0.977
Homo male	MEAN	28.3	51.8	6.8	1.0	34.5	4.5	11.75
	S.D	1.2	10.3	4.8	0.6	7.0	2.8	12.72
Wild female	MEAN	29.9	16.4	1.8	0.4	77.6	2.8	4.46
	S.D	0.50	1.37	1.15	0.19	1.61	0.92	0.162
Homo female	MEAN	30.0	52.7	6.5	1.1	30.2	8.5	4.60
	S.D	0.89	5.33	1.72	1.01	4.77	2.56	0.758

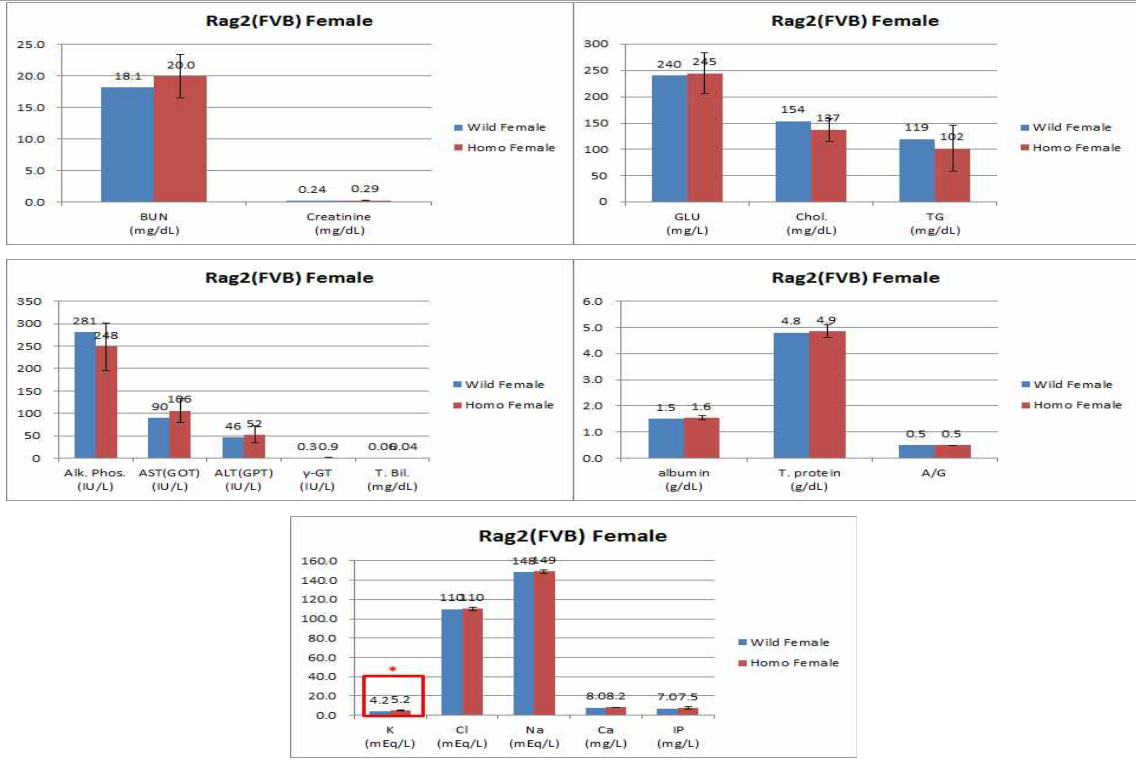
○ 혈청학적 검사

- 분석기기 : Automatic Chemistry Analyzer(Hitachi7070, HITACHI)
- 항목 : Blood urea nitrogen, Creatinine, Glucose, Cholesterol, Triglyceride, Alkaline phosphatase, Aspartate aminotransferase, Alanine aminotransferase, Gamma-glutamyl transferase, Bilirubin, Albumin, Total protein, Albumin/Globulin, K, Na, Cl, Ca, Inorganic phosphors
- WT male(n=6), KO male(n=7)



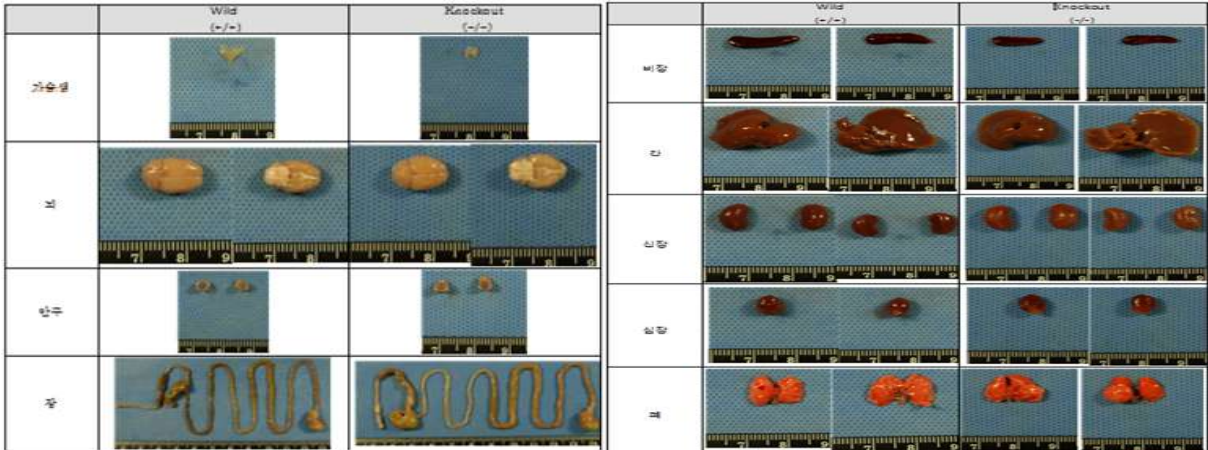
Rag2(FVB)		BUN (mg/dL)	Creatinine (mg/dL)	GLU (mg/L)	Chol. (mg/dL)	TG (mg/dL)	Alk. Phos. (IU/L)	AST(GOT) (IU/L)	ALT(GPT) (IU/L)	γ-GT (IU/L)
Wild male	MEAN	22.3	0.30	246	188	131	189	93	79	0.2
	S.D	4.53	0.045	61.7	23.4	43.4	28.0	45.7	40.8	0.41
Homo male	MEAN	20.0	0.30	299	156	108	134	47	28	0
	S.D	4.2	0.06	19	27	31	18	5	7	0
Wild female	MEAN	17.3	0.25	240	136	109	266	96	45	0.2
	S.D	2.93	0.037	49.9	24.3	21.6	63.1	29.5	21.8	0.45
Homo female	MEAN	19.4	0.29	245	137	102	248	106	52	0.9
	S.D	3.1	0.05	38	20	40	52	27	18	1
Rag2(FVB)		T. Bil. (mg/dL)	albumin (g/dL)	T. protein (g/dL)	A/G	K (mEq/L)	Cl (mEq/L)	Na (mEq/L)	Ca (mg/L)	IP (mg/L)
Wild male	MEAN	0.08	1.6	4.7	0.5	4.97	110	150	8.4	8.5
	S.D	0.035	0.05	0.21	0.06	0.723	2.7	3.0	0.34	0.99
Homo male	MEAN	0.14	1.5	4.6	0.5	4.4	110	150	8	7
	S.D	0.07	0.0	0.3	0.1	0.6	2	1	0	1
Wild female	MEAN	0.05	1.5	4.4	0.5	4.7	111	149	8.3	7.8
	S.D	0.027	0.07	0.29	0.04	0.30	1.7	3.3	0.46	1.27
Homo female	MEAN	0.04	1.6	4.8	0.5	5.2	110	149	8.2	7.6
	S.D	0.03	0.1	0.3	0.0	0.4	2	2	0.3	1.0

- WT female(n=5), KO female(n=7)



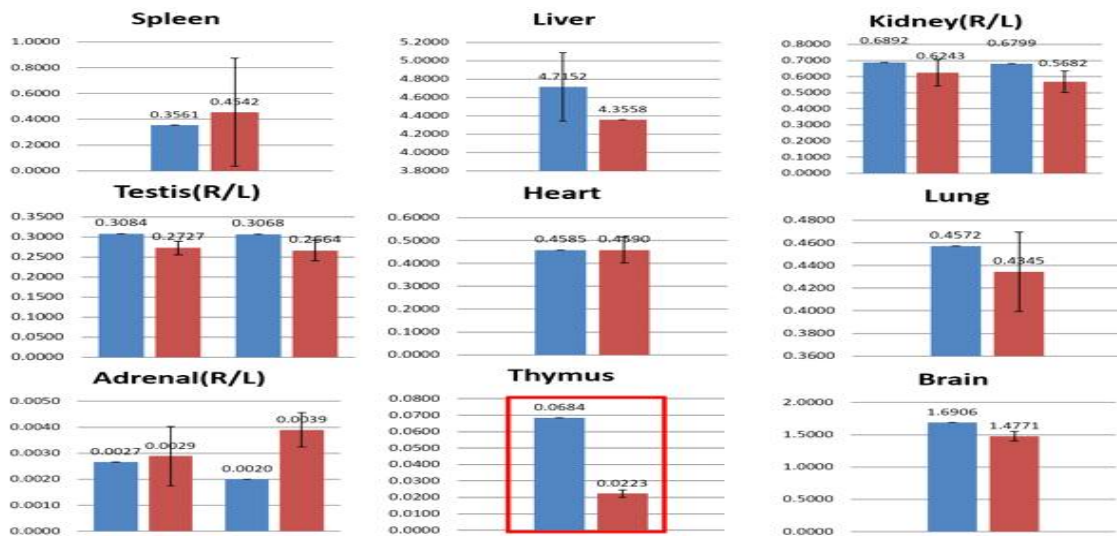
Rag2(FVB)		BUN (mg/dL)	Creatinine (mg/dL)	GLU (mg/L)	Chol. (mg/dL)	TG (mg/dL)	Alk. Phos. (IU/L)	AST(GOT) (IU/L)	ALT(GPT) (IU/L)	γ-GT (IU/L)
Wild male	MEAN	22.3	0.30	246	188	131	189	93	79	0.2
	S.D	4.53	0.045	61.7	23.4	43.4	28.0	45.7	40.8	0.41
Homo male	MEAN	20.0	0.30	299	156	108	134	47	28	0
	S.D	4.2	0.06	19	27	31	18	5	7	0
Wild female	MEAN	17.3	0.25	240	136	109	266	96	45	0.2
	S.D	2.93	0.037	49.9	24.3	21.6	63.1	29.5	21.8	0.45
Homo female	MEAN	19.4	0.29	245	137	102	248	106	52	0.9
	S.D	3.1	0.05	38	20	40	52	27	18	1
Rag2(FVB)		T. Bil. (mg/dL)	albumin (g/dL)	T. protein (g/dL)	A/G	K (mEq/L)	Cl (mEq/L)	Na (mEq/L)	Ca (mg/L)	IP (mg/L)
Wild male	MEAN	0.08	1.6	4.7	0.5	4.97	110	150	8.4	8.5
	S.D	0.035	0.05	0.21	0.06	0.723	2.7	3.0	0.34	0.99
Homo male	MEAN	0.14	1.5	4.6	0.5	4.4	110	150	8	7
	S.D	0.07	0.0	0.3	0.1	0.6	2	1	0	1
Wild female	MEAN	0.05	1.5	4.4	0.5	4.7	111	149	8.3	7.8
	S.D	0.027	0.07	0.29	0.04	0.30	1.7	3.3	0.46	1.27
Homo female	MEAN	0.04	1.6	4.8	0.5	5.2	110	149	8.2	7.6
	S.D	0.03	0.1	0.3	0.0	0.4	2	2	0.3	1.0

○ 조직 사진



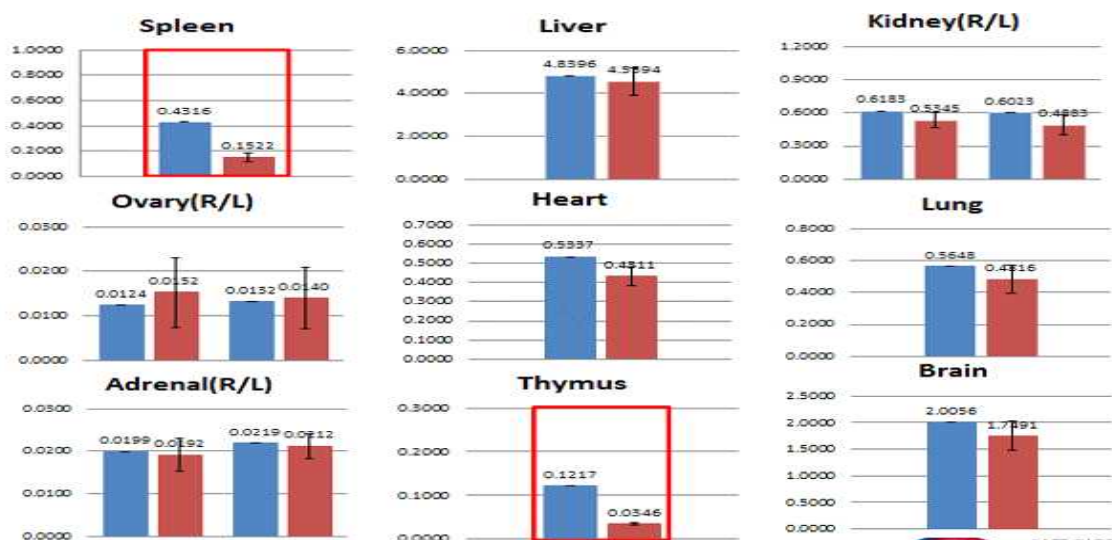
○ 상대 장기중량 그래프

- WT male(n=6), KO male(n=7), 단위 : g



Rag2(FVB)		RSpleen	RLiver	RKidney(R)	RKidney(L)	RTestis(R)	RTestis(L)
Wild male	MEAN	0.3396	4.5035	0.5980	0.6813	0.3252	0.2818
	S,D	0.0145	0.1662	0.2938	0.0507	0.1320	0.0414
Homo male	MEAN	0.3053	4.2542	0.6289	0.5881	0.2618	0.2559
	S,D	0.3502	0.3312	0.0757	0.0566	0.0204	0.0228
Wild female	MEAN	0.4890	5.0664	0.6463	0.6404	0.0195	0.0201
	S,D	0.0566	0.1944	0.0875	0.0740	0.0081	0.0086
Homo female	MEAN	0.1596	4.6854	0.5500	0.5010	0.0157	0.0141
	S,D	0.0378	0.6596	0.0760	0.0881	0.0071	0.0063
Rag2(FVB)		Rheart	RLung	부신Ⓢ	부신(L)	가슴샘	뇌
Wild male	MEAN	0.4660	0.4244	0.0028	0.0024	0.0523	1.2580
	S,D	0.0578	0.0712	0.0007	0.0004	0.0110	0.2393
Homo male	MEAN	0.4616	0.4312	0.0029	0.0123	0.0265	1.5189
	S,D	0.0421	0.0325	0.0008	0.0107	0.0070	0.1121
Wild female	MEAN	0.6157	0.6382	0.0216	0.0246	0.1197	2.0886
	S,D	0.0684	0.0711	0.0016	0.0026	0.0140	0.0681
Homo female	MEAN	0.4433	0.4906	0.0192	0.0217	0.0353	1.7315
	S,D	0.0552	0.0850	0.0035	0.0029	0.0029	0.2610

- WT female(n=5), KO female(n=7), 단위 : g

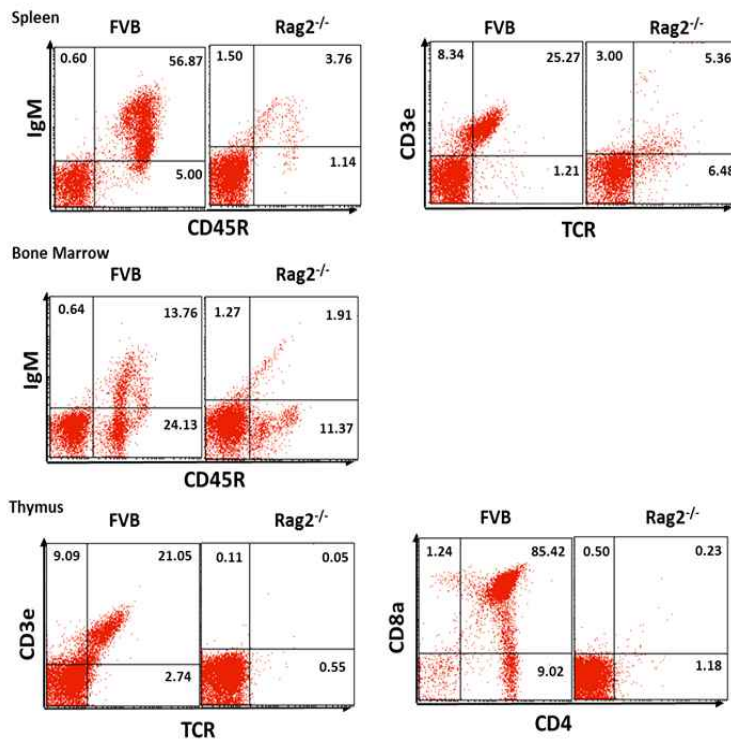


Rag2(FVB)		RSpleen	RLiver	RKidney(R)	RKidney(L)	RTestis(R)	RTestis(L)
Wild male	MEAN	0.3396	4.5035	0.5980	0.6813	0.3252	0.2818
	S.D	0.0145	0.1662	0.2938	0.0507	0.1320	0.0414
Homo male	MEAN	0.3053	4.2542	0.6289	0.5881	0.2618	0.2559
	S.D	0.3502	0.3312	0.0757	0.0566	0.0204	0.0228
Wild female	MEAN	0.4890	5.0664	0.6463	0.6404	0.0195	0.0201
	S.D	0.0566	0.1944	0.0875	0.0740	0.0081	0.0086
Homo female	MEAN	0.1596	4.6854	0.5500	0.5010	0.0157	0.0141
	S.D	0.0378	0.6596	0.0760	0.0881	0.0071	0.0063
Rag2(FVB)		Rheart	RLung	부신(R)	부신(L)	가슴샘	뇌
Wild male	MEAN	0.4660	0.4244	0.0028	0.0024	0.0523	1.2580
	S.D	0.0578	0.0712	0.0007	0.0004	0.0110	0.2393
Homo male	MEAN	0.4616	0.4312	0.0029	0.0123	0.0265	1.5189
	S.D	0.0421	0.0325	0.0008	0.0107	0.0070	0.1121
Wild female	MEAN	0.6157	0.6382	0.0216	0.0246	0.1197	2.0886
	S.D	0.0684	0.0711	0.0016	0.0026	0.0140	0.0681
Homo female	MEAN	0.4433	0.4906	0.0192	0.0217	0.0353	1.7315
	S.D	0.0552	0.0850	0.0035	0.0029	0.0029	0.2610

○ 면역세포 분포 분석(Flow cytometry)

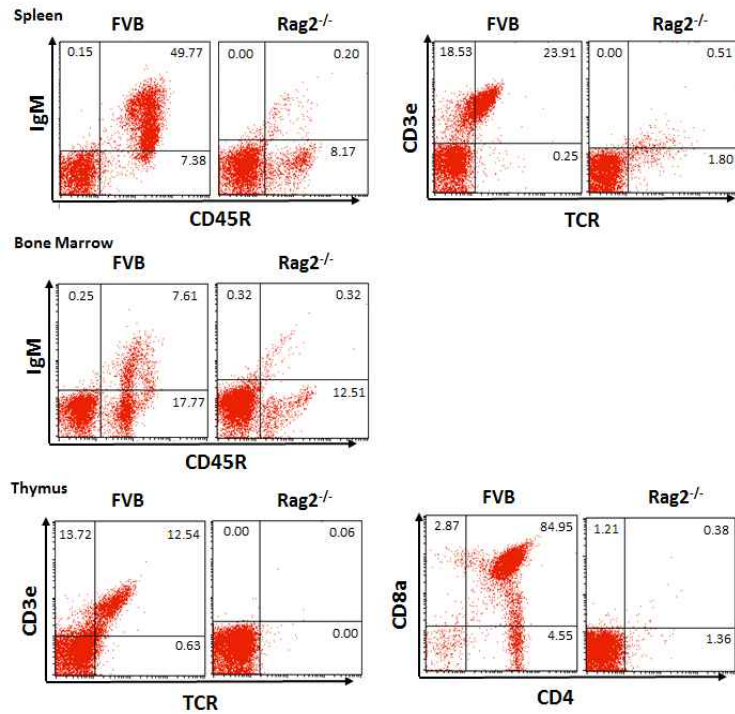
(1) WT n=3, KO n=4, male, 8w

Tissue	Phenotype	FVB- <i>Rag2</i> ^{-/-}	Wild
Spleen	CD45R ⁺ /IgM ⁺	3.82±1.80	54.99±6.66
	TCR ⁺ /CD3e ⁺	1.98±0.62	23.56±6.67
Bone Marrow	CD45R ⁺ /IgM ⁺	0.18±0.30	10.61±2.49
Thymus	TCR ⁺ /CD3e ⁺	1.07±1.84	14.63±6.32
	CD4 ⁺ /CD8a ⁺	0.29±0.13	77.41±7.87



(2) WT n=3, KO n=4, female, 8w

Tissue	Phenotype	FVB- <i>Rag2</i> ^{-/-}	Wild
Spleen	CD45R ⁺ /IgM ⁺	1.10±1.19	50.17±5.62
	TCR ⁺ /CD3e ⁺	0.49±0.36	24.33±0.59
Bone Marrow	CD45R ⁺ /IgM ⁺	0.31±0.35	7.73±2.46
Thymus	TCR ⁺ /CD3e ⁺	0.74±0.38	12.84±4.92
	CD4 ⁺ /CD8a ⁺	0.21±0.14	87.07±1.98



○ 혈중 면역글로불린 측정(ELISA)

- KO male=2, female=2, 8w

항목	IgM	IgG1	IgG2a	IgG2b	IgG3	IgA
FVB-Rag2 ^{-/-}	low limit	0.5 μ g/ml 이하	0.1 μ g/ml 이하	low limit	low limit	low limit
FVB	100 μ g/ml 이상	30 μ g/ml 이상	10 μ g/ml 이상	100 μ g/ml 이상	100 μ g/ml 이상	4 μ g/ml 이상

○ 조직 및 면역염색

(1) 조직염색(H&E 염색)

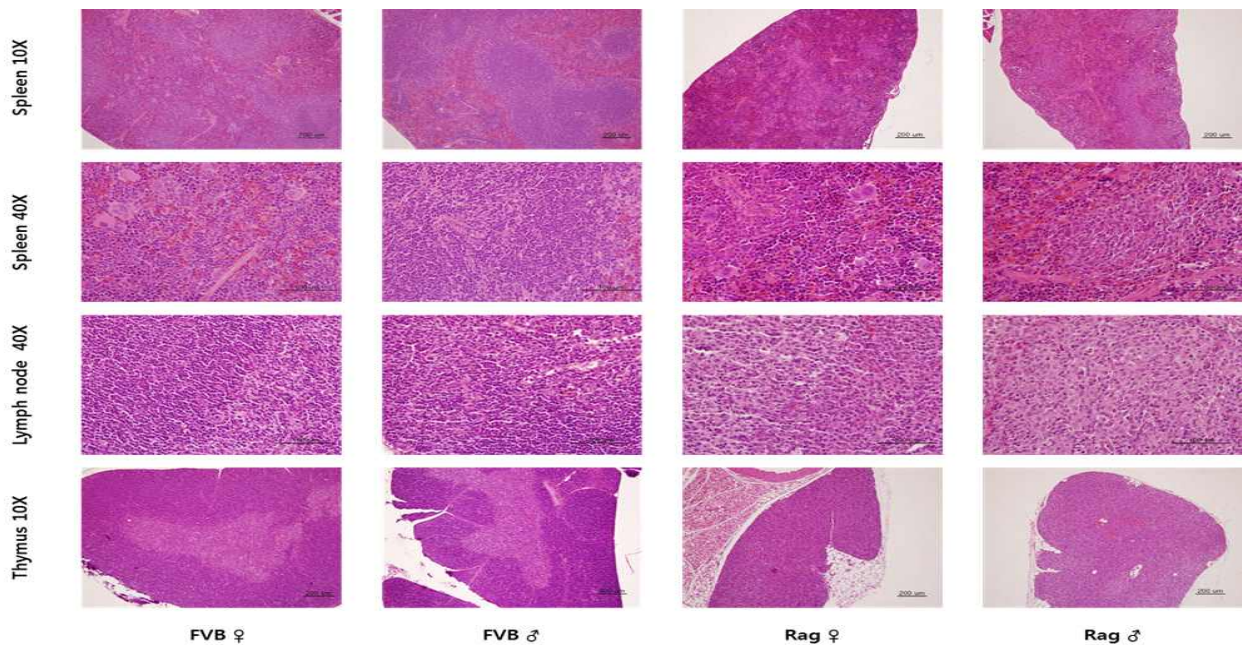


Fig. 1. H&E stained immune organs of FVB-Rag2 knockout mouse. FVB-Rag2 knockout mouse has smaller spleen and thymus than FVB control mouse

(2) B cell 염색(CD45 antibody)

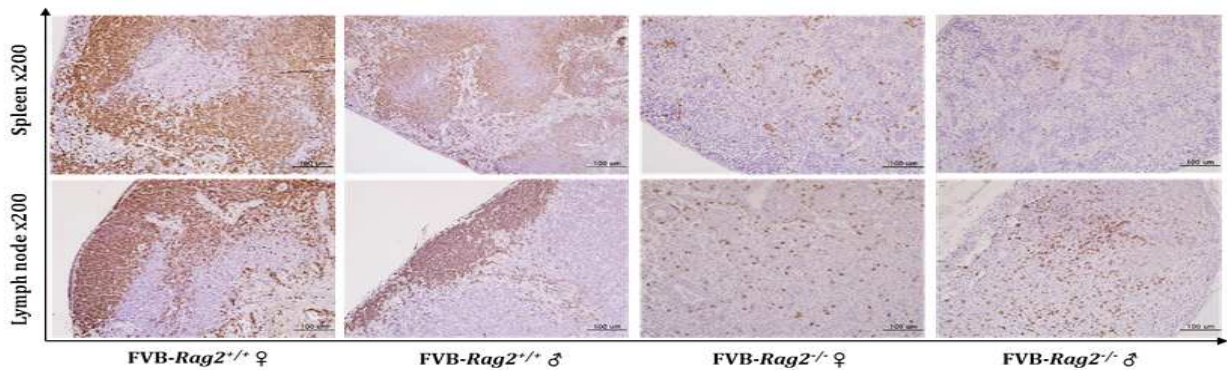


Fig. 2. IHC staining for CD45R antibody in spleen and lymph node of FVB-Rag2 knockout mouse. Significantly decreased CD45R+ cells in FVB-Rag2 knockout mouse.

(3) T cell 염색(CD4 antibody)

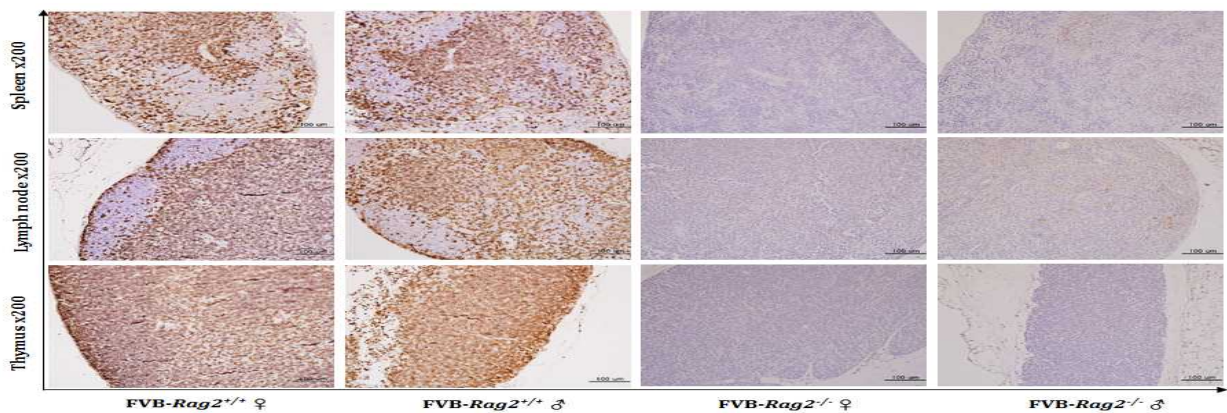


Fig. 3. IHC staining for CD45R antibody in spleen and lymph node of FVB-Rag2 knockout mouse. Significantly decreased CD45R+ cells in FVB-Rag2 knockout mouse.

사육관리 정보

번식능력 및 번식방법(Breeding Scheme) (HT×WT 기준)

- 평균 한배 새끼 수 : 9~11마리
 - * Breeding을 위해 HT×WT mating 실시, 평균 8.5마리(n=77)
- FVB/n strain으로 생산되었으며, genetic background를 유지하기 위해서 Rag2 heterozygote (+/-) 또는 heterozygote (+/-) 마우스를 FVB/n strain의 마우스로만 mating을 실시하여 strain을 유지
- homozygote mouse is also viable and fertile

사육관리에서 특별히 요구되는 사항

- Homozygote일 때, 면역결핍 증상을 보이므로 감염에 주의
 - 사육실 환경조건 : 온도;20~26°C, 습도;30~70%, 조도;150~300lux

Reference

- RAG-2-Deficient Mice Lack Mature Lymphocytes Owing to Inability to Initiate V(D)J Rearrangement Cell, Vol. 68, 855-867, March 6, 1992
- Immunity 11:201-212 (1999)