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研究協力者

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Group	Number of females and general conditions	Days of administration																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Control (Distilled water)	Number of females	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	General appearance, No abnormality	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10
	Skin Crust formation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snPt	Number of females	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	General appearance, No abnormality	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10
	Skin Crust formation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
nPt	Number of females	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	General appearance, No abnormality	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10
	Skin Crust formation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

表 1 一般状態(雄)

snPt 群では投与 9 日以降、nPt 群では投与 14 日以降、貼付部皮膚に痂皮形成(一部潰瘍を伴う)が観察された。

Group	Number of females and general conditions	Days of administration																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Control (Distilled water)	Number of females	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
	General appearance, No abnormality	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	
	Skin Crust formation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snPt	Number of females	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
	General appearance, No abnormality	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	5	5	10	10	10	
	Skin Crust formation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
nPt	Number of females	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
	General appearance, No abnormality	10	10	5	5	10	10	10	10	10	5	5	10	10	10	10	10	3	4	4	3	3	4	4	4	3	3	4	4	4
	Skin Crust formation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	2	2	4	4	4	2	2	4	4	4	4

表 2 一般状態(雌)

snPt 群では投与 12 日以降、nPt 群では投与 16 日以降、貼付部皮膚に痂皮形成(一部潰瘍を伴う)が観察された。

Group	Control (Distilled water)		snPT		nPT	
Number of males	5		5		5	
Days of administration						
1	236.6	± 3.5	236.6	± 3.9	237.9	± 4.7
8	289.5	± 1.6	284.0	± 17.0	291.5	± 14.5
15	338.6	± 4.4	321.8	± 27.5	341.8	± 17.6
22	382.1	± 8.4	350.7	± 43.8	382.1	± 21.2
28	408.4	± 13.9	375.0	± 47.7	407.0	± 22.1

Each value shows mean (g) ± S.D.

表3 体重(雄)

皮膚病変が重篤であった snPt 群の 2 例の体重推移がやや低値に推移したために、snPt 群の体重平均値が低値を示したが、統計学的な有意差は認められていない。

Group	Control (Distilled water)		snPT		nPT	
Number of females	5		5		5	
Days of administration						
1	163.9	± 5.4	162.9	± 7.5	164.7	± 4.8
8	180.9	± 7.9	179.9	± 2.8	178.3	± 3.4
15	192.8	± 9.1	200.0	± 2.5	197.5	± 6.9
22	209.5	± 14.1	217.2	± 6.0	212.6	± 6.7
28	218.2	± 18.1	221.4	± 10.5	217.7	± 8.9

表4 体重(雌)

snPt 群および nPt 群ともに対照群と同様に推移した。

Group	Control (Distilled water)		snPT		nPT	
Number of males	5		5		5	
Days of administration						
1	25.3	± 2.3	25.4	± 2.9	24.9	± 1.5
8	30.4	± 1.2	29.0	± 5.5	30.4	± 3.1
15	32.2	± 1.8	27.1	± 6.5	29.8	± 2.8
22	32.0	± 1.6	28.8	± 5.5	32.1	± 3.4

Each value shows mean (g) ± S.D.

表5 摂餌量(雄)

摂餌量には snPt あるいは nPt 投与による影響は見られなかった。

Group	Control (Distilled water)		snPT		nPT	
Number of females	5		5		5	
Days of administration						
1	17.4	± 1.2	17.7	± 0.9	17.4	± 1.9
8	18.6	± 3.9	18.7	± 2.3	17.6	± 1.5
15	19.5	± 4.1	19.4	± 1.7	19.5	± 2.2
22	19.4	± 1.7	20.3	± 1.8	22.3	± 1.3 *

Each value shows mean (g) ± S.D.

Significantly different from the control group (*: P<0.03, **: P<0.01).

表6 摂餌量(雌)

摂餌量には snPt あるいは nPt 投与による影響は見られなかった。

Group	Number of animals	RBC ($\times 10^4 \mu\text{L}$)	Hemoglobin (g dL)	Hematocrit (%)	MCV (fL)	MCH (pg)	MCHC (g dL)	Platelet ($\times 10^4 \mu\text{L}$)	PT (sec)	APTT (sec)
Distilled water	5	744 ± 16	15.3 ± 0.3	43.5 ± 1.2	58.5 ± 1.9	20.6 ± 0.7	35.2 ± 0.6	86.7 ± 11.7	18.9 ± 3.6	22.2 ± 1.6
snPt	5	751 ± 22	15.1 ± 0.5	43.0 ± 1.5	57.3 ± 1.9	20.1 ± 0.7	35.0 ± 0.4	83.1 ± 7.2	20.0 ± 2.6	21.3 ± 1.5
nPt	5	776 ± 24	15.6 ± 0.1	44.9 ± 0.8	58.0 ± 3.0	20.2 ± 0.9	34.8 ± 0.6	89.1 ± 1.6	19.4 ± 3.9	21.9 ± 2.2

Group	Number of animals	WBC ($\times 100 \mu\text{L}$)	Neutrophil (%)	Eosinophil (%)	Basophil (%)	Monocyte (%)	Lymphocyte (%)	Reticulocyte (%)
Distilled water	5	105.4 ± 15.8	10.8 ± 4.0	1.0 ± 0.4	0.0 ± 0.0	2.6 ± 0.8	85.6 ± 4.5	3.46 ± 0.82
snPt	5	65.4 ** ± 16.5	15.2 ± 5.6	1.2 ± 0.3	0.0 ± 0.0	3.6 ± 1.3	80.0 ± 6.3	3.22 ± 0.29
nPt	5	67.0 * ± 23.4	20.1 ** ± 3.4	1.2 ± 0.3	0.0 ± 0.0	2.4 ± 0.7	76.2 ** ± 3.4	3.21 ± 0.44

Each value shows mean \pm S.D.

Significantly different from the control group (*: $P < 0.05$, **: $P < 0.01$).

表 7 血液学検査(雄)

snPt 群、nPt 群ともに白血球数が減少した。白血球分類では snPt 群で好中球比率が増加し、リンパ球比率が減少した。この変化は雌には認められていない。

Group	Number of animals	RBC ($\times 10^4 \mu\text{L}$)	Hemoglobin (g dL)	Hematocrit (%)	MCV (fL)	MCH (pg)	MCHC (g dL)	Platelet ($\times 10^4 \mu\text{L}$)	PT (sec)	APTT (sec)
Distilled water	5	710 ± 15	14.4 ± 0.2	40.3 ± 0.9	56.8 ± 0.9	20.3 ± 0.1	35.8 ± 0.5	83.9 ± 10.0	12.7 ± 0.9	16.6 ± 1.5
snPt	5	700 ± 45	13.8 ± 0.8	39.1 ± 2.1	55.9 ± 2.0	19.7 ** ± 0.3	35.2 ± 0.8	86.4 ± 11.7	13.3 ± 4.2	17.0 ± 1.2
nPt	5	752 ** ± 18	15.2 ** ± 0.4	42.6 ** ± 1.2	56.6 ± 0.5	20.2 ± 0.3	35.6 ± 0.3	76.7 ± 9.5	13.3 ± 0.9	16.7 ± 1.3

Group	Number of animals	WBC ($\times 100 \mu\text{L}$)	Neutrophil (%)	Eosinophil (%)	Basophil (%)	Monocyte (%)	Lymphocyte (%)	Reticulocyte (%)
Distilled water	5	66.3 ± 16.7	12.5 ± 3.5	1.1 ± 0.4	0.0 ± 0.1	2.7 ± 0.7	83.7 ± 3.6	3.0 ± 0.7
snPt	5	88.2 ± 13.1	16.7 ± 3.7	2.0 ± 0.9	0.0 ± 0.0	3.1 ± 0.9	78.3 ± 3.8	3.2 ± 0.5
nPt	5	65.1 ± 17.4	14.7 ± 5.4	2.0 ** ± 0.4	0.0 ± 0.0	2.5 ± 0.7	80.8 ± 5.9	2.4 ± 0.2

Each value shows mean \pm S.D.

Significantly different from the control group (*: $P < 0.05$, **: $P < 0.01$).

表 8 血液学検査(雌)

赤血球数、ヘモグロビン値、ヘマトクリット値、MCH 値が統計学的に有意に高値を示したが、わずかな変化であることから、毒性とは判断しない。

snPt 群では白血球数が増加傾向を示した。この変化は皮膚病変に起因した変化と考えられた。白血球分類では snPt 群、nPt 群ともに好酸球が占める割合が高かった。

Group	Number of animals	Total protein (g dL)	Albumin (g dL)	Total cholesterol (mg dL)	Triglyceride (mg dL)	Phospholipid (mg dL)	Glucose (mg dL)	BUN (mg dL)	Creatinine (mg dL)	Total bilirubin (mg dL)	ALP (U/L)
Distilled water	5	5.7 ±0.2	3.8 ±0.1	47 ±16	32 ±5	75 ±14	143 ±10	16 ±1	0.5 ±0.1	0.05 ±0.01	572 ±100
snPt	5	5.4 ±0.3	3.6 ±0.2	42 ±8	26 ±6	70 ±10	136 ±8	16 ±1	0.5 ±0.1	0.05 ±0.01	567 ±92
nPt	5	5.5 ±0.3	3.8 ±0.2	36 ±7	21* ±6	63 ±9	131 ±7	17 ±3	0.4 ±0.0	0.05 ±0.01	733* ±50

Group	Number of animals	AST (U/L)	ALT (U/L)	γ-GTP (U/L)	LDH (U/L)	Ca (mg dL)	Inorganic phosphorus (mg dL)	A/G	Na (mEq/L)	K (mEq/L)	Cl (mEq/L)
Distilled water	5	70 ±5	31 ±5	0 ±0	155 ±46	9.6 ±0.4	7.9 ±0.4	2.01 ±0.11	145.3 ±1.2	3.42 ±0.17	106.0 ±1.4
snPt	5	73 ±5	28 ±3	0 ±0	118 ±44	9.3 ±0.2	7.8 ±0.3	2.04 ±0.21	146.1 ±0.9	3.48 ±0.13	107.5 ±1.5
nPt	5	80 ±14	31 ±4	0 ±0	177 ±51	9.5 ±0.2	7.3 ±0.5	2.16 ±0.21	145.9 ±1.0	3.37 ±0.05	108.3* ±0.8

Each value shows mean±SD.

Significantly different from the control group (*: P<0.05, **: P<0.01).

表 9 血液生化学検査(雄)

snPt 群、nPt 群ともに栄養状態が良好ではない徴候がみられたが、体重値には影響がない程度であった。貼付ストレスに加え皮膚病変ストレスが一因と考えられる。同じ徴候は雌でも認められている。

Group	Number of animals	Total protein (g dL)	Albumin (g dL)	Total cholesterol (mg dL)	Triglyceride (mg dL)	Phospholipid (mg dL)	Glucose (mg dL)	BUN (mg dL)	Creatinine (mg dL)	Total bilirubin (mg dL)	ALP (U/L)
Distilled water	5	5.5 ±0.4	3.8 ±0.3	54 ±4	14 ±3	98 ±6	121 ±15	16 ±2	0.4 ±0.0	0.07 ±0.01	375 ±54
snPt	5	5.7 ±0.5	3.7 ±0.3	48 ±14	14 ±5	91 ±15	121 ±9	18 ±3	0.5 ±0.0	0.06 ±0.01	450 ±174
nPt	5	5.4 ±0.4	3.8 ±0.2	50 ±14	11 ±5	79* ±13	113 ±13	20* ±3	0.5 ±0.0	0.06* ±0.01	357 ±72

Group	Number of animals	AST (U/L)	ALT (U/L)	γ-GTP (U/L)	LDH (U/L)	Ca (mg dL)	Inorganic phosphorus (mg dL)	A/G	Na (mEq/L)	K (mEq/L)	Cl (mEq/L)
Distilled water	5	74 ±16	28 ±6	0 ±1	94 ±22	9.1 ±0.3	6.9 ±0.4	2.22 ±0.20	143.8 (4) a ±1.2	3.35 ±0.20	107.1 ±1.4
snPt	5	107 ±73	30 ±6	1 ±0	128 ±25	9.1 ±0.6	7.6 ±1.5	1.86*** ±0.11	142.9 (4) a ±1.7	3.71 ±0.45	106.5 ±2.0
nPt	5	83 ±9	29 ±4	1 ±0	69 ±33	9.0 ±0.5	7.0 ±1.1	2.38 ±0.25	143.6 (4) a ±1.0	3.31 ±0.08	107.4 ±0.8

Each value shows mean±SD.

a) One animal data was deleted because the animal was died during collecting a blood sample.

Significantly different from the control group (*: P<0.05, **: P<0.01, ***: P<0.001).

表 10 血液生化学検査(雌)

snPt 群、nPt 群ともに白血球数が減少した。白血球分類では snPt 群で好中球比率が増加し、リンパ球比率が減少した。この変化は眼雌には認められていない。

Group	Number of animals	pH				protein			glucose		ketone body			Bilirubin	occult blood				urobilinogen		Urine volume (mL/6 hr)	Electrolyte, gross volume (mEq/6 hr)		
		6.5	7.0	7.5		-	=	1+	-	1+	-	=	1+	-	=	1+	2+	=	1+	Na		K	Cl	
Distilled water	5	0	4	1	0	5	0	5	0	0	4	1	5	4	1	0	0	1	4	3.7 ±0.7	0.3 ±0.1	0.5 ±0.1	0.4 ±0.1	
αPt	5	2	1	2	0	5	0	5	0	1	1	3	5	5	0	0	0	3	2	3.2 ±1.0	0.3 ±0.2	0.5 ±0.2	0.4 ±0.2	
αPt	5	2	1	2	0	4	1	5	0	1	2	2	5	5	0	0	0	2	3	4.3 ±1.9	0.3 ±0.1	0.5 ±0.1	0.4 ±0.1	

Each value shows mean±SD.

表 11 尿検査(雄)

Group	Number of animals	pH				protein			glucose		ketone body			Bilirubin	occult blood				urobilinogen		Urine volume (mL/6 hr)	Electrolyte, gross volume (mEq/6 hr)		
		6.0	6.5	7.0	7.5	-	=	1+	-	1+	-	=	1+	-	=	1+	2+	=	1+	2+		Na	K	Cl
Distilled water	5	0	5	0	0	0	1	4	5	0	1	3	1	5	4	0	1	1	3	1	1.5 ±0.5	0.1 ±0.0	0.2 ±0.1	0.1 ±0.1
αPt	5	0	0	1	4	0	3	2	5	0	4	1	0	5	4	0	2	2	3	0	2.0 ±0.8	0.2 ±0.1	0.3 ±0.1	0.2 ±0.1
αPt	5	3	1	1	0	1	1	3	5	0	2	3	0	5	5	0	0	3	2	0	1.9 ±1.0	0.1 ±0.2	0.2 ±0.0	0.1 ±0.1

Each value shows mean±SD.

表 12 尿検査(雌)

Group		Control (Distilled water)		snPT		nPT	
Number of males		5		5		5	
Body weight	(g)	371.5	= 13.7	340.2	= 43.9	374.0	= 20.2
Brain	(mg)	1943.7	= 101.5	1970.6	= 92.0	1961.5	= 93.7
	(mg/g)	5.240	= 0.375	5.846	= 0.541	5.248	= 0.144
Thymus	(mg)	530.0	= 61.1	423.1	= 126.3	454.9	= 112.8
	(mg/g)	1.429	= 0.178	1.229	= 0.247	1.215	= 0.293
Heart	(mg)	1317.5	= 99.5	1177.0	= 120.9	1333.9	= 70.8
	(mg/g)	3.545	= 0.191	3.472	= 0.189	3.573	= 0.247
Liver	(mg)	12078.5	= 804.3	10037.4	= 1593.1	10946.6	= 471.5 *
	(mg/g)	32.491	= 1.235	29.433	= 1.486 **	29.348	= 2.216 *
Kidney (R)	(mg)	1430.1	= 103.6	1342.4	= 181.8	1485.6	= 94.7
	(mg/g)	3.847	= 0.186	3.943	= 0.041	3.988	= 0.404
Kidney (L)	(mg)	1439.1	= 134.5	1314.8	= 156.9	1528.1	= 49.1
	(mg/g)	3.869	= 0.249	3.869	= 0.089	4.093	= 0.196
Spleen	(mg)	706.2	= 110.3	651.2	= 108.1	695.3	= 93.5
	(mg/g)	1.908	= 0.342	1.916	= 0.219	1.856	= 0.206
Testis (R)	(mg)	1553.1	= 102.5	1603.1	= 51.9	1655.2	= 68.3
	(mg/g)	4.180	= 0.221	4.767	= 0.550	4.438	= 0.331
Testis (L)	(mg)	1550.1	= 139.8	1579.7	= 68.9	1668.2	= 80.8
	(mg/g)	4.171	= 0.309	4.694	= 0.529	4.468	= 0.259
Epididymis (R)	(mg)	419.3	= 31.2	428.3	= 47.3	431.5	= 16.6
	(mg/g)	1.130	= 0.098	1.264	= 0.083	1.157	= 0.085
Epididymis (L)	(mg)	409.4	= 22.6	415.9	= 45.2	426.0	= 12.2
	(mg/g)	1.103	= 0.063	1.227	= 0.085	1.141	= 0.056
Adrenal gland (R)	(mg)	32.5	= 7.3	26.3	= 3.7	30.6	= 7.0
	(mg/g)	0.087	= 0.020	0.078	= 0.013	0.081	= 0.016
Adrenal gland (L)	(mg)	35.8	= 7.6	27.3	= 3.8	31.5	= 6.8
	(mg/g)	0.097	= 0.022	0.081	= 0.013	0.084	= 0.014

Each value shows mean ± S.D.

Figures in parentheses indicate number of males.

Significantly different from the control group (*: P<0.05, **: P<0.01).

表 13 器官重量(雄)

snPt 群、nPt 群ともに肝臓重量が対照群と比較して低値を示したが、病理組織学検査では異常は認められていない。

Group	Control (Distilled water)		snPT		nPT	
Number of females	5		5		5	
Body weight	(g)	199.0 = 18.0	201.0 = 6.8	201.7 = 6.0		
Brain	(mg)	1784.0 = 71.6	1782.7 = 110.5	1794.5 = 25.2		
	(mg/g)	9.044 = 1.131	8.870 = 0.478	8.902 = 0.219		
Thymus	(mg)	390.3 = 107.0	360.1 = 73.2	417.1 = 62.9		
	(mg/g)	1.950 = 0.480	1.794 = 0.380	2.074 = 0.353		
Heart	(g)	0.7 = 0.1	0.8 = 0.0	0.8 = 0.0		
	(g/g)	0.004 = 0.000	0.004 = 0.000	0.004 = 0.000		
Liver	(mg)	6238.7 = 668.9	6612.4 = 1022.8	5959.0 = 826.6		
	(mg/g)	31.343 = 1.554	32.828 = 4.215	29.478 = 3.229		
Kidney (R)	(mg)	864.3 = 65.3	902.6 = 107.8	839.4 = 50.2		
	(mg/g)	4.363 = 0.423	4.491 = 0.505	4.163 = 0.228		
Kidney (L)	(mg)	857.6 = 70.6	894.4 = 89.7	832.6 = 46.4		
	(mg/g)	4.322 = 0.340	4.450 = 0.412	4.128 = 0.181		
Spleen	(mg)	445.6 = 92.9	485.4 = 74.7	470.4 = 52.4		
	(mg/g)	2.234 = 0.378	2.414 = 0.350	2.336 = 0.292		
Ovary (R)	(mg)	45.6 = 5.2	45.0 = 9.7	37.9 = 4.5		
	(mg/g)	0.229 = 0.019	0.224 = 0.045	0.187 = 0.017		
Ovary (L)	(mg)	42.2 = 7.5	42.9 = 13.6	34.6 = 3.6		
	(mg/g)	0.214 = 0.046	0.214 = 0.067	0.171 = 0.015		
Adrenal gland (R)	(mg)	31.6 = 4.2	30.8 = 2.6	30.1 = 3.2		
	(mg/g)	0.160 = 0.026	0.153 = 0.011	0.149 = 0.015		
Adrenal gland (L)	(mg)	32.5 = 3.7	33.3 = 3.1	32.2 = 3.4		
	(mg/g)	0.164 = 0.023	0.166 = 0.016	0.160 = 0.014		

Each value shows mean = S.D.

Figures in parentheses indicate number of males.

Significantly different from the control group (*: $P < 0.05$, **: $P < 0.01$).

表 14 器官重量(雌)

snPt あるいは nPt 投与による影響は認められていない。

Findings	Group	Control-1		snPt		nPt	
	Dose(mL/kg)	2		2		2	
	Grade	-	P	-	P	-	P
Kidney							
Cyst, right		5	0	5	0	4	1
Skin							
Crust, exposure area		5	0	0	5	2	3

Notes) -: No abnormal changes P: Non-graded change
Numerals represent the number of animals.

表 15 肉眼的所見(雄)

snPt 群、nPt 群ともに貼付部位に痂皮が認められた。

Findings	Group	Control-1		snPt		nPt	
	Dose(mL/kg)	2		2		2	
	Grade	-	P	-	P	-	P
Liver							
Whitish spot		5	0	4	1	5	0
Lymph node, submandibular							
Discoloration, reddish		5	0	5	0	4	1
Skin							
Crust, exposure area		5	0	0	5	3	2

Notes) -: No abnormal changes P: Non-graded change
Numerals represent the number of animals.

表 16 肉眼的所見(雌)

snPt 群、nPt 群ともに貼付部位に痂皮が認められた。

Findings	Group Dose(mL/kg)	Control						snPt						nPt								
		2						2						2								
Grade	Grade	-	=	-	2-	3-	P	Pos.	-	=	-	2-	3-	P	Pos.	-	=	-	2-	3-	P	Pos.
Lymph node, submandibular		5						5						5								
Thymus																						
Tingible body macrophage, cortex		2	3	0	0	0		3	4	1	0	0	0		1	4	1	0	0	0		1
Lung																						
Accumulation, foam cell, alveolus		4	1	0	0	0		1	4	1	0	0	0		1	3	2	0	0	0		2
Cellular infiltration, eosinophil, periarterial		2	3	0	0	0		3	3	2	0	0	0		2	2	3	0	0	0		3
Cellular infiltration, inflammatory, periarterial		4	1	0	0	0		1	5	0	0	0	0		0	4	1	0	0	0		1
Metaplasia, osseous, focal		4	1	0	0	0		1	3	2	0	0	0		2	5	0	0	0	0		0
Bronchus		5						5						5								
Lymph node, mesenteric		5						5						5								
Heart																						
Degeneration fibrosis, myocardial, focal		4	1	0	0	0		1	5	0	0	0	0		0	5	0	0	0	0		0
Liver																						
Fatty change, hepatocyte, periportal		1	4	0	0	0		4	3	2	0	0	0		2	2	3	0	0	0		3
Fibrosis, subserosa		5	0	0	0	0		0	4	1	0	0	0		1	5	0	0	0	0		0
Microgranuloma		1	4	0	0	0		4	2	3	0	0	0		3	4	1	0	0	0		1
Necrosis, focal		4	1	0	0	0		1	4	1	0	0	0		1	5	0	0	0	0		0
Spleen																						
Hematopoiesis, extramedullary		0	1	4	0	0		5	0	3	2	0	0		5	0	1	4	0	0		5

Notes) -: No abnormal changes = Very slight -: Slight 2-: Moderate 3-: Marked
P: Non-graded change NE: Not examined Pos.: Total of positive grade
Numerals represent the number of animals.
Not significantly different from control.

Findings	Group Dose(mL/kg)	Control						snPt						nPt											
		2						2						2											
Grade	Grade	-	=	-	2-	3-	P	Pos.	-	=	-	2-	3-	P	Pos.	-	=	-	2-	3-	P	Pos.			
Kidney																									
Basophilic tubule, cortex		4	1	0	0	0		1	4	1	0	0	0		1	2	3	0	0	0		3			
Cellular infiltration, lymphocyte, interstitial		4	1	0	0	0		1	4	1	0	0	0		1	3	2	0	0	0		2			
Cyst, medulla		5	0	0	0	0		0	5	0	0	0	0		0	4	1	0	0	0		1			
Mineralization, cortex		4	1	0	0	0		1	4	1	0	0	0		1	4	1	0	0	0		1			
Adrenal gland		5						5						5											
Testis		5						5						5											
Epididymis		5						5						5											
Skin																									
Attachment, crust, focal, epidermis		5						0	0	1						4	4	=	2					3	3
Cellular infiltration, lymphocyte macrophage, dermis		5	0	0	0	0		0	0	5	0	0	0		5	**=	2	3	0	0	0		3		
Cellular infiltration, eosinophil, dermis		5	0	0	0	0		0	2	3	0	0	0		3	5	0	0	0	0		0			
Edema, epidermis dermis		5	0	0	0	0		0	2	3	0	0	0		3	2	3	0	0	0		3			
Erosion		5	0	0	0	0		0	2	3	0	0	0		3	3	2	0	0	0		2			
Hemorrhage, focal		5	0	0	0	0		0	2	3	0	0	0		3	3	2	0	0	0		2			
Hyperplasia, squamous cell		5	0	0	0	0		0	0	2	3	0	0		5	**=	1	3	1	0	0		4		
Proliferation, fibroblast		5	0	0	0	0		0	0	2	3	0	0		5	**=	2	3	0	0	0		3		

Notes) -: No abnormal changes = Very slight -: Slight 2-: Moderate 3-: Marked
P: Non-graded change NE: Not examined Pos.: Total of positive grade
Numerals represent the number of animals.
**P<0.01: Significantly different from control by Mann-Whitney U test.
=P<0.03, **P<0.01: Significantly different from control by Fisher's exact test.

表 17 病理組織学所見(雄)

皮膚所見以外は、被験物質投与によると考えられた変化は認められなかった。

Findings	Group Dose(mL/kg) Grade	Control						snPt						nPt					
		-	=	+	2+	3+	P Pos.	-	=	+	2+	3+	P Pos.	-	=	+	2+	3+	P Pos.
Lymph node, submandibular		5						5						5					
Thymus																			
Tingible body macrophage, cortex		3	2	0	0	0	2	4	1	0	0	0	1	3	2	0	0	0	2
Lung																			
Accumulation, foam cell, alveolus		3	2	0	0	0	2	1	4	0	0	0	4	3	2	0	0	0	2
Cellular infiltration, eosinophil, periarterial		2	3	0	0	0	3	3	2	0	0	0	2	3	2	0	0	0	2
Cellular infiltration, neutrophil, focal		4	1	0	0	0	1	4	1	0	0	0	1	5	0	0	0	0	0
Hemorrhage, focal		4	1	0	0	0	1	4	1	0	0	0	1	5	0	0	0	0	0
Metaplasia, osseous, focal		4	1	0	0	0	1	5	0	0	0	0	0	5	0	0	0	0	0
Mineralization, arterial wall		4	1	0	0	0	1	5	0	0	0	0	0	3	2	0	0	0	2
Bronchus		5						5						5					
Lymph node, mesenteric		5						5						5					
Heart		5						5						5					
Liver																			
Fatty change, hepatocyte, periportal		3	2	0	0	0	2	2	3	0	0	0	3	3	2	0	0	0	2
Microgranuloma		4	1	0	0	0	1	4	1	0	0	0	1	3	2	0	0	0	2
Necrosis, focal		4	0	1	0	0	1	4	1	0	0	0	1	4	1	0	0	0	1
Spleen																			
Deposit, pigment, brown		0	5	0	0	0	5	0	5	0	0	0	5	0	5	0	0	0	5
Hemopoiesis, extramedullary		0	2	3	0	0	5	0	4	1	0	0	5	0	3	2	0	0	5

Notes) -: No abnormal changes = Very slight +: Slight 2+: Moderate 3+: Marked

P: Non-graded change NE: Not examined Pos.: Total of positive grade

Numerals represent the number of animals.

Not significantly different from control.

Findings	Group Dose(mL/kg) Grade	Control						snPt						nPt						
		-	=	+	2+	3+	P Pos.	-	=	+	2+	3+	P Pos.	-	=	+	2+	3+	P Pos.	
Kidney																				
Basophilic tubule, cortex		4	1	0	0	0	1	3	2	0	0	0	2	2	3	0	0	0	3	
Cellular infiltration, lymphocyte, interstitial		4	1	0	0	0	1	5	0	0	0	0	0	5	0	0	0	0	0	
Hypertrophy, transitional cell, with cellular infiltration, lymphocyte		5	0	0	0	0	0	5	0	0	0	0	0	4	1	0	0	0	1	
Mineralization, cortico-medullary junction		3	2	0	0	0	2	2	3	0	0	0	3	4	1	0	0	0	1	
Adrenal gland		5						5						5						
Ovary		5						5						5						
Uterus		5						5						5						
Vagina		5						5						5						
Skin																				
Attachment, crust, focal, epidermis		5				0	0	0					5	5**	1				4	4*
Cellular infiltration, lymphocyte macrophage, dermis		5	0	0	0	0	0	0	5	0	0	0	5***	3	2	0	0	0	2	
Cellular infiltration, eosinophil, dermis		5	0	0	0	0	0	1	4	0	0	0	4*	5	0	0	0	0	0	
Edema, epidermis dermis		5	0	0	0	0	0	1	4	0	0	0	4*	2	3	0	0	0	3	
Erosion		5	0	0	0	0	0	0	2	3	0	0	5***	3	2	0	0	0	2	
Hemorrhage, focal		5	0	0	0	0	0	1	4	0	0	0	4*	4	1	0	0	0	1	
Hypertrophy, squamous cell		5	0	0	0	0	0	0	2	3	0	0	5***	1	3	1	0	0	4*	
Proliferation, fibroblast		5	0	0	0	0	0	0	2	3	0	0	5***	3	2	0	0	0	2	
Ulcer		5	0	0	0	0	0	4	0	1	0	0	1	5	0	0	0	0	0	

Notes) -: No abnormal changes = Very slight +: Slight 2+: Moderate 3+: Marked

P: Non-graded change NE: Not examined Pos.: Total of positive grade

Numerals represent the number of animals.

**P<0.01: Significantly different from control by Mann-Whitney U test.

=P<0.05, ==P<0.01: Significantly different from control by Fisher's exact test.

表 18 病理組織学所見(雌)

皮膚所見以外は、被験物質投与によると考えられた変化は認められなかった。

群	被験物質	濃度 (ppm)	投与量 (mL/kg)	動物数
対照群 (溶媒)	注射用水 (溶媒)	0	2	雄5 雌5
2	snPt ASP-WM500C 直径1nm以下	5000	2	雄5 雌5
3	nPt ASP-WM500C 直径20nm前後	5000	2	雄5 雌5

図1 群構成

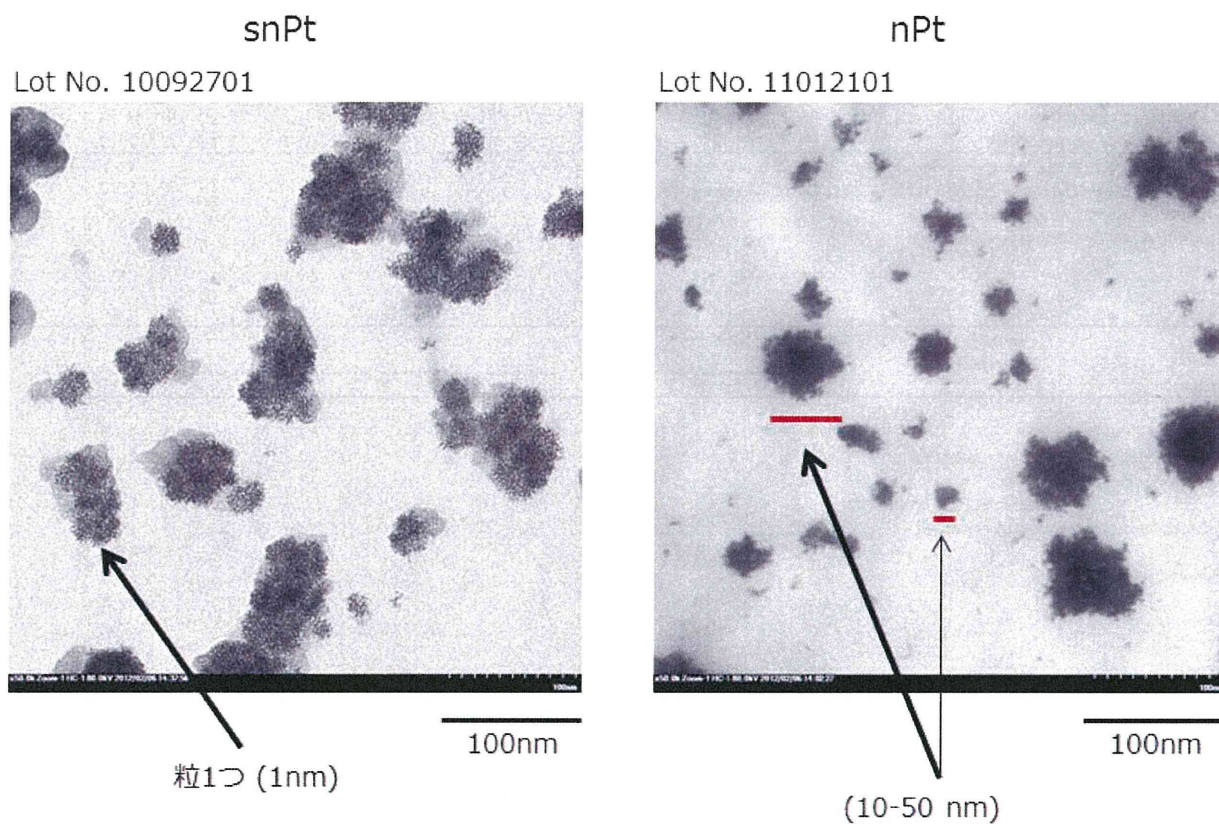


図2 試験に使用した snPt および nPt (TEM)

コロジオン膜貼付メッシュ上に被験物質を滴下し自然乾燥させて観察した。

提供元： Polytech & Net GmbH 社製

投与15日雄（11回貼付）



投与21日雄（15回貼付）



投与28日雄（20回貼付）



対照群（注射用水）

snPT群

nPT群

図3 貼付部位皮膚の変化見(雄)

投与第2週から貼付部位に痂皮(一部潰瘍)が認められたが、投与終了時には回復傾向にあった。

投与15日 雌 (11回貼付)



投与21日 雌 (15回貼付)



投与28日 雌 (20回貼付)



対照群 (注射用水)

snPT群

nPT群

図 4 貼付部位皮膚の変化見(雌)

投与第 2 週から貼付部位に痂皮(一部潰瘍) が認められたが、投与終了時には回復傾向にあった。

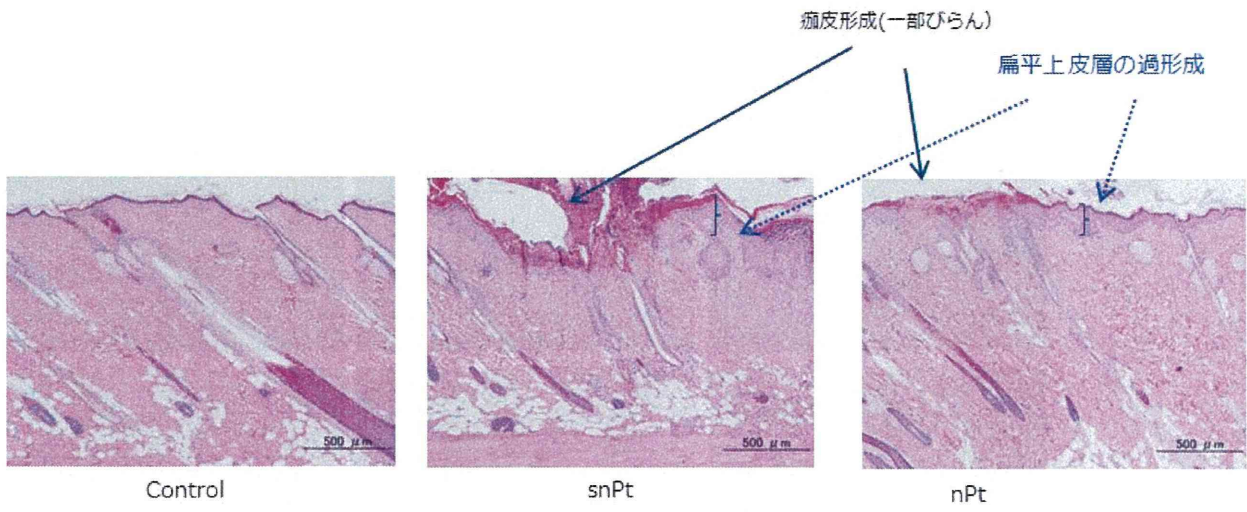


図5 貼付部位皮膚の病理組織変化見(雄)

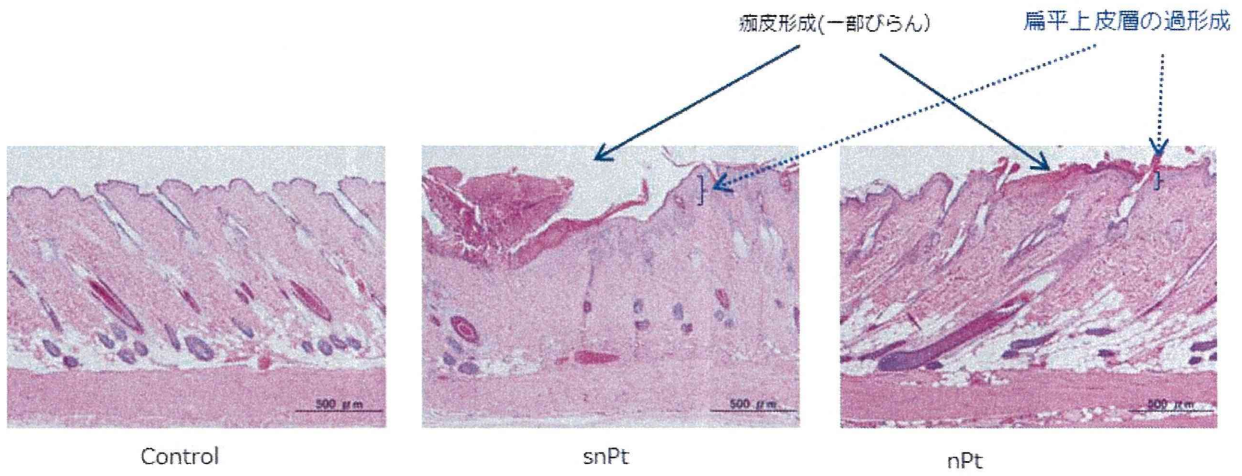


図6 貼付部位皮膚の病理組織変化見(雌)

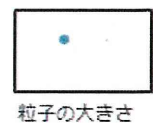
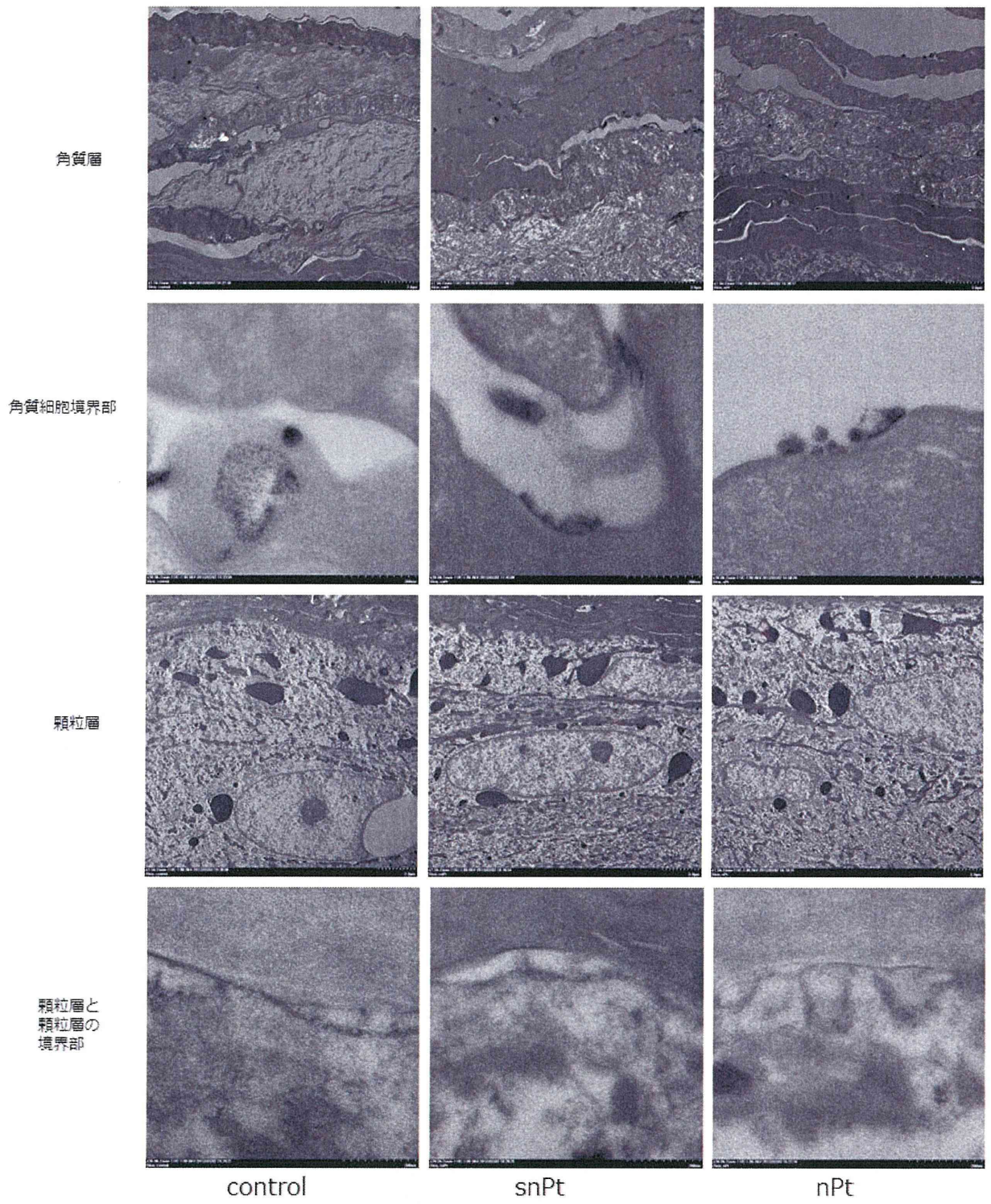


図7 TEM 電顕像

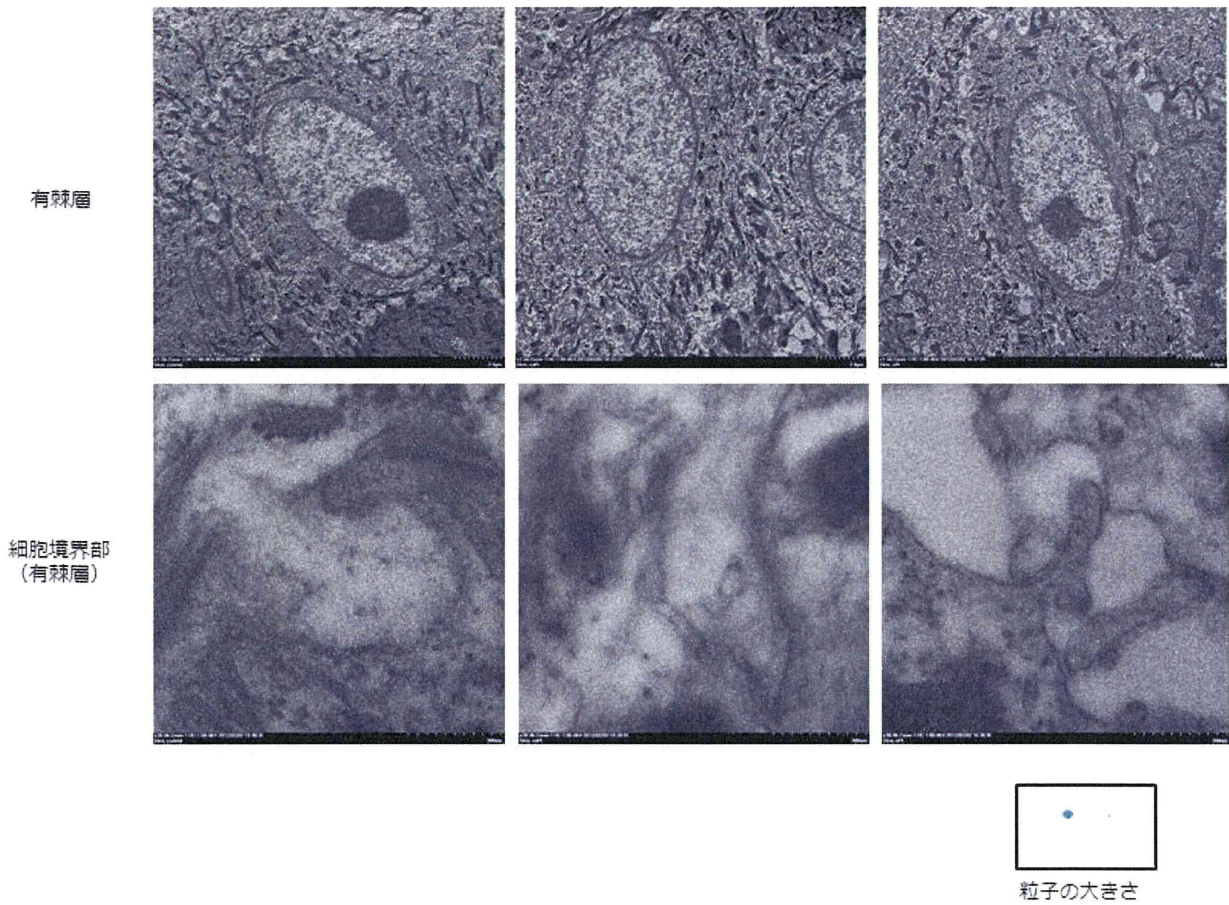
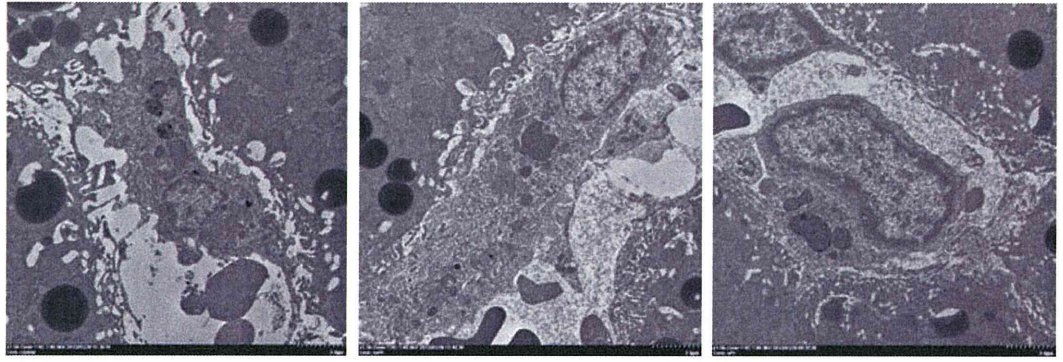


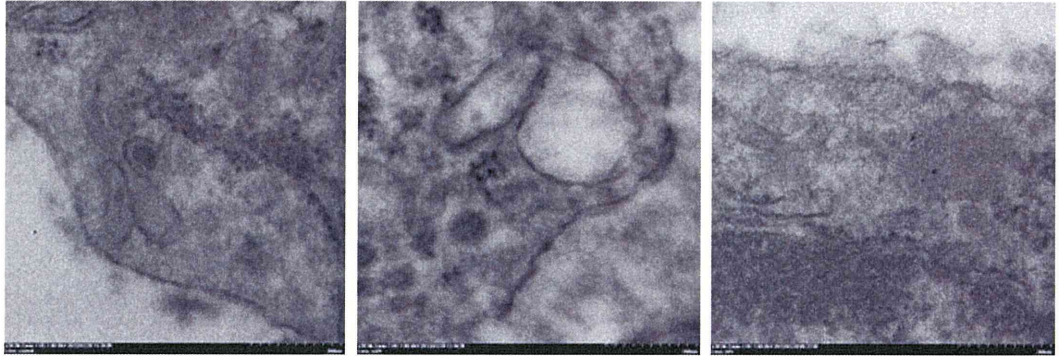
図 8 TEM 電顕像

肝臓

クッパー細胞



類洞面のクッ
パー細胞

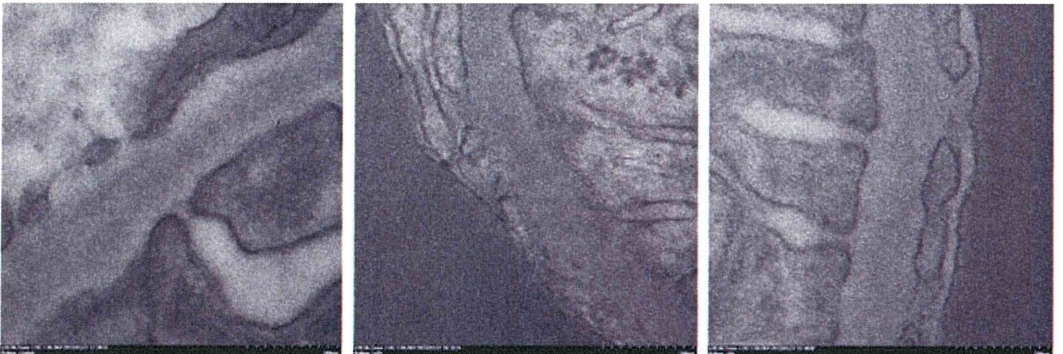


腎臓

糸球体



糸球体基
底膜部



control

snPt

nPt



粒子の大きさ

図 9 TEM 電顕像

組織中のsnPtおよびnPtの分布 (ICP-MS分析、 $\mu\text{g/g}$)

Control												
Animal no.	下顎リンパ 節	頰膜リン パ(節)	胸腺	心臓	脾臓	皮膚	肝臓	肺	腎臓	副腎	精巣	精巣上体
M01001	0	0	-	0	0	0	0	0	0	0	0	0
M01002	0	0	0	0	0	0	0	0	0	0	0	0
Ave	0	0	0	0	0	0	0	0	0	0	0	0
snPt												
M02002	2.1	0.81	0.34	0.44	2.8	89	1.5	0.86	11	1.1	0.43	0.46
M02005	1.2	1.9	0.53	0.46	3	30	1.6	0.84	12	1.1	0.39	0.46
Ave	1.65	1.355	0.435	0.45	2.9	59.5	1.55	0.85	11.5	1.1	0.41	0.46
nPt												
M03002	0	0	0	0	0	1.3	0	0	0	0	0	0
M03003	0	0	0	0	0	1.1	0	0	0	0	0	0
Ave	0	0	0	0	0	1.2	0	0	0	0	0	0

図 10 雄の各組織中の snPt および nPt の分布 (ICP-MS 分析、 $\mu\text{g/g}$)

電顕を実施した動物で分析を行った(各群 N=2)。

snPt は皮膚以外に検査した組織に含まれていた。

研究成果の刊行に関する一覧表レイアウト（参考）

書籍

著者氏名	論文タイトル名	書籍全体の編集者名	書籍名	出版社名	出版地	出版年	ページ
平井敏郎, 吉岡靖雄, 堤康央	ナノカーボンDDSの可能性と安全性.	永井恒治, 岡田弘晃	ドラッグデリバリーシステムの新展開Ⅱ - 核酸医薬・抗体医薬・ワクチン医療を支えるDDS技術-	シーエムシー出版,	日本	2011	242-247

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Higashisaka K., Yoshioka Y., Yamashita K., Morishita Y., Fujimura M., Nabeshi H., Nagano K., Abe Y., Kamada H., Tsunoda S., Yoshikawa T., Itoh N., Tsutsumi Y.	Acute phase proteins as biomarkers for predicting the exposure and toxicity of nanomaterials.	Biomaterials	32	3-9	2011
Nabeshi H., Yoshikawa T., Matsuyama K., Nakazato Y., Matsuo K., Arimori A., Isobe M., Tochigi S., Kondoh S., Hirai T., Akase T., Yamashita T., Yamashita K., Yoshida T., Nagano K., Abe Y., Yoshioka Y., Kamada H., Imazawa T., Nakagawa S., Mayumi T., Itoh N., Tsunoda S., Tsutsumi Y.	Systemic distribution, nuclear entry and cytotoxicity of amorphous nanosilica following topical application.	Biomaterials	32	2713-2724	2011