

図4B ラット 定量PCR vs DNA chip

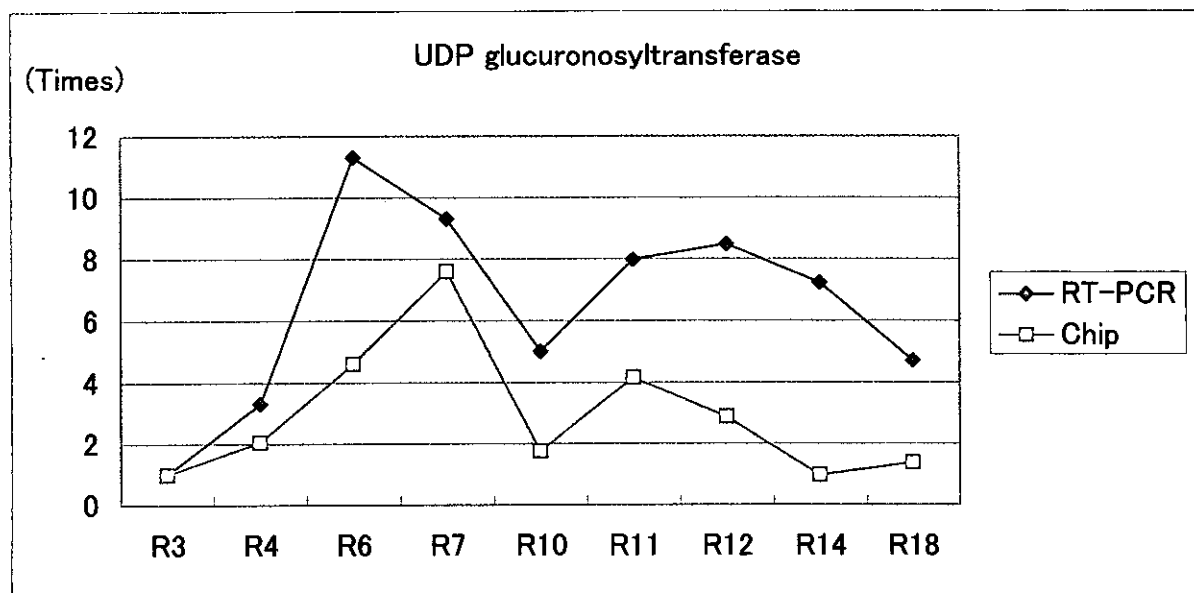
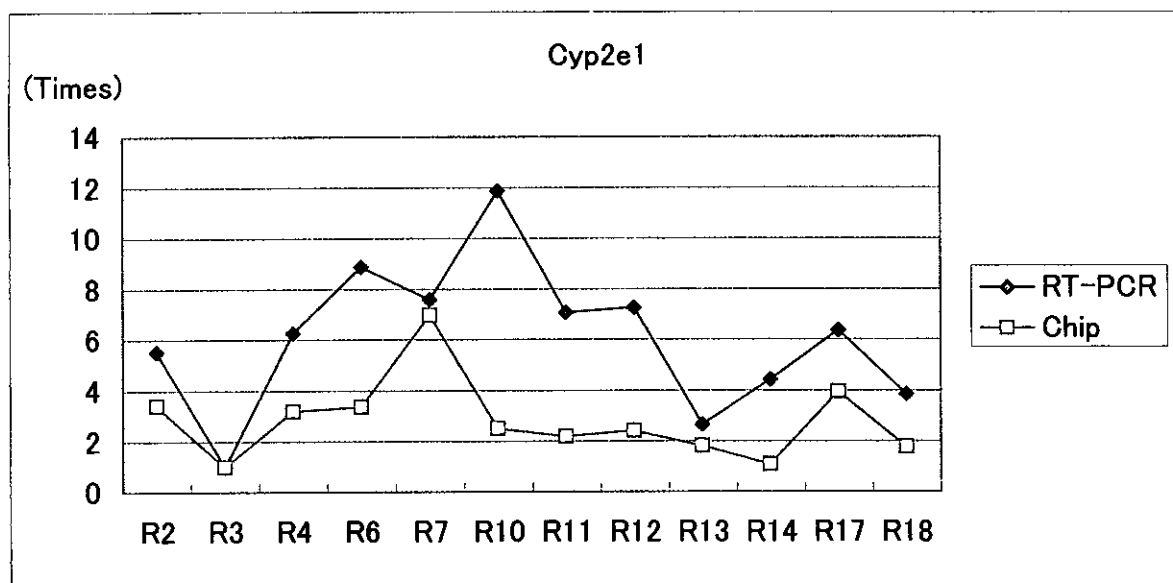
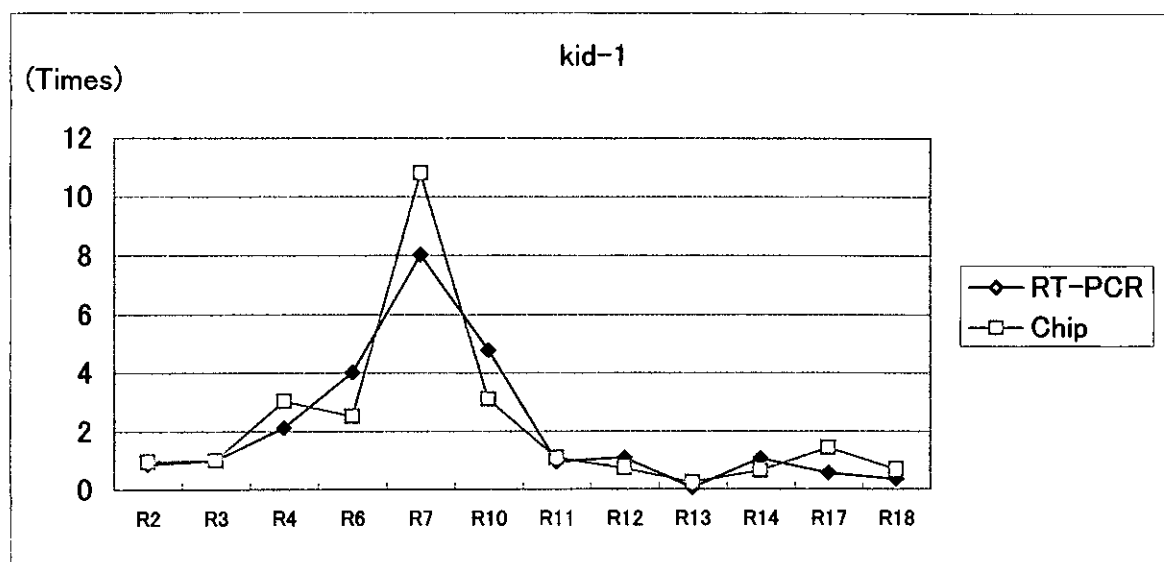


表5A マウス 定量PCR法 VS DNAチップ 相関係数

catlase

相関係数

			catlase rt-pcr	catalase chip
SpearmanのR ²	catlase rt-pcr	相関係数	1.000	.633
		有意確率 (両側)	.	.067
		N	9	9
	catalase chip	相関係数	.633	1.000
		有意確率 (両側)	.067	.
		N	9	9

AOX

相関係数

			AOX rt-pcr	AOX chip
SpearmanのR ²	AOX rt-pcr	相関係数	1.000	.008
		有意確率 (両側)	.	.983
		N	9	9
	AOX chip	相関係数	.008	1.000
		有意確率 (両側)	.983	.
		N	9	9

urate oxidase

相関係数

			UO rt-pcr	UO chip
SpearmanのR ²	UO rt-pcr	相関係数	1.000	.300
		有意確率 (両側)	.	.433
		N	9	9
	UO chip	相関係数	.300	1.000
		有意確率 (両側)	.433	.
		N	9	9

PPAR α

相関係数

			PPAR alpha rt-pcr	PPAR alpha chip
SpearmanのR ²	PPAR alpha rt-pcr	相関係数	1.000	.917*
		有意確率 (両側)	.	.001
		N	9	9
	PPAR alpha chip	相関係数	.917*	1.000
		有意確率 (両側)	.001	.
		N	9	9

**. 相関係数は 1% 水準で有意 (両側)

Cyp2a4

相関係数

			Cyp 2a4 rt-pcr	Cyp 2a4 chip
Spearmanのρ	Cyp 2a4 rt-pcr	相関係数	1.000	.933*
		有意確率 (両側)	.	.000
		N	9	9
	Cyp 2a4 chip	相関係数	.933*	1.000
		有意確率 (両側)	.000	.
		N	9	9

** 相関係数は 1% 水準で有意 (両側)

Cyp4a10

相関係数

			Cyp4a10 rt-pcr	Cyp4a10 chip
Spearmanのρ	Cyp4a10 rt-pcr	相関係数	1.000	.917*
		有意確率 (両側)	.	.001
		N	9	9
	Cyp4a10 chip	相関係数	.917*	1.000
		有意確率 (両側)	.001	.
		N	9	9

** 相関係数は 1% 水準で有意 (両側)

Cyp2b10

相関係数

			Cyp2b10 rt-pcr	Cyp2b10 chip
Spearmanのρ	Cyp2b10 rt-pcr	相関係数	1.000	.850*
		有意確率 (両側)	.	.004
		N	9	9
	Cyp2b10 chip	相関係数	.850*	1.000
		有意確率 (両側)	.004	.
		N	9	9

** 相関係数は 1% 水準で有意 (両側)

GADPH

相関係数

			GADPH rt-pcr	GADPH chip
Spearmanのρ	GADPH rt-pcr	相関係数	1.000	.733*
		有意確率 (両側)	.	.025
		N	9	9
	GADPH chip	相関係数	.733*	1.000
		有意確率 (両側)	.025	.
		N	9	9

* 相関係数は 5% 水準で有意 (両側)

表5B ラット 定量PCR法 VS DNAチップ 相関係数

Kid-1

相関係数

			kid rt-pcr	kid chip
Spearmanのρ	kid rt-pcr	相関係数	1.000	.741**
		有意確率 (両側)	.	.006
		N	12	12
	kid chip	相関係数	.741**	1.000
		有意確率 (両側)	.006	.
		N	12	12

** 相関係数は 1% 水準で有意 (両側)

Cyp2e1

相関係数

			cyp2e1 rt-pcr	cyp2e1 chip
Spearmanのρ	cyp2e1 rt-pcr	相関係数	1.000	.636*
		有意確率 (両側)	.	.026
		N	12	12
	cyp2e1 chip	相関係数	.636*	1.000
		有意確率 (両側)	.026	.
		N	12	12

* 相関係数は 5% 水準で有意 (両側)

UDP-glucuronosyltransferase

相関係数

			udp rt-pcr	udp chip
Spearmanのρ	udp rt-pcr	相関係数	1.000	.750*
		有意確率 (両側)	.	.020
		N	9	9
	udp chip	相関係数	.750*	1.000
		有意確率 (両側)	.020	.
		N	9	9

* 相関係数は 5% 水準で有意 (両側)

表4A
腹腔内投与 マウス 有意差を示した遺伝子リスト

Affymetrix Nd	GI No	Gene name	control	low	high
100381_at	M12347	Mouse skeletal alpha-actin gene, complete cds.	9.25	3.39	0.63
100550_f_at	AW060422	U1-M-BH1-anj-c-07-0-UI.s1 NIH_BMAP_M_S2 Mus musculus cDNA clone U1-M-BH1-anj-c-07-0-UI 3', mRNA sequence.	16.61	17.16	10.87
100574_f_at	L09104	putative; Mus musculus glucose phosphate isomerase mRNA, 3' end.	10.43	13.99	17.27
100599_at	M94087	murine homolog of TAXREB67/ATF4; M.musculus mATF4 (mTR67) mRNA, complete cds.	5.98	4.41	3.24
100753_at	L01062	Mouse ATP synthase alpha subunit, complete cds.	17.85	19.59	15.26
100946_at	AF109906	Intron-exon boundaries defined in relation to human cDNA in L03411.; complement factor B; Intron-exon boundaries defined in relation to cDNA in M57890; complement factor C2; Intron-exon boundaries defined in relation to cDNA in M57891; Zn finger; This new	10.08	8.58	5.92
100967_at	AF072757	FATP2; Mus musculus fatty acid transport protein 2 mRNA, complete cds.	25.81	24.40	18.96
101073_at	X67469	M.musculus mRNA for AM2 receptor.	7.32	4.51	6.54
101214_f_at	M32599	glyceraldehyde-3-phosphate dehydrogenase; Mouse glyceraldehyde-3-phosphate dehydrogenase mRNA, complete cds.	14.39	17.36	18.72
101590_at	A1747194	u13a12.x1 Sugano mouse embryo mewa Mus musculus cDNA clone IMAGE:2076670 3', mRNA	5.12	5.23	7.80
101869_s_at	J00413	Mouse beta-globin major gene.	10.72	14.83	14.82
101887_at	AF045887	Mus musculus angiotensinogen precursor, gene, exon 5 and complete cds.	19.90	16.78	21.81
101899_at	X52308	protein precursor (AA -43 to 575); Mouse mRNA for prothrombin.	18.89	16.42	17.32
102084_f_at	AF047725	cytochrome P450; Mus musculus CYP2C38 (Cyp2c38) mRNA, partial cds.	5.47	5.95	8.30
102701_at	M21856	testosterone 16-alpha-hydroxylase; Mouse testosterone 16-alpha-hydroxylase mRNA, complete cds, clone pf3/46.	0.94	5.33	2.60
102847_s_at	M19319	testosterone 15-alpha-hydroxylase; Mouse testosterone 15-alpha-hydroxylase mRNA type II, complete cds.	3.45	14.04	21.67
102973_f_at	M65238	Mouse murinoglobulin (MUG2) mRNA, complete cds.	17.51	14.41	14.20
102998_at	X04283	cytochrome P2-450 (aa 1-513); Mouse mRNA for cytochrome P2-450.	9.71	9.63	13.74
103033_at	X06454	Slp(w7); Mouse mRNA for sex-limited protein Slp(w7) alpha-gamma chain.	25.71	15.48	17.60
103458_at	M35525	complement component C5S precursor; Mouse complement component C5S (pro-C5) mRNA, complete cds.	13.89	9.68	8.91
103660_at	AF093669	membrane protein; Mus musculus peroxisomal biogenesis factor (Pex11a) mRNA, complete cds.	6.76	9.30	12.07
103689_at	AA833514	uc91f12.r1 Soares.NMPu Mus musculus cDNA clone IMAGE:1433039 5' similar to gb:X78338	16.31	15.56	22.61
103963_f_at	AA914345	MUL TIDRUG RESISTANCE-ASSOCIATED PROTEIN (HUMAN); mRNA sequence.	5.33	3.47	2.83
104148_at	AA939571	vy94a08.r1 Soares_mammary_gland_NbMMG Mus musculus cDNA clone IMAGE:1313846 5', mRNA sequence.	14.70	10.23	14.59
104213_at	A1266885	vz51d08.r1 Soares_thymus_2NbMT Mus musculus cDNA clone IMAGE:1329999 5', mRNA sequence.	3.87	8.03	10.16
104424_at	X05475	uj08c05.x1 Sugano mouse liver mila Mus musculus cDNA clone IMAGE:1891304 3', mRNA sequence.	20.08	17.81	16.56
104519_at	X70392	C9 protein; Mouse mRNA fragment for complement component C9.	17.35	16.40	20.54
160089_at	M32015	M.musculus mRNA for inter-alpha-inhibitor H2 chain.	26.05	19.75	21.88
		lysosomal membrane glycoprotein-type A precursor; Mouse lysosomal membrane glycoprotein-type A (lgp-120) mRNA, complete cds.			

160104_at	AA824102	vy20a04.r1 Stratagene mouse macrophage (#937306) Mus musculus cDNA clone IMAGE:1295982 5', mRNA sequence.	14.36	11.13	8.91
160139_at	A1848798	UI-M-AJ1-ahg-e-08-0-UI.s1 NIH_BMAP_MOB_N Mus musculus cDNA clone UI-M-AJ1-ahg-e-08-0-UI 3', mRNA sequence.	8.72	7.21	9.67
160194_at	U18992	Mus musculus glutaryl-CoA dehydrogenase mRNA, complete cds.	13.67	12.36	16.41
160482_at	A1841705	UI-M-AL0-abo-c-05-0-UI.s1 NIH_BMAP_MCO Mus musculus cDNA clone UI-M-AL0-abo-c-05-0-UI 3', mRNA sequence.	20.18	16.90	19.58
161815_f_at	AV355798	AV355798 RIKEN full-length enriched, adult male adrenal gland Mus musculus cDNA clone 7330417P17 3' similar to M28649 Mouse major urinary protein mRNA, mRNA sequence.	27.67	27.97	16.73
162125_f_at	AV305832	AV305832 RIKEN full-length enriched, 8 days embryo Mus musculus cDNA clone 5730533E22 3' similar to D50527 Mouse mRNA for TI-225, mRNA sequence.	8.70	7.48	5.75
92600_f_at	AB018421	Mus musculus CYP4A10 mRNA for cytochrome P-450, complete cds.	15.49	16.16	10.57
92800_i_at	A1836694	UI-M-AJ0-aax-a-08-0-UI.s1 NIH_BMAP_MOB Mus musculus cDNA clone UI-M-AJ0-aax-a-08-0-UI 3', mRNA sequence.	12.11	17.16	19.74
92837_f_at	M65736	Mouse murinoglobulin mRNA, complete cds.	21.54	22.02	16.83
92851_at	U49430	multi-copper oxidase; Mus musculus ceruloplasmin mRNA, complete cds.	29.29	23.59	22.83
93026_at	AW124337	UI-M-BH2.1-apq-f-08-0-UI.s1 NIH_BMAP_M_S3.1 Mus musculus cDNA clone UI-M-BH2.1-apq-f-08-0-UI 3', mRNA sequence.	16.37	14.95	9.42
93088_at	X01838	beta2-microglobulin precursor (aa -20 to 99); Mouse mRNA for beta2-microglobulin.	13.74	12.75	9.17
93097_at	U51805	Mus musculus arginase mRNA, complete cds.	29.45	34.68	25.77
93497_at	K02782	preprocomplement component C3; Mouse complement component C3 mRNA, alpha and beta subunits, complete cds.	14.44	18.10	10.35
93596_i_at	AA624586	vn82e11.r1 Knowles Solter mouse blastocyst B1 Mus musculus cDNA clone IMAGE:1038476 5' similar to SW:ATPE_BOVIN P05632 ATP SYNTHASE EPSILON CHAIN, MITOCHONDRIAL PRECURSOR ;, mRNA sequence.	5.86	4.98	7.61
93787_f_at	A1837302	UI-M-AK0-ade-h-11-0-UI.s1 NIH_BMAP_MHY Mus musculus cDNA clone UI-M-AK0-ade-h-11-0-UI 3', mRNA sequence.	8.51	6.73	6.02
93797_g_at	AW123952	UI-M-BH2.3-aqc-d-05-0-UI.s1 NIH_BMAP_M_S3.3 Mus musculus cDNA clone UI-M-BH2.3-aqc-d-05-0-UI 3', mRNA sequence.	3.15	4.26	6.76
94318_at	Y11356	beta-2-glycoprotein I; M.musculus mRNA for beta-2-glycoprotein I.	28.64	22.63	23.11
94440_at	A1173533	ud67g09.x1 Sugano mouse liver mlia Mus musculus cDNA clone IMAGE:1451008 3', mRNA sequence.	18.73	19.70	24.08
95348_at	J04596	secretory protein KC precursor; Mouse platelet-derived growth factor--inducible KC protein mRNA, complete cds.	24.16	#DIV/0!	0.47
95350_at	D00073	Mus musculus gene for prealbumin, complete cds.	9.75	6.21	7.10
95472_f_at	A1526902	uj47g07.x1 Sugano mouse liver mlia Mus musculus cDNA clone IMAGE:1923132 3' similar to gb:X13585 UBIQUINOL-CYTOCHROME C REDUCTASE COMPLEX UBIQUINONE-BINDING (HUMAN);, mRNA sequence.	11.20	12.03	8.92
95585_at	AF034569	Mus musculus anticoagulant protein C gene, complete cds.	17.75	13.41	15.64
95728_g_at	A1785422	uj42a07.x1 Sugano mouse liver mlia Mus musculus cDNA clone IMAGE:1922580 3', mRNA sequence.	17.00	18.22	14.67
96025_g_at	L32836	copper binding protein; Mus musculus (clone C7/B9) S-adenosyl homocysteine hydrolase (ahcy) mRNA, complete cds.	24.56	19.10	22.79

96057_at	AI647493	uk42h02.x1 Sugano mouse kidney mkia Mus musculus cDNA clone IMAGE:1971699 3' similar to gb:U07235 Mus musculus aldehyde dehydrogenase (MOUSE); mRNA sequence.	10.97	9.56	12.13
96348_at	AW121217	UI-M-BH2.3-aok-d-10-0-UI.s1 NIH_BMAP_M_S3.3 Mus musculus cDNA clone UI-M-BH2.3-aok-d-10-0-UI 3', mRNA sequence.	8.97	12.28	11.44
96542_at	M62606	Mouse surfeit locus surfeit 4 protein gene, exon 6.	12.12	9.57	9.16
96764_at	AJ007971	Mus musculus mRNA for IIGP protein.	13.52	9.13	8.69
96829_at	AW047083	UI-M-BH1-alr-f-05-0-UI.s1 NIH_BMAP_M_S2 Mus musculus cDNA clone UI-M-BH1-alr-f-05-0-UI 3', mRNA sequence.	8.43	9.51	13.56
96859_at	AB026621	Mus musculus mRNA for RIE2, complete cds.	4.71	5.85	11.88
96868_at	AI196896	ui5b05.y1 Sugano mouse liver mlia Mus musculus cDNA clone IMAGE:1886289 5' similar to gb:M64983 rna6 FIBRINOGEN BETA CHAIN PRECURSOR (HUMAN); mRNA sequence.	14.85	11.85	7.04
97449_at	AI835461	UI-M-AQ0-aag-a-06-0-UI.s1 NIH_BMAP_MHI Mus musculus cDNA clone UI-M-AQ0-aag-a-06-0-UI 3', mRNA sequence.	15.75	15.29	18.50
97450_s_at	AA986258	uc74b03.y1 Sugano mouse liver mlia Mus musculus cDNA clone IMAGE:1431341 5' similar to SW:DHAX_HUMAN P49419 ANTIQUITIN ; mRNA sequence.	18.13	19.06	23.29
97524_f.at	X02578	pancreatic alpha-amylase isozyme (aa 1-508); Mouse non-allelic mRNA for pancreatic alpha-amylase isozyme (pCEPa12).	7.73	#DIV/0!	0.34
97559_at	M76131	Mouse elongation factor 2 (ef-2) mRNA, 3' end.	15.87	14.22	16.68
98447_at	M62362	Mouse CCAAT/enhancer binding protein gene, complete cds.	15.41	11.75	15.20
98582_at	U58988	2,5-dihydroxyphenylacetate oxidase; dioxygenase; Mus musculus homogenisate 1,2-dioxygenase (HGO) mRNA, complete cds.	19.51	22.54	24.74
99019_at	D17571	Mouse mRNA for NADPH-cytochrome P450 oxidoreductase, complete cds.	7.02	10.75	11.61
99081_at	AF010254	Mus musculus C1 inhibitor mRNA, complete cds.	25.71	22.58	27.50
99120_f.at	R75450	MDB0625 Mouse brain, Stratagene Mus musculus cDNA 3' end similar to proliferating cell nuclear protein P120 [human], mRNA sequence.	9.29	7.62	6.52
99378_f.at	M18837	MHC beta-2-microglobulin; Mouse MHC class I Q4 beta-2-microglobulin (Qb-1) gene, complete cds.	6.61	8.62	9.40
99927_at	U47810	Mus musculus complement factor 1 mRNA, complete cds.	17.98	16.57	14.78
AFFX-Gapdh	M32599	glyceraldehyde-3-phosphate dehydrogenase; Mouse glyceraldehyde-3-phosphate dehydrogenase mRNA, complete cds.	25.02	31.80	31.64
AFFX-PyruC	L09192	putative; Mus musculus pyruvate carboxylase mRNA, complete cds.	11.49	9.82	12.63

表4B
腹腔内投与 ラット 有意差を示した遺伝子リスト

Affymetrix No	GI No	Gene name	control	low	high
K03045cds_r_at	K03045	Rat retinol-binding protein (RBP) gene, exon 5.	7.50	12.83	6.72
L19998_at	L19998	Rat minoxidil sulfotransferase mRNA, complete cds.	9.17	9.69	12.70
X66370_at	X66370	R.norvegicus mRNA for ribosomal protein S9.	11.47	11.10	14.20
rc_A1010453_at	A1010453	EST204904 Normalized rat lung, Bento Soares Rattus sp. cDNA clone RLUBZ64 3' end, mRNA	19.49	7.73	7.71
rc_AA866460_at	AA866460	UI-R-E0-br-f-03-0-UI.s1 UI-R-E0 Rattus norvegicus cDNA clone UI-R-E0-br-f-03-0-UI 3' similar to gblAA084864/AA084864 zn11f02.s1 Stratagene hNT neuron (#937233) Homo sapiens cDNA clone 547131 3' mRNA sequence.			
X52477_at	X52477	pre-pro-complement C3 (AA 1663); Rat pCR201 mRNA for pre-pro-complement C3.	10.16	7.03	9.44
M12450_at	M12450	vitamin D binding protein prepeptide; Rat vitamin D binding protein (DBP) mRNA, complete cds.	23.30	17.74	20.16
rc_A1104035_s_at	A1104035	EST213324 Normalized rat heart, Bento Soares Rattus sp. cDNA clone RHEBW48 3' end, mRNA	31.23	24.09	23.30
M91597_s_at	M91597	Sprague-Dawley (p18-12d) RBL-NDP kinase 18kDa subunit (p18) mRNA, complete cds.	10.36	9.20	7.44
Z50052_at	Z50052	putative; R.norvegicus mRNA for C4BP beta chain protein.	7.18	7.00	10.15
X07365_s_at	X07365	glutathione peroxidase; selenocysteine; Rat mRNA for glutathione peroxidase.	8.68	6.86	10.01
M82855cds_s_at	M82855	Rat cytochrome P450IIC13 gene, exon 9.	14.43	13.97	11.05
rc_A1010480_g_at	A1010480	EST204931 Normalized rat lung, Bento Soares Rattus sp. cDNA clone RLUBZ96 3' end, mRNA	29.44	23.38	23.77
J02861mRNA_s_at	J02861	cytochrome P-450g; Rat polymorphic, male-specific cytochrome P-450g mRNA, complete cds.	7.24	6.31	9.34
U39943_s_at	U39943	hemoprotein; arachidonic acid epoxidase and omega-1 hydroxylase; Rattus norvegicus cytochrome P450 monooxygenase (CYP2J3) mRNA, complete cds.	12.62	9.61	9.71
J00735_g_at	J00735	rat fibrinogen gamma chain-b mrna.	4.17	3.77	1.39
L32132_at	L32132	Rat lipopolysaccharide binding protein mRNA, complete cds.	21.61	18.73	19.02
rc_A1234604_s_at	A1234604	EST231166 Normalized rat lung, Bento Soares Rattus sp. cDNA clone RLUDC11 3' end similar to similar to 70 kd heat-shock-like protein, mRNA sequence.	2.69	1.42	4.65
rc_AA945169_g_at	AA945169	EST200668 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIAH44 3' end, mRNA	19.01	16.51	13.50
D00569_at	D00569	Rattus norvegicus mRNA for 2,4-dienyl-CoA reductase precursor, complete cds.	29.81	25.46	26.66
rc_AA945585_at	AA945585	EST201084 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIAH37 3' end, mRNA	5.81	5.61	3.07
AF074608mRNA_f_at	AF074608	Rattus norvegicus MHC class I antigen (RT1.EC2) gene, complete cds.	29.39	25.43	25.11
L19998_g_at	L19998	Rat minoxidil sulfotransferase mRNA, complete cds.	7.33	6.99	4.18
rc_AA858673_at	AA858673	UI-R-A0-be-f-05-0-UI.s1 UI-R-A0 Rattus norvegicus cDNA clone UI-R-A0-be-f-05-0-UI 3' similar to gblM27883/RATPSTIB Rat pancreatic secretory trypsin inhibitor type II (PSTI-II) mRNA, complete cds, mRNA sequence.	15.35	15.79	18.66
D83796_s_at	D83796	Rat UGT1 mRNA for UDP-glucuronosyltransferase, complete cds.			
rc_AA893485_g_at	AA893485	EST197288 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIAH06 3' end, mRNA	16.44	16.12	19.23
rc_A1103396_g_at	A1103396	EST212685 Normalized rat embryo, Bento Soares Rattus sp. cDNA clone REMCB47 3' end, mRNA sequence.	17.34	19.48	14.33
		Ornithine decarboxylase antizyme is expressed through translational frameshifting which results in the products of ORF1 and ORF2 being synthesized as a single polypeptide. Sequencing of in vitro product showed that the mRNA sequence at the junction of the two ORFs, UCC UGA U (253..259, shown as ORF1 codons), is decoded as Ser-Arp through +1 frameshifting.; Rattus norvegicus mRNA for ornithine decarboxylase antizyme, complete cds.	18.33	13.72	15.75
D10706cds#3_s_at	D10706		23.07	17.28	17.72
			7.50	9.85	11.17

X59051_cds_s_at	X59051	R.norvegicus gene for ribosomal protein S29.	20.75	15.73	13.43
M11071_f_at	M11071	MHC antigen; Rat MHC class I cell surface antigen mRNA.	20.43	13.26	16.73
rc_AA818888_at	AA818888	UI-R-A0-av-c-08-0-UI.s1 UI-R-A0 Rattus norvegicus cDNA clone UI-R-A0-av-c-08-0-UI 3' similar to emb X82636 RNUQL40 R.norvegicus mRNA for a fusion protein of ubiquitin and ribosomal protein L40, mRNA sequence.	15.01	11.51	12.26
X16273_cds_g_at	X16273	Rat mRNA for serine proteinase inhibitor-like protein, partial.	29.36	21.48	21.01
L00124_at	L00124	Rattus norvegicus elastase II precursor, exon 8 and complete cds.	8.02	0.99	#DIV/0!
M12335_expandedCD	M12335	Rattus norvegicus carbamyl phosphate synthetase I precursor (cps) gene, exon 13 and complete cds; nuclear gene for mitochondrial product.	17.09	12.27	16.05
L13025_UTR#1_f_at	L13025	Rattus norvegicus (clone 2) mRNA sequence, 3' end GAA-triplet repeat.	7.44	8.45	5.12
X63446_at	X63446	R.norvegicus mRNA for fetuin.	22.55	17.49	18.25
M20629_s_at	M20629	carboxylesterase precursor (EC 3.1.1.1); Rat liver carboxylesterase.	18.08	15.44	12.65
rc_A1007824_at	A1007824	EST202275 Normalized rat brain, Bento Soares Rattus sp. cDNA clone RBRAV39 3' end, mRNA	22.61	17.57	20.17
D16478_g_at	D16478	Rat mRNA for mitochondrial long-chain enoyl-CoA hydratase/3-hydroxyacyl-CoA dehydrogenase alpha-subunit of mitochondrial trifunctional protein, complete cds.	10.15	10.69	7.64
M77479_at	M77479	Rattus norvegicus sodium/bile acid cotransporter mRNA, complete cds.	6.59	6.91	3.75
M58041_s_at	M58041	Rat P49 cytochrome P450 mRNA, complete cds.	12.80	12.31	15.95
X06107_r_at	X06107	IGF-I (AA 1-159); Rat mRNA (clone IGF1AB1) for insulin-like growth factor I.	7.20	3.40	#DIV/0!
D10261_g_at	D10261	Rattus norvegicus mRNA for 59-kDa bone sialic acid-containing protein, complete cds.	29.27	22.11	23.16
rc_A1179576_s_at	A1179576	EST223298 Normalized rat spleen, Bento Soares Rattus sp. cDNA clone RSPCJ16 3' end, mRNA sequence.	19.02	15.47	15.81
X56228_at	X56228	Rat mRNA for rhodanese.	9.20	12.34	12.03
Y11283_at	Y11283	R.norvegicus mRNA for plasma protein.	20.94	17.09	17.81
M11942_s_at	M11942	70 kDa heat-shock-like protein; Rat 70 kd heat-shock-like protein mRNA, complete cds.	21.50	18.36	14.67
M33648_at	M33648	3-hydroxy-3-methylglutaryl-CoA synthase precursor (EC 4.1.3.5); Rat mitochondrial 3-hydroxy-3-methylglutaryl-CoA synthase mRNA, complete cds.	20.27	12.00	15.64
rc_AA892333_at	AA892333	EST196136 Normalized rat kidney, Bento Soares Rattus sp. cDNA clone RKIAP19 3' end, mRNA	7.71	4.49	8.57
U05675_at	U05675	Rattus norvegicus Sprague-Dawley fibrinogen B beta chain mRNA, complete cds.	22.22	17.43	18.24
rc_AA818226_s_at	AA818226	UI-R-A0-ah-g-06-0-UI.s1 UI-R-A0 Rattus norvegicus cDNA clone UI-R-A0-ah-g-06-0-UI 3' similar to emb X14209 RNCOXIV Rat mRNA for cytochrome c oxidase subunit IV, mRNA sequence.	20.82	15.29	17.24
rc_AA875523_s_at	AA875523	UI-R-E0-cv-e-11-0-UI.s1 UI-R-E0 Rattus norvegicus cDNA clone UI-R-E0-cv-e-11-0-UI 3' similar to gi 1041793 gb U04443 MMU04443 Mus musculus non-muscle myosin light chain 3 (MLC3nm) mRNA, partial cds, mRNA sequence.	25.47	20.87	21.91
U55765_at	U55765	Rattus norvegicus RASPI1 mRNA, complete cds.	7.70	7.27	10.47
X56325mRNA_s_at	X56325	R.norvegicus 2-alpha-1 globin gene.	22.30	17.42	18.10
X60769mRNA_at	X60769	Rat sfb mRNA for silencer factor B.	7.92	4.47	5.35
rc_A1178207_at	A1178207	EST221872 Normalized rat placenta, Bento Soares Rattus sp. cDNA clone RPLCN51 3' end, mRNA sequence.	10.69	8.94	15.21
rc_A1013834_s_at	A1013834	EST208509 Normalized rat spleen, Bento Soares Rattus sp. cDNA clone RSPBV42 3' end, mRNA sequence.	12.50	12.80	9.04
rc_AA866240_f_at	AA866240	UI-R-A0-bg-g-05-0-UI.s1 UI-R-A0 Rattus norvegicus cDNA clone UI-R-A0-bg-g-05-0-UI 3' similar to gb U18335 RATCYP45Q Rat cytochrome P450 mRNA, complete cds, mRNA sequence.	7.04	3.55	4.56

X86561cds#2_at	X86561	putative precursor; predominant form; putative precursor; alpha subunit variant with extended C-terminus; Rat gene for alpha-fibrinogen.	7.41	4.78	10.37
X1484cds#2_s at	X14848	Rattus norvegicus mitochondrial genome.	20.71	18.37	15.70
K01933 at	K01933	preprohaptoglobin; Rat haptoglobin mRNA, partial alpha-, complete beta-subunit and 3' flank.	15.68	6.06	2.89
X05861exon#1-6_s a	X05861	R.norvegicus fibrinogen gamma-chain gene exons 5-10 and 3'-UT region.	27.07	22.79	21.35
S80431_s.at	S80431	37 kda protein; This sequence comes from Fig. 3; conceptual translation presented here differs from translation in publication; delta 4-3-ketosteroid 5 beta-reductase=37 kda protein [rats, liver, mRNA Partial, 1003 nt].	1.14	3.36	5.00
D16554 at	D16554	highly homologous with human UbB gene.; Rat mRNA for polyubiquitin (four repetitive ubiquitins in tandem), complete cds.	23.16	16.13	18.07
M17419 at	M17419	ribosomal protein L5; Rat ribosomal protein L5 mRNA, complete cds.	13.31	13.22	10.30
D16478 at	D16478	Rat mRNA for mitochondrial long-chain enoyl-CoA hydratase/3-hydroxyacyl-CoA dehydrogenase alpha-subunit of mitochondrial trifunctional protein, complete cds.	11.96	11.69	8.86
X13098cds_s at	X13098	urate oxidase (AA 1 - 303); Rat mRNA for urate oxidase (uricase; EC 1.7.3.3).	4.56	5.98	8.43
U02096 at	U02096	Rattus norvegicus Sprague Dawley fatty acid binding protein mRNA, complete cds.	4.07	2.90	0.72
U40004 s at	U40004	Premature termination before heme binding domain results in a nonfunctional protein; Rattus norvegicus cytochrome P450 pseudogene (CYP2J3P2) mRNA.	4.64	3.94	1.38
S72505 f at	S72505	glutathione S-transferase Yc1 subunit [rats, fetal liver, mRNA, 1052 nt].	9.03	15.47	10.66
K03243mRNA_s at	K03243	Rattus norvegicus phosphoenolpyruvate carboxykinase (GTP) gene, exons 1, 2, and 3.	23.30	17.52	17.01
U94856_g at	U94856	does not include the codons for ten first amino acids; these amino acids have been determined by protein sequencing and they are: MAKLLALTLV; Rattus norvegicus paraoxonase mRNA, partial cds.	12.79	14.26	10.71
M17701 s at	M17701	glyceraldehyde-3-phosphate-dehydrogenase (EC 1.2.1.12); Rat glyceraldehyde-3-phosphate-dehydrogenase (GAPDH) mRNA, complete cds.	8.13	9.28	11.72
U44845 at	U44845	S-protein; epibolin; serum spreading factor; found in endothelial cell matrix, necrotic tissues; adhesion protein; Rattus norvegicus vitronectin mRNA, complete cds.	22.20	15.97	15.27
M94548 at	M94548	Rattus norvegicus hepatic tumor cytochrome P450 (CYP4F1) mRNA, complete cds.	12.14	12.62	8.85
M26247 at	M26247	factor IX; Rat factor IX mRNA, partial cds.	4.75	5.26	8.04
M15481_g at	M15481	insulin-like growth factor precursor; Rat insulin-like growth factor I (IGF-I) mRNA, complete cds.	15.45	12.40	10.32
rc_AA875097_at	AA875097	UI-R-E0-cf-g-09-0-UI.s1 UI-R-E0 Rattus norvegicus cDNA clone UI-R-E0-cf-g-09-0-UI 3' similar to gi 790485 emb X86561 RNLFIB Rat gene for alpha-fibrinogen, mRNA sequence.	11.83	7.61	12.75
D00753 at	D00753	Rat mRNA for contraptin-like protease inhibitor related protein (CPI-26).	27.20	21.26	17.19
M81397 at	M81397	Rattus norvegicus thrombin mRNA, 3' end.	26.04	21.15	22.25
X16481_r at	X16481	Rat mRNA for zinc(2+) binding protein.	17.23	12.66	13.24
AFFX_Rat_GAPDH_5 at			6.86	9.32	12.31
rc_AI044900_s.at	AI044900	UI-R-C1-kk-c-05-0-UI.s1 UI-R-C1 Rattus norvegicus cDNA clone UI-R-C1-kk-c-05-0-UI 3', mRNA sequence.	13.08	11.71	8.96
rc_AA817964_s at	AA817964	UI-R-A0-ag-g-03-0-UI.s1 UI-R-A0 Rattus norvegicus cDNA clone UI-R-A0-ag-g-03-0-UI 3' similar to gb U32684 MMU32684 Mus musculus serum paraoxonase (Pon) mRNA, complete cds, mRNA	23.15	15.44	18.17
J02720 at	J02720	liver arginase (E.C. 3.5.3.1); Rat liver arginase mRNA, complete cds.	10.41	11.48	16.62
K02814_g at	K02814	Rat mRNA for major acute phase alpha-1 protein (MAP).	24.31	16.84	18.27
X54793 at	X54793	Rat liver mRNA for heat shock protein (hsp60).	13.21	11.45	9.78
rc_AI230247_s at	AI230247	EST226942 Normalized rat embryo, Bento Soares Rattus sp. cDNA clone REMCU12 3' end, mRNA sequence.	17.68	13.63	15.11

D78308_at	D78308	Rattus norvegicus mRNA for calcitriculin, complete cds.	17.00	12.39	15.63
D43964_at	D43964	Rat liver mRNA for Kan-1, complete cds.	9.85	6.75	6.47
X05834_at	X05834	C-terminal nucleotide-bonding segment; Rat fibronectin gene 3' end.	17.73	14.88	19.80
M24239cds#2_f_at	M24239	product of unknown function; Rat cytochrome P450-1/PB-(ps) gene, exon 9.	28.45	22.06	21.30
X13119cds_s_at	X13119	Rat DNA for serine dehydratase (EC 4.2.1.13).	3.66	3.59	8.46
M81088_at	M81088	Rat EF-1-alpha mRNA, 3' end.	11.70	8.16	8.59
K02814_at	K02814	Rat mRNA for major acute phase alpha-1 protein (MAP).	24.41	17.69	9.36
E13557cds_s_at	E13557	Rat mRNA for GADII.	1.45	2.21	4.95
AF056333_s_at	AF056333	Rattus norvegicus cytochrome P450 2E1 (CYP2E1) mRNA, partial cds.	21.88	21.57	15.98
rc_AA892462_at	AA892462	EST196265 Normalized rat kidney, Bento Soares Rattus sp. cDNA clone RKIAQ74 3' end, mRNA	5.07	6.66	9.78
S87544_g_at	S87544	This sequence comes from Fig 1; polypeptide 1-microglobulin/bikunin [rats, liver, mRNA, 1162 nt].	26.59	22.17	21.11
J02596cds_at	J02596	preapolipoprotein C-III; Rat apolipoprotein C-III gene, complete cds.	17.87	6.13	11.16
AB013112_s_at	AB013112	human AQP9 like new aquaporin from rat liver; Rattus rattus mRNA for aquaporin, complete cds.	5.20	7.67	9.10
D38381_s_at	D38381	Rattus norvegicus mRNA for P450 6beta-2, complete cds.	8.70	8.52	4.50
rc_AA894200_g_at	AA894200	EST198003 Normalized rat spleen, Bento Soares Rattus sp. cDNA clone RSPAS59 3' end, mRNA			
J03524_s_at	J03524	alpha-1 inhibitor III; Rat alpha-1 inhibitor III mRNA, partial cds.	20.73	16.49	19.16
rc_AA874999_at	AA874999	UI-R-E0-cf-d-12-0-UI.s1 UI-R-E0 Rattus norvegicus cDNA clone UI-R-E0-cf-d-12-0-UI 3' similar to gi 459833 gb L25085 HUMSEC61B Human Sec61-complex beta-subunit mRNA, complete cds, mRNA sequence.	26.91	20.46	21.29
M18363cds_s_at	M18363	cytochrome P450; Rat cytochrome P-450(M-1) gene, exon 9.	5.64	4.64	9.99
rc_AA965264_at	AA965264	UI-R-C0-hd-b-11-0-UI.s1 UI-R-C0 Rattus norvegicus cDNA clone UI-R-C0-hd-b-11-0-UI 3', mRNA	13.25	13.00	9.15
U42719_at	U42719	sequence.	27.33	21.92	22.01
M26125_at	M26125	Rattus norvegicus C4 complement protein mRNA, partial cds.	16.13	9.24	10.98
L33869_at	L33869	epoxide hydrolase; Rat epoxide hydrolase mRNA, complete cds.	8.06	14.55	10.20
J02596cds_g_at	J02596	Rat norvegicus ceruloplasmin mRNA, complete cds.	17.80	12.70	15.18
L22339_g_at	L22339	preapolipoprotein C-III; Rat apolipoprotein C-III gene, complete cds.	29.66	22.35	23.32
U19485_at	U19485	Rat N-hydroxy-2-acetylaminofluorene (ST1C1) mRNA, complete cds.	19.09	15.57	7.38
S48325_s_at	S48325	missing 5' region coding for signal peptide; Rattus norvegicus spp-24 precursor mRNA, partial cds.	18.70	16.05	15.10
rc_A1176460_s_at	A1176460	This sequence comes from Fig. 2; RLM6; diabetes-inducible cytochrome P450RLM6 [rats, liver, mRNA			
U08976_at	U08976	Partial, 1093 nt].	30.41	20.23	24.82
X78848cds_f_at	X78848	EST220045 Normalized rat ovary, Bento Soares Rattus sp. cDNA clone ROVBS08 3' end, mRNA	25.83	19.19	17.09
J02657_s_at	J02657	Rattus norvegicus Wistar peroxisomal enoyl hydratase-like protein (PXEL) mRNA, complete cds.	17.70	18.81	12.55
rc_AA942685_at	AA942685	R.norvegicus (Fischer 344) GST Yc1 mRNA.	12.07	17.18	11.79
J02869mRNA_s_at	J02869	cytochrome P-450(M-1); Rat cytochrome P-450(M-1) mRNA, complete cds.	19.58	15.22	14.18
D00729_g_at	D00729	EST198184 Normalized rat brain, Bento Soares Rattus sp. cDNA clone RBRAA17 3' end, mRNA	25.12	22.40	19.84
U04733_s_at	U04733	cytochrome P-450 IID5; Rat cytochrome P-450 IID5 mRNA, complete cds.	26.00	21.67	18.86
X15734_at	X15734	Rat mRNA for delta3, delta2-enoyl-CoA isomerase.	23.90	19.35	16.53
M64733mRNA_s_at	M64733	microsomal hemoprotein; Rattus norvegicus Sprague Dawley cytochrome P450 arachidonic acid			
M57718mRNA_s_at	M57718	epoxygenase (cyp 2C23) mRNA, complete cds.	19.80	16.42	13.81
		s-adenosylmethionine synthetase; Rat mRNA for s-adenosylmethionine synthetase.	4.55	5.74	9.68
		Rat TRPM-2 gene, complete cds.	19.75	14.54	15.12
		Rat cytochrome P-450 IV A1 (CYP4A1) gene, complete cds.	19.71	18.67	14.22

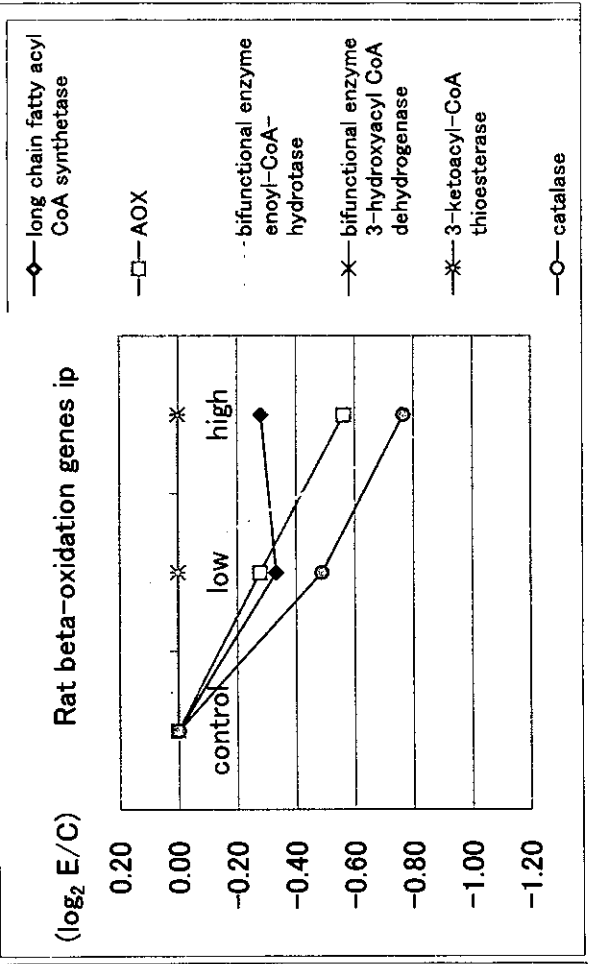
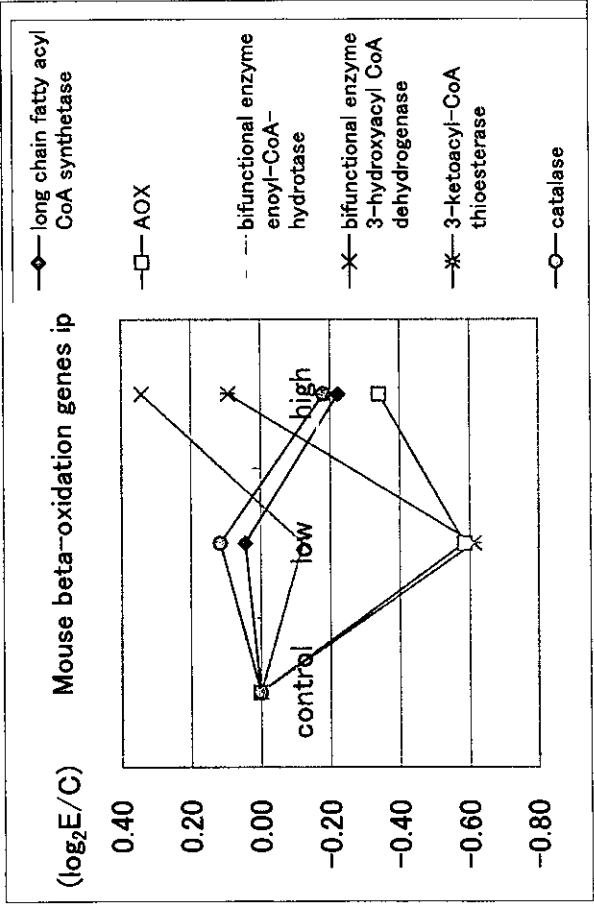
X83231_at	X83231	R.norvegicus mRNA for pre-alpha-inhibitor, heavy chain 3.	23.87	17.71	20.09
AF093773_s_at	AF093773	Rattus norvegicus cytosolic malate dehydrogenase (Mdh) mRNA, complete cds.	6.19	7.03	10.04
rc_AA800849_f_at	AA800849	EST190346 Normalized rat lung, Bento Soares Rattus sp. cDNA 3' end, mRNA sequence.	17.38	13.02	13.47
J05210_g_at	J05210	Rat ATP citrate-lyase mRNA, complete cds.	3.96	3.30	7.20
rc_AA945569_at	AA945569	EST201068 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIAP11 3' end, mRNA	21.77	16.62	18.05
M35601_g_at	M35601	alpha-fibrinogen; Rat alpha-fibrinogen mRNA, 3' end.	21.46	16.97	19.57
X16273cds_at	X16273	Rat mRNA for serine proteinase inhibitor-like protein, partial.	25.70	17.91	15.81
M20131cds_s_at	M20131	cytochrome P450IIE1; Rat cytochrome P450IIE1 gene, complete cds.	16.92	6.27	17.20
J05132_s_at	J05132	truncated UDP-glucuronosyltransferase (EC 2.4.1.17); Rat 3-methylcholanthrene-inducible truncated UDP-glucuronosyltransferase mRNA, complete cds.	20.01	15.59	14.46
S61973_at	S61973	This sequence comes from Fig 2; Rattus sp. NMDA receptor glutamate-binding subunit mRNA, complete cds.	11.11	10.66	7.36
rc_AA945169_at	AA945169	EST200668 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIH444 3' end, mRNA	24.80	16.96	18.34
rc_AA945143_at	AA945143	EST200642 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIH13 3' end, mRNA	8.47	12.46	17.97
J03752_at	J03752	glutathione S-transferase; Rat glutathione S-transferase mRNA, complete cds.	19.00	14.47	18.32
rc_A1176546_at	A1176546	EST220133 Normalized rat ovary, Bento Soares Rattus sp. cDNA clone ROVB45 3' end, mRNA	12.97	9.32	8.63
rc_A1010632_s_at	A1010632	EST205083 Normalized rat muscle, Bento Soares Rattus sp. cDNA clone RMUAP32 3' end, mRNA sequence.	26.91	24.05	20.98
L14004UTR#1_s_at	L14004	Rattus norvegicus polymeric immunoglobulin receptor AATTAA-containing 3'UTR Group 1 mRNA sequence.	29.37	23.46	23.12
J00778_at	J00778	precursor; Rat pancreatic trypsin I gene, complete cds.	14.01	0.92	#DIV/0!
M64755_at	M64755	Rattus norvegicus cysteine sulfinic acid decarboxylase mRNA, complete cds.	1.76	2.11	5.75
rc_A1236795_s_at	A1236795	EST233357 Normalized rat ovary, Bento Soares Rattus sp. cDNA clone ROVDK61 3' end, mRNA	21.86	15.30	14.68
U10697_s_at	U10697	Rattus norvegicus kidney microsomal carboxylesterase mRNA, complete cds.	7.36	7.44	3.30
rc_AA891739_at	AA891739	EST195542 Normalized rat kidney, Bento Soares Rattus sp. cDNA clone RKIAG19 3' end, mRNA	4.11	5.25	8.44
AFFX Rat GAPDH_M_at			10.08	12.87	15.95
D85100_at	D85100	Rattus norvegicus mRNA for very-long-chain acyl-CoA synthetase, complete cds.	15.56	15.95	10.23
J02679_s_at	J02679	NAD(P)H:menadione oxidoreductase (EC 1.6.99.2); Rat NAD(P)H:menadione oxidoreductase mRNA, complete cds.	2.03	5.85	8.07
AF038870_at	AF038870	Rattus norvegicus betaine homocysteine methyltransferase (BHMT) mRNA, complete cds.	6.52	8.10	15.09
J02752_at	J02752	acyl-CoA oxidase (EC 1.3.3.6); Rat acyl-coA oxidase mRNA, complete cds.	20.95	18.48	14.81
J02592_s_at	J02592	glutathione S-transferase Y-b subunit (EC 2.5.1.18); Rat glutathione S-transferase Y-b subunit mRNA, 3' end.	11.50	14.50	8.32
rc_A1169756_s_at	A1169756	EST215655 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLIAS86 3' end, mRNA	15.70	11.13	10.76
K03249_at	K03249	peroxisomal enoyl-CoA: hydratase-3-hydroxyacyl-CoA; Rat peroxisomal enoyl-CoA: hydratase-3-hydroxyacyl-CoA bifunctional enzyme mRNA, complete cds.	9.70	12.03	4.93
rc_AA900582_at	AA900582	UI-R-E0-dn-b-10-0-UI-s1 UI-R-E0 Rattus norvegicus cDNA clone UI-R-E0-dn-b-10-0-UI 3' similar to gil202591[gb J02635 RATA2M Rat liver alpha-2-macroglobulin mRNA, complete cds, mRNA	2.92	3.54	16.76
rc_AA946503_at	AA946503	EST202002 Normalized rat ovary, Bento Soares Rattus sp. cDNA clone ROVAR89 3' end, mRNA	15.46	2.03	14.62
rc_A1007820_s_at	A1007820	EST202271 Normalized rat brain, Bento Soares Rattus sp. cDNA clone RBRAV35 3' end, mRNA	17.69	13.06	12.52
AFFX Rat GAPDH_3_at			13.35	15.40	19.29
U19485_g_at	U19485	missing 5' region coding for signal peptide; Rattus norvegicus spp-24 precursor mRNA, partial cds.	17.92	14.20	13.04
X15551cds_g_at	X15551	beta-2 glycoprotein I (AA 1-297); Rat mRNA for beta-2 glycoprotein I.	24.68	19.28	19.47

M33648_g_at	M33648	3-hydroxy-3-methylglutaryl-CoA synthase precursor (EC 4.1.3.5); Rat mitochondrial 3-hydroxy-3-methylglutaryl-CoA synthase mRNA, complete cds.	26.29	22.76	21.38
M10934_s_at	M10934	retinol-binding protein; Rat retinol-binding protein (RBP) mRNA, partial cds.	15.71	11.14	11.22
M35601_at	M35601	alpha-fibrinogen; Rat alpha-fibrinogen mRNA, 3' end.	25.44	20.24	21.71
D17309_at	D17309	Rat mRNA for delta-4-3-ketosteroid 5-beta-reductase, complete cds.	8.01	13.47	13.27
M24324_f_at	M24324	MHC RTS protein; Rat MHC class I RT1 (RTS) mRNA (u haplotype), 3' end.	19.99	13.74	15.24
X15512_at	X15512	Rat mRNA for apolipoprotein C1.	26.59	13.72	18.55
D38380_g_at	D38380	Rattus norvegicus mRNA for transferrin, complete cds.	23.21	9.00	9.92
AF001898_at	AF001898	constitutively expressed cytosolic protein; Rattus norvegicus aldehyde dehydrogenase (ALDH) mRNA, complete cds.	4.85	10.35	5.07
V01235_at	V01235	binding protein; Rat mRNA encoding liver fatty acid binding protein.	23.69	20.45	18.22
J00738_s_at	J00738	Rattus norvegicus submaxillary gland alpha-2u globulin mRNA, complete cds.	11.24	6.54	4.34
rc_AA997806_at	AA997806	UI-R-C0-hv-e-08-0-UI.s1 UI-R-C0 Rattus norvegicus cDNA clone UI-R-C0-hv-e-08-0-UI 3', mRNA sequence.	15.15	11.09	9.45
J03914_cds_s_at	J03914	glutathione S-transferase Yb subunit; Rat glutathione S-transferase Yb subunit gene, complete cds.	9.16	14.62	7.36
U52948_at	U52948	Rattus norvegicus complement component C9 precursor mRNA, complete cds.	20.71	14.12	16.52
X03468_at	X03468	pre-pro-apolipoprotein (-23 to 79); Rat mRNA for apolipoprotein apoA-II.	22.24	10.20	13.82
AF045464_s_at	AF045464	Rattus norvegicus aflatoxin B1 aldehyde reductase (AFAR) mRNA, complete cds.	2.29	9.94	3.40
rc_AA893239_at	AA893239	EST197042 Normalized rat kidney, Bento Soares Rattus sp. cDNA clone RKBD93 3' end, mRNA	8.32	9.22	1.56
D00569_g_at	D00569	Rattus norvegicus mRNA for 2,4-dienoyl-CoA reductase precursor, complete cds.	14.68	12.61	6.71
rc_AA893495_at	AA893495	EST197298 Normalized rat liver, Bento Soares Rattus sp. cDNA clone RLAD19 3' end, mRNA	10.49	10.81	3.30
L07736_at	L07736	Rat carnitine palmitoyltransferase I mRNA, complete cds.	14.69	12.38	4.55

図5 β 酸化関連遺伝子

Mouse	control	low	high
long chain fatty acyl CoA synthetase	0.00	0.04	-0.22
AOX	0.00	-0.59	-0.34
bifunctional enzyme enoyl-CoA-hydratase	0.00	-0.13	-0.17
bifunctional enzyme 3-hydroxyacyl CoA dehydrogenase	0.00	-0.12	0.34
3-ketoacyl-CoA thioesterase	0.00	-0.61	0.09
catalase	0.00	0.11	-0.18

Rat	control	low	high
long chain fatty acyl CoA synthetase	0.00	-0.33	-0.28
AOX	0.00	-0.28	-0.56
bifunctional enzyme enoyl-CoA-hydratase	0.00	0.11	-0.96
bifunctional enzyme 3-hydroxyacyl CoA dehydrogenase	#NUM!	#NUM!	#NUM!
3-ketoacyl-CoA thioesterase	#NUM!	#NUM!	#NUM!
catalase	0.00	-0.49	-0.77



参考文献

- Akao Y, Seto M, Takahashi T, Kubonishi I, Miyoshi I, Nakazawa S, Tsujimoto Y, Croce CM, Ueda R. Molecular cloning of the chromosomal breakpoint of a B-cell lymphoma with the t(11;14)(q23;q32) translocation. *Cancer Res.* 1991 Mar 1;51(5):1574-1576.
- Bennett AM, Williams GM. Alteration of rat liver endoplasmic reticulum Ca(2+)-ATPase thiol integrity by ciprofibrate, a peroxisome proliferator. *Biochem Pharmacol.* 1993 May 25;45(10):2093-2098.
- Britton CH, Schultz RA, Zhang B, Esser V, Foster DW, McGarry JD. Human liver mitochondrial carnitine palmitoyltransferase I: characterization of its cDNA and chromosomal localization and partial analysis of the gene. *Proc Natl Acad Sci U S A.* 1995 Mar 14;92(6):1984-1988.
- Bruning T, Lammert M, Kempkes M, Thier R, Golka K, Bolt HM. Influence of polymorphisms of GSTM1 and GSTT1 for risk of renal cell cancer in workers with long-term high occupational exposure to trichloroethene. *Arch Toxicol.* 1997;71(9):596-599.
- Cavaillès V, Dauvois S, L'Horset F, Lopez G, Hoare S, Kushner PJ, Parker MG. Nuclear factor RIP140 modulates transcriptional activation by the estrogen receptor. *EMBO J.* 1995 Aug 1;14(15):3741-3751.
- Fukami MH, Eikhom TS, Ekanger R, Flatmark T, Nilsson A. Relation between induction of ornithine decarboxylase and specific gene expression in rat liver in response to the tumor promoter agent clofibrate. *Carcinogenesis.* 1986 Sep;7(9):1441-1446.
- Furnari FB, Huang HJ, Cavenee WK. The phosphoinositol phosphatase activity of PTEN mediates a serum-sensitive G1 growth arrest in glioma cells. *Cancer Res.* 1998 Nov 15;58(22):5002-5008.
- Goeptar AR, Commandeur JN, van Ommen B, van Bladeren PJ, Vermeulen NP. Metabolism and kinetics of trichloroethylene in relation to toxicity and carcinogenicity. Relevance of the mercapturic acid pathway. *Chem Res Toxicol.* 1995 Jan-Feb;8(1):3-21.
- Haubenwallner S, Essenburg AD, Barnett BC, Pape ME, DeMattos RB, Krause BR, Minton LL, Auerbach BJ, Newton RS, Leff T, et al. Hypolipidemic activity of select fibrates correlates to changes in hepatic apolipoprotein C-III expression: a potential physiologic basis for their mode of action. *J Lipid Res.* 1995 Dec;36(12):2541-2551.

Hayashi F, Tamura H, Yamada J, Kasai H, Suga T. Characteristics of the hepatocarcinogenesis caused by dehydroepiandrosterone, a peroxisome proliferator, in male F-344 rats.

Carcinogenesis. 1994 Oct;15(10):2215-2219.

Huibregtse JM, Scheffner M, Howley PM. A cellular protein mediates association of p53 with the E6 oncoprotein of human papillomavirus types 16 or 18. EMBO J. 1991 Dec;10(13):4129-4135.

Lash LH, Lipscomb JC, Putt DA, Parker JC. Glutathione conjugation of trichloroethylene in human liver and kidney: kinetics and individual variation. Drug Metab Dispos. 1999 Mar;27(3):351-359.

Lash LH, Qian W, Putt DA, Jacobs K, Elfarra AA, Krause RJ, Parker JC. Glutathione conjugation of trichloroethylene in rats and mice: sex-, species-, and tissue-dependent differences. Drug Metab Dispos. 1998 Jan;26(1):12-19.

Li DM, Sun H. PTEN/MMAC1/TEP1 suppresses the tumorigenicity and induces G1 cell cycle arrest in human glioblastoma cells. Proc Natl Acad Sci U S A. 1998 Dec 22;95(26):15406-15411.

Li K, Li Y, Shelton JM, Richardson JA, Spencer E, Chen ZJ, Wang X, Williams RS. Cytochrome c deficiency causes embryonic lethality and attenuates stress-induced apoptosis. Cell. 2000 May 12;101(4):389-399.

Lipscomb JC, Fisher JW, Confer PD, Byczkowski JZ. In vitro to in vivo extrapolation for trichloroethylene metabolism in humans. Toxicol Appl Pharmacol. 1998 Oct;152(2):376-387.

Lipscomb JC, Garrett CM, Snawder JE. Cytochrome P450-dependent metabolism of trichloroethylene: interindividual differences in humans. Toxicol Appl Pharmacol. 1997 Feb;142(2):311-318.

Lock EA, Mitchell AM, Elcombe CR. Biochemical mechanisms of induction of hepatic peroxisome proliferation. Annu Rev Pharmacol Toxicol. 1989;29:145-163.

Mailand N, Falck J, Lukas C, Syljuasen RG, Welcker M, Bartek J, Lukas J. Rapid destruction of human Cdc25A in response to DNA damage. Science. 2000 May 26;288(5470):1425-1429.

Malle E, Steinmetz A, Raynes JG. Serum amyloid A (SAA): an acute phase protein and apolipoprotein. *Atherosclerosis*. 1993 Sep;102(2):131-146.

McQuaid S, Russell SE, Withe SA, Pearson CM, Elcombe CR, Humphries P. Analysis of transcripts homologous to acyl-CoA oxidase and enoyl-CoA hydratase/3-hydroxyacyl-CoA dehydrogenase induced in rat liver by methylclofenapate. *Cancer Lett*. 1987 Oct;37(1):115-121.

Metcalf D, Greenhalgh CJ, Viney E, Willson TA, Starr R, Nicola NA, Hilton DJ, Alexander WS. Gigantism in mice lacking suppressor of cytokine signalling-2. *Nature*. 2000 Jun 29;405(6790):1069-1073.

Minamoto S, Ikegame K, Ueno K, Narazaki M, Naka T, Yamamoto H, Matsumoto T, Saito H, Hosoe S, Kishimoto T. Cloning and functional analysis of new members of STAT induced STAT inhibitor (SSI) family: SSI-2 and SSI-3. *Biochem Biophys Res Commun*. 1997 Aug 8;237(1):79-83.

Nakajima T. Cytochrome P450 isoforms and the metabolism of volatile hydrocarbons of low relative molecular mass. *J Occup Health* 1997 39:83-91

Nakajima T, Kamijo Y, Usuda N, Liang Y, Fukushima Y, Kametani K, Gonzalez FJ, Aoyama T.

Sex-dependent regulation of hepatic peroxisome proliferation in mice by trichloroethylene via peroxisome proliferator-activated receptor alpha (PPARalpha). *Carcinogenesis*. 2000 Apr;21(4):677-682.

Neele DM, Kaptein A, Huisman H, de Wit EC, Princen HM. No effect of fibrates on synthesis of apolipoprotein(a) in primary cultures of cynomolgus monkey and human hepatocytes: apolipoprotein A-I synthesis increased. *Biochem Biophys Res Commun*. 1998 Mar 17;244(2):374-378.

Reddy JK, Goel SK, Nemali MR, Carrino JJ, Laffler TG, Reddy MK, Sperbeck SJ, Osumi T, Hashimoto T, Lalwani ND, et al. Transcription regulation of peroxisomal fatty acyl-CoA oxidase and enoyl-CoA hydratase/3-hydroxyacyl-CoA dehydrogenase in rat liver by peroxisome proliferators. *Proc Natl Acad Sci U S A*. 1986 Mar;83(6):1747-1751.

Renbaum P, Levy-Lahad E. Monogenic determinants of familial Alzheimer's disease: presenilin-2 mutations. *Cell Mol Life Sci*. 1998 Sep;54(9):910-919. Review.

- Roberts RA, James NH, Hasmall SC, Holden PR, Lambe K, Macdonald N, West D, Woodyatt NJ, Whitcome D. Apoptosis and proliferation in nongenotoxic carcinogenesis: species differences and role of PPAR α . *Toxicol Lett*. 2000 Mar 15;112-113:49-57.
- Scheffner M, Huibregtse JM, Vierstra RD, Howley PM. The HPV-16 E6 and E6-AP complex functions as a ubiquitin-protein ligase in the ubiquitination of p53. *Cell*. 1993 Nov 5;75(3):495-505.
- Shayesteh L, Lu Y, Kuo WL, Baldocchi R, Godfrey T, Collins C, Pinkel D, Powell B, Mills GB, Gray JW. PIK3CA is implicated as an oncogene in ovarian cancer. *Nat Genet*. 1999 Jan;21(1):99-102.
- Soni MG, Ramaiah SK, Mumtaz MM, Clewell H, Mehendale HM. Toxicant-inflicted injury and stimulated tissue repair are opposing toxicodynamic forces in predictive toxicology. *Regul Toxicol Pharmacol*. 1999 Apr;29(2 Pt 1):165-74.
- Stroschein SL, Wang W, Zhou S, Zhou Q, Luo K. Negative feedback regulation of TGF- β signaling by the SnoN oncoprotein. *Science*. 1999 Oct 22;286(5440):771-774.
- Tao L, Yang S, Xie M, Kramer PM, Pereira MA. Effect of trichloroethylene and its metabolites, dichloroacetic acid and trichloroacetic acid, on the methylation and expression of c-Jun and c-Myc protooncogenes in mouse liver: prevention by methionine. *Toxicol Sci*. 2000 Apr;54(2):399-407.
- Velho G, Froguel P, Clement K, Pueyo ME, Rakotoambinina B, Zouali H, Passa P, Cohen D, Robert JJ. Primary pancreatic beta-cell secretory defect caused by mutations in glucokinase gene in kindreds of maturity onset diabetes of the young. *Lancet*. 1992 Aug 22;340(8817):444-448.
- Vu-Dac N, Schoonjans K, Kosykh V, Dallongeville J, Fruchart JC, Staels B, Auwerx J. Fibrates increase human apolipoprotein A-II expression through activation of the peroxisome proliferator-activated receptor. *J Clin Invest*. 1995 Aug;96(2):741-750.
- Vu-Dac N, Schoonjans K, Laine B, Fruchart JC, Auwerx J, Staels B. Negative regulation of the human apolipoprotein A-I promoter by fibrates can be attenuated by the interaction of the peroxisome proliferator-activated receptor with its response element. *J Biol Chem*. 1994 Dec 9;269(49):31012-31018.
- Young LJ, Nilsen R, Waymire KG, MacGregor GR, Insel TR. Increased affiliative response to vasopressin in mice expressing the V1a receptor from a monogamous vole. *Nature*. 1999 Aug 19;400(6746):766-768.

I-2-2. トリクロロエチレン経口投与実験

要旨 腹腔内投与実験では曝露時間の問題等により、本来得られるべきペルオキシゾーム増殖に関連する遺伝子の変化は十分に捉えることが出来なかった。そこで我々は、TCE を2週間経口投与するとPPAR α 遺伝子及びペルオキシゾームにおける β 酸化系酵素の増加が観察されたという報告に基づき、2週間の経口投与実験を行い、時間経過を追って遺伝子の発現がどのように変化するかを観察し、どのような種差があるかを検証するか実験を行った。マウスとラットに対してコーン油に溶解させた1500mg/kg TCE を1) 単回投与後5時間、2) 単回投与後18時間、3) 1週間連続投与後、18時間、4) 2週間連続投与後、18時間、経口投与し、摘出した肝臓から得られたmRNAをDNAチップにハイブリダイゼーションさせてその遺伝子発現プロファイルを得た。クラスター解析ではマウスとラットのデータは明確に区別され、遺伝子発現変化の種差を視覚的に捉えることが出来た。Gene Ontologyを用いて遺伝子を分類して表示すると、機能別に遺伝子発現の変化を捉えることが出来た。TCE曝露による遺伝子発現変化を時系列で追って観察したところ、ペルオキシゾーム増殖薬によって誘導されることが報告されている遺伝子の発現がコントロール群に比較して明らかに増加していた。これらの遺伝子は主にチトクローム系遺伝子、グルタチオン抱合に関与する遺伝子、及び β 酸化系酵素の遺伝子であった。特に腹腔内への単回投与では十分に捉えることが出来なかったペルオキシゾーム β 酸化系酵素は、時系列とその代謝カスケードに応じた変化をこの実験デザインでは捉えることが出来た。DNAチップは幾つかのタイムポイントで発現プロファイルを得ておくと、時間軸に沿った遺伝子の発現変化をダイナミックに捉える可能性を十分に示された。

トリクロロエチレン経口投与実験については平成13年度に報告したが、解析等が変更になっているので再掲する。

経口投与実験

○目的

単時間観察の腹腔内投与試験では曝露からの時間的経過の問題等により、ペルオキシゾーム増殖薬であるTCEの特性より本来得られると予測される代謝に関連する遺伝子やペルオキシゾームに置ける β 酸化に関連する遺伝子の変化が十分に捉えることが出来なかった。TCEを2週間経口投与する

と、電顕でペルオキシゾームの増殖が確認されており、また、PPAR α 遺伝子及びペルオキシゾームにおける β 酸化系酵素の増加が観察されたという報告がある。(Nakjima et al. 2000) そこで我々は、最大2週間の経口投与実験を行い、時間軸に沿って遺伝子発現がどのように変化していくかを観察し、その遺伝子発現変化にはどのような種差があるのかを検証する実験を行った。

○曝露方法

●動物、曝露条件

B6C3F1マウス(8週齢、雄)、及びSDラ

ット (8 週齢、雄) (Japan Charles River) を温度 23~25℃、湿度 50~60%、12 時間の明暗サイクル下で 1 週間馴化し、体重が群によってばらつかないように均等に 4 匹ずつを 9 群に分け、トリクロロエチレン (TCE : Wako Pure Chemical Industries, Ltd., Purity 99.5%) をコーン油に溶解させて 1500mg TCE/kg 体重経口投与を行った。曝露方法は以下の通りである。

コントロール群 (各 n=4)		TCE 曝露群 (各 n=4)	
曝露時間	投与回数	曝露時間	投与回数
0 時間	なし		
5 時間	1 回	5 時間	1 回
18 時間	1 回	18 時間	1 回
1 週間	24 時間毎に 7 回	1 週間	24 時間毎に 7 回
2 週間	24 時間毎に 14 回	2 週間	24 時間毎に 14 回

なお、この動物実験は慶應義塾大学医学部動物実験ガイドライン (平成 9 年改正) に基き計画を立案し、慶應義塾大学医学部動物実験委員会の承認を得て実施したものである。

●代謝産物測定、生化学的肝機能検査

曝露後の各肝臓摘出時間にエーテル麻酔下で右心房より心臓採血し、次いで肝臓の摘出を行った。TCE の生物学的曝露指標として、TCE と TCE の代謝産物であるトリクロロ酢酸 (TCA)、ジクロロ酢酸 (DCA)、トリクロロエタノール (TCOH) の血液中

濃度、生化学的肝臓機能の測定を質量分析計型検出器付きガスクロマトグラフ (GC-MS) を用いて行った。また、肝傷害の程度を見る目的で、血中 GOT, GPT, LDH の測定をラットに対して行った。

●臓器

肝臓は重量測定後、液体窒素で直ちに凍結し、total RNA の抽出を行うまで -80℃ で保存した。

●RNA の精製、cDNA 合成 :

肝臓から抽出した RNA を DNA チップへハイブリダイゼーションするプロセスは腹腔内投与実験と同様の方法で行った。

ハイブリダイゼーションに用いるサンプルは以下の実験結果に基き、各群 4 匹のサンプルをビオチン化ラベル cRNA の段階で等量ずつ混合し、各群につき 1 サンプルでハイブリダイゼーションを行った。

○ 混合サンプルを用いることの有用性の検討

●目的

ところで、動物に化学物質を曝露した際の反応には個体差が観察されるが、1 枚 30 万円以上の高額な DNA チップを用いた実験時にはなるべく使用するチップの枚数を減らせるような実験系の構築が現段階では不可欠である。TCE 腹腔内投与実験では、高曝露、低曝露、コントロールの各群 4 匹、計 12 サンプルそれぞれに対して DNA チップへのハイブリダイゼーションを行った。さらに複雑な曝露濃度設定、時系列の実験にあたっては、膨大な数の DNA チップが必要となり、限られた予算の範囲において