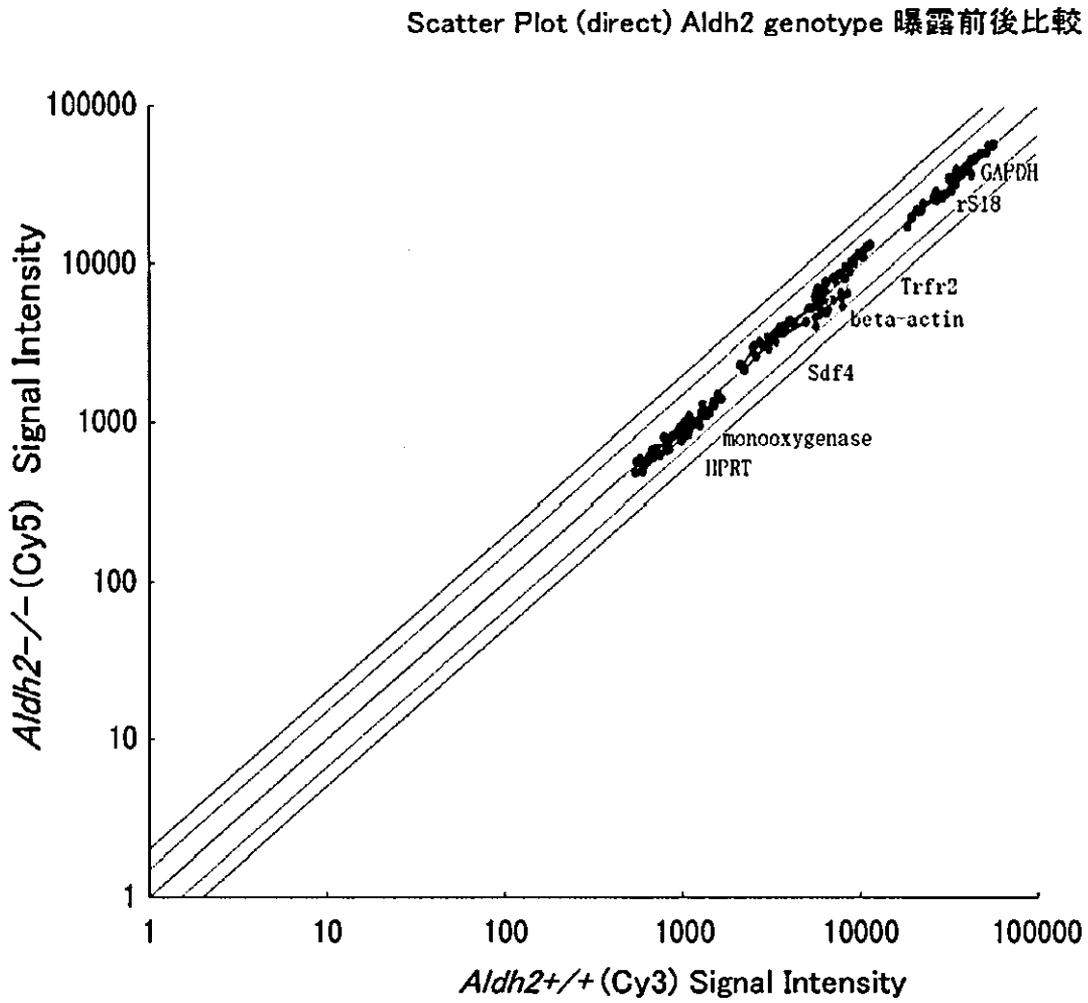


Fig1-II-2-2 サンプル間および実験間で発現量に相違の生じていない House keeping gene



### 1-II-1-3 Global normalization

観測した全ての遺伝子の蛍光強度の補正前数値を解析毎に結んだのが下図(Fig1-II-3-1 および 2)であり、これを移動の少なかった順に 250 ずつ色分けして分けて表示したのが次図(Fig1-II-3-3)である。半数以上の遺伝子は遺伝子型およびアセトアルデヒド曝露によらず蛍光強度に差を生じていないのがわかる。また、実験結果に標識蛍光色素間の歪みが生じているのはおおむね蛍光強度 100 以下のものだけであることがわかり、ほとんどの遺伝子は  $y=x$  から蛍光強度 1.5 から 2 倍以内に発現していることがわかる。採取した RNA の品質も良いことから、一番観測点の多い補正法として Global normalization を採用した。また、Scatter Plot の重ね合わせによる以降の解析には標識蛍光色素の違いによる歪みは蛍光強度 100 以上ではごく小さいため、補正前値を用いることとした。

Fig1-II-3-1 全ての遺伝子の蛍光強度の補正前数値を解析毎に結んだ図

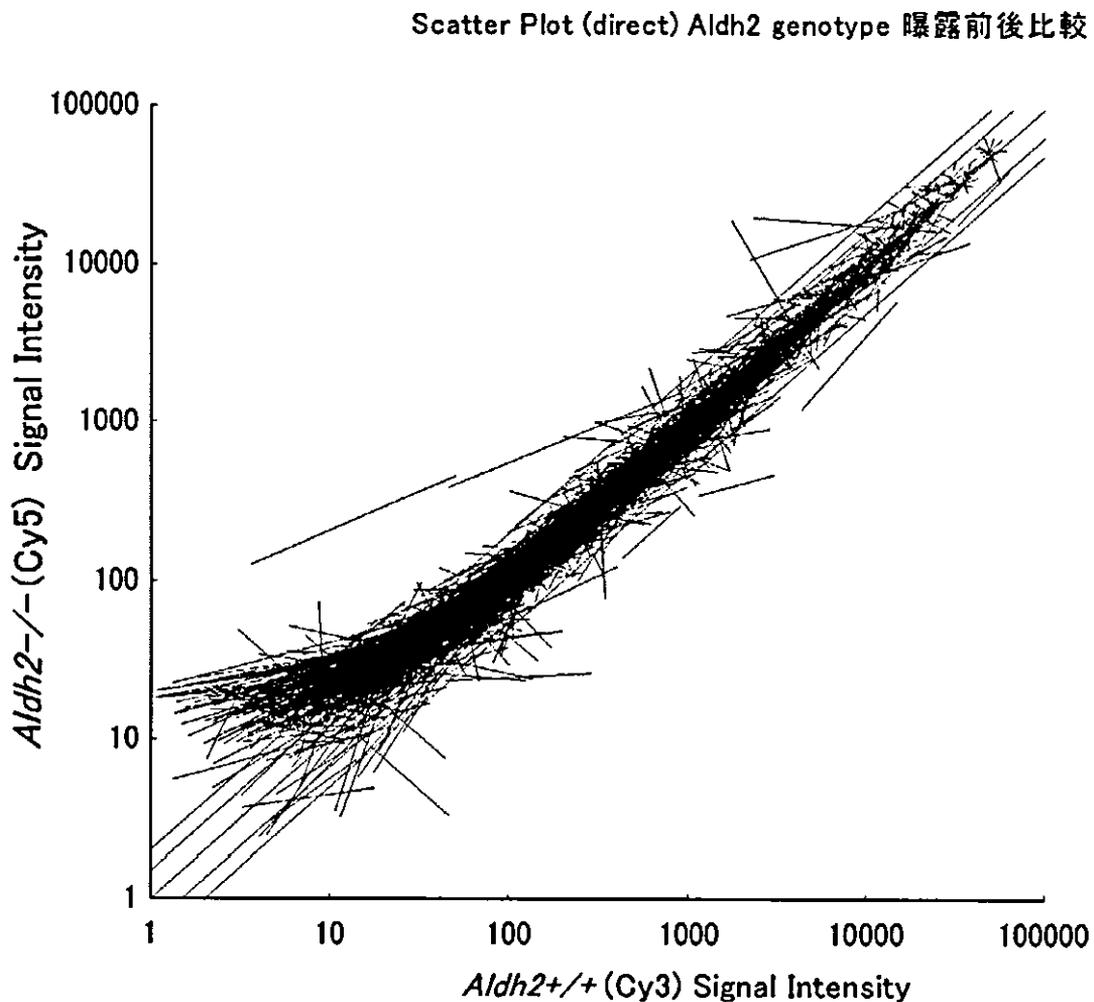


Fig1-II-3-2) 全ての遺伝子の蛍光強度の補正前数値を解析毎に結んだ図 (移動距離の小さい遺伝子を 250 個ずつ色分け)

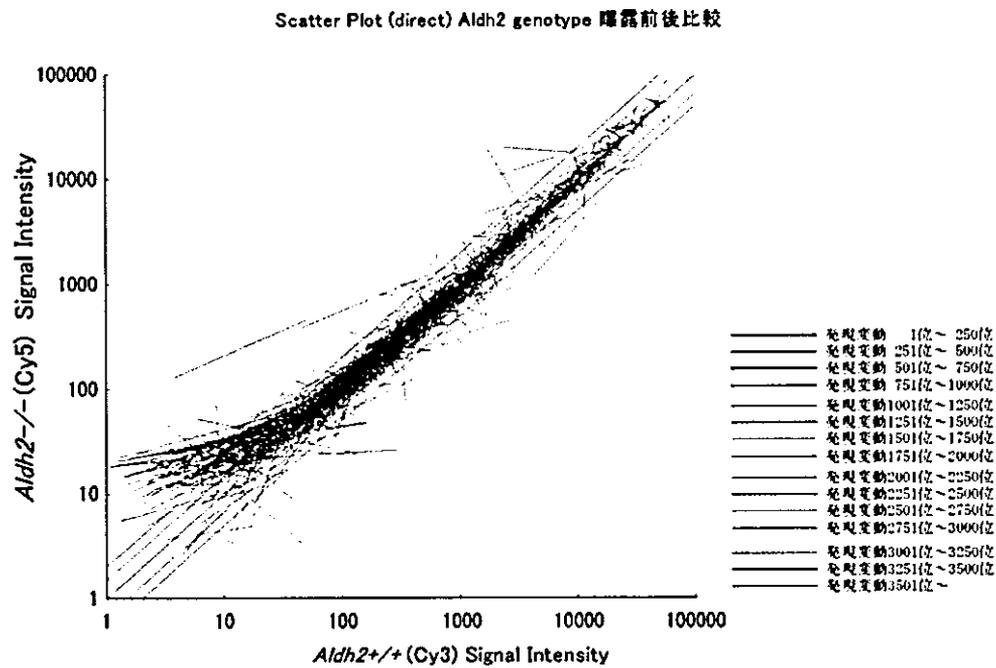
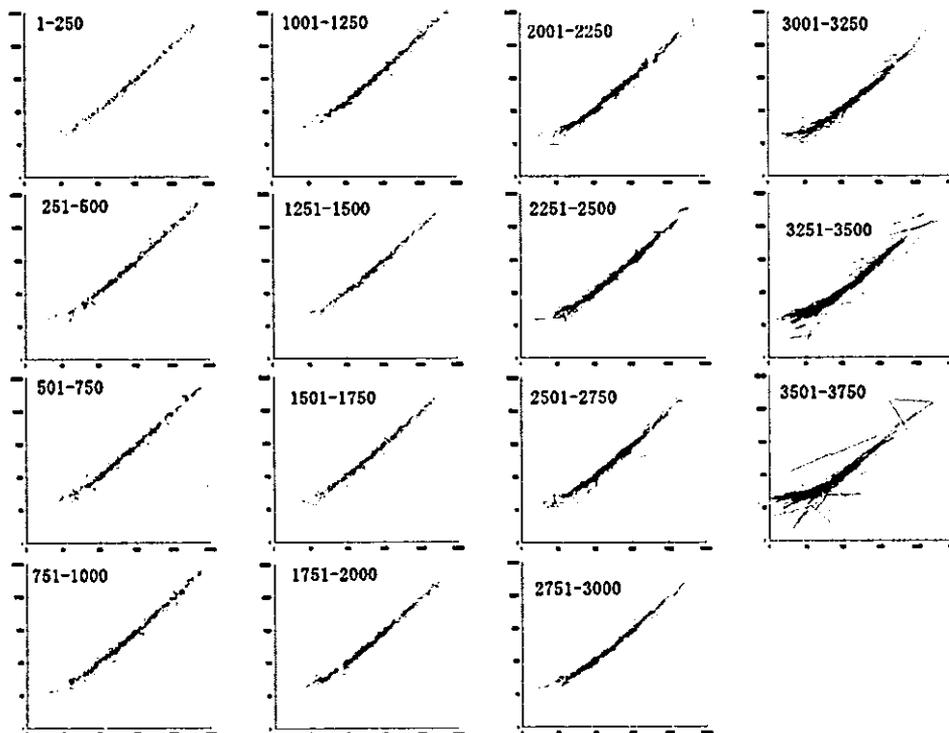


Fig1-II-3-3 解析した全ての遺伝子を移動距離の小さい遺伝子を 250 個ずつ色分けした図



1-II-2-1 一般的な2実験の差を検出する手法(チップ間の誤差検定によく用いる)での検討

x軸: *Aldh2*<sup>+/+</sup>のアセトアルデヒド曝露前後の発現差

$$\log_2 \frac{x_1}{x_2}$$

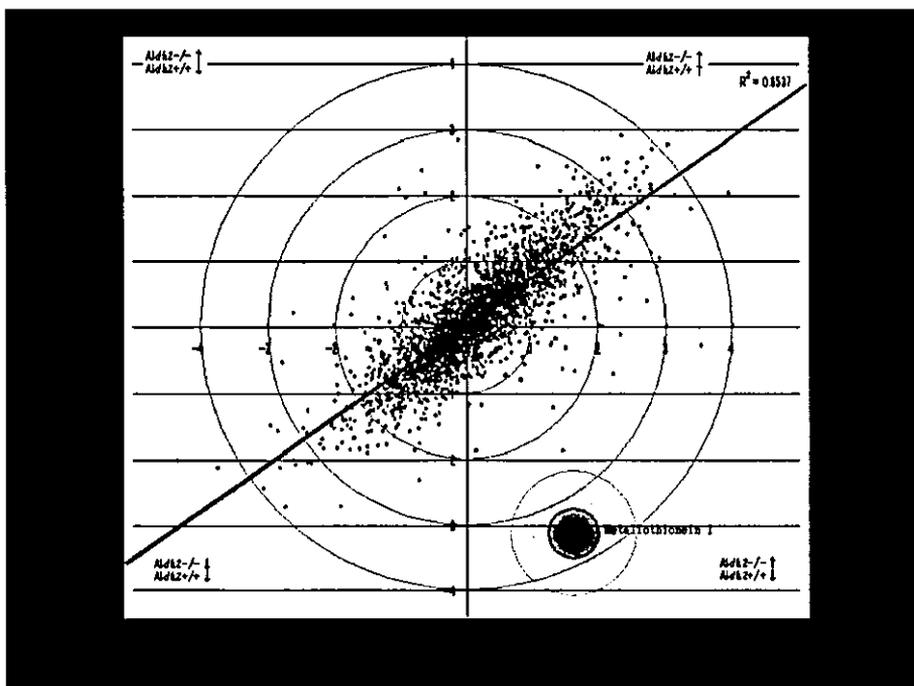
y軸: *Aldh2*<sup>-/-</sup>のアセトアルデヒド曝露前後の発現差

$$\log_2 \frac{y_1}{y_2}$$

*Aldh2* 遺伝型で発現量に差がなければ  $y=x$  軸に沿ってすべての遺伝子がプロットされる  
中心(0, 0)から距離の離れた遺伝子ほど、発現に差を生じている。

利点: 全ての遺伝子が点で表示される

不利な点: 蛍光強度(遺伝子発現量)や曝露前あるいは後に差があったかなどの一部のデータが計算上消去されてしまう。

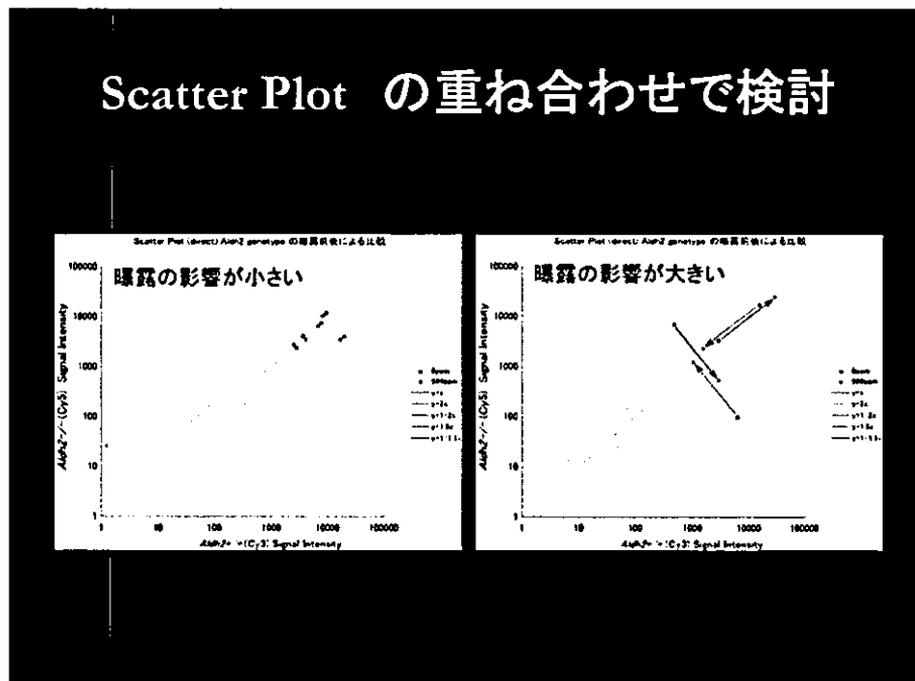


### 1-II-2-2 Scatter Plot の重ねあわせによる表示法

蛍光強度（遺伝子発現量）のデータを図中に残したまま発現量の変化を検討した方が、発現量が大きいほど誤差が少なくかつ生理的変化が大きいことが読み取れる。そこで Scatter Plot の重ね合わせ表示をし、曝露前後の移動を線で結び表示することとした。

#### 1-II-2-2-1. 移動距離の計算

Scatter Plot の描図上で曝露前後の移動線の長さが長い遺伝子ほど、アセトアルデヒド曝露の有無で蛍光強度の変化すなわち発現量の変化が大きかった遺伝子である。従って Scatter Plot の移動距離を計算することでアセトアルデヒド曝露による発現変動の大きい遺伝子を抽出した。

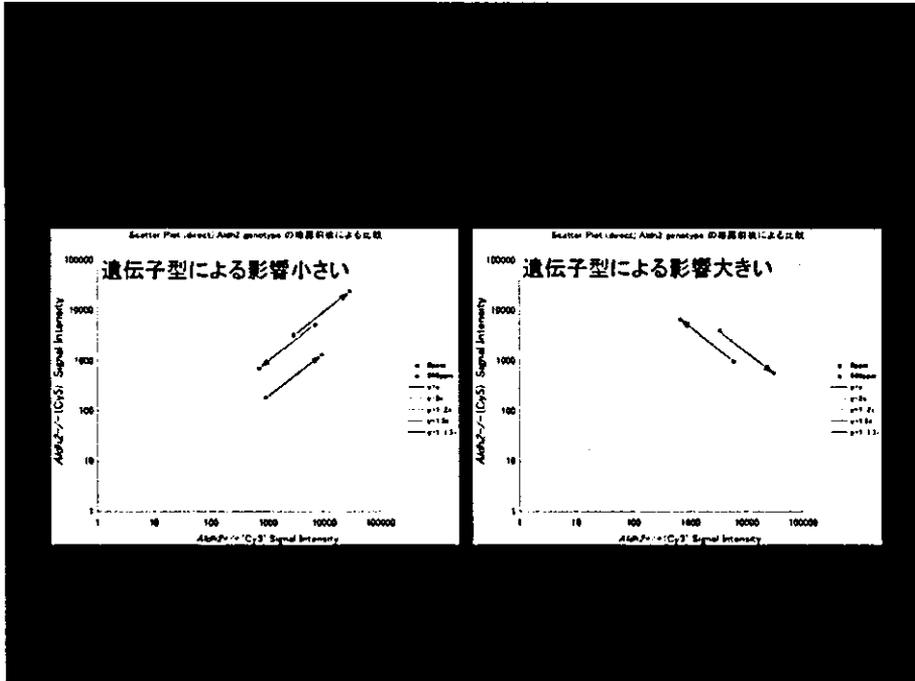


$$d = \sqrt{\left(\log_2 \frac{x_2}{x_1}\right)^2 + \left(\log_2 \frac{y_2}{y_1}\right)^2}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

1-II-2-2-2. Scatter Plot の移動方向による、影響の篩い分け

遺伝子型による影響であるか、曝露による影響下を Scatter Plot の移動方向により篩い分けすることができる。



$$a(1,1) + b(1,-1) = (x_2 - x_1, y_2 - y_1)$$

$$a = \frac{1}{2} \log_2 \left( \frac{x_2}{x_1} \times \frac{y_2}{y_1} \right)$$

$$b = \frac{1}{2} \log_2 \left( \frac{x_2}{x_1} \times \frac{y_1}{y_2} \right)$$

結果 1-III

1-III-1-1 解析法 1-1 Spot 判定が全て陽性で移動距離が大きい遺伝子

Fig1-III-1-1 Spot 判定が全て陽性で移動距離が大きい遺伝子上位 250 位  
Scatter Plot (direct) Aldh2 genotype 構築前後発現変動 all positive 上位 250

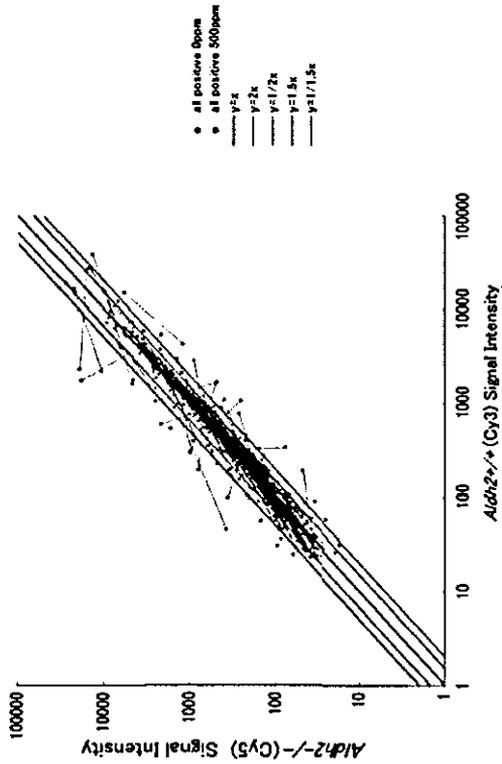


Table 1-III-1-1 Spot 判定が全て陽性で移動距離が大きい遺伝子上位 250 位

Gene Bank Accession	Gene name
1 NM_010000	Cytochrome P450, 2b9, Phenobarbital inducible, type a
2 NM_025435	Sterol-C-4-methyl oxidase-like
3 NM_024226	Retinoid 4
4 NM_007468	Apolipoprotein A-IV
5 NM_010228	FMS-like tyrosine kinase 1
6 NM_007591	Calreticulin
7 NM_021465	Stromal antigen 2
8 NM_054055	Solute carrier family 13 (sodium-dependent decarboxylase transporter), member 3
9 NM_013732	Cocaine and amphetamine regulated transcript
10 NM_007825	Cytochrome P450, 7b1
11 NM_022882	Lipin 2
12 NM_010941	NAD(P) dependent steroid dehydrogenase-like
13 NM_023320	RIKEN cDNA 2810052M02 gene
14 NM_007542	Biglycan
15 NM_023113	Aspartoacylase (aminoacylase) 2

16 NM_016668	Betaine-homocysteine methyltransferase
17 NM_009860	Phosphatase and tensin homolog
18 NM_021789	Syntenin
19 NM_013602	Metallothionein 1
20 NM_007478	ADP-ribosylation factor 3
21 NM_020268	DnaJ (Hsp40) homolog, subfamily B, member 10
22 NM_016874	Deformed epidermal autoregulatory factor 1 (Drosophila)
23 NM_011592	Translocator of inner mitochondrial membrane 44
24 NM_016707	B-cell CLL/lymphoma 11A (zinc finger protein)
25 NM_020276	Nasal embryonic LHRH factor
26 NM_023323	RIKEN cDNA 2810470K21 gene
27 NM_009609	Actin, gamma, cytoplasmic
28 NM_008669	N-acetyl galactosaminidase, alpha
29 NM_020007	Muscleblind-like (Drosophila)
30 NM_025636	RIKEN cDNA 2310079N02 gene
31 NM_008180	Glutathione synthetase
32 NM_013683	Transporter 1, ATP-binding cassette, sub-family B (MDR/TAP)
33 NM_008942	Punomycin-sensitive aminopeptidase
34 NM_007796	Cytotoxic T lymphocyte-associated protein 2 alpha
35 NM_009148	SEC8 (S. cerevisiae)
36 NM_009672	Acidic (leucine-rich) nuclear phosphoprotein 32 family, member A
37 NM_054046	Differentially expressed in FDCP 8
38 NM_008537	Alpha-methylacyl-CoA racemase
39 NM_009360	Transcription factor A, mitochondrial
40 NM_025437	RIKEN cDNA 1500010B24 gene
41 NM_025688	RIKEN cDNA 2410004N11 gene
42 NM_009178	Sialyltransferase 4C (beta-galactosidase alpha-2,3-sialyltransferase)
43 NM_009127	Stearoyl-Coenzyme A desaturase 1
44 NM_007572	Complement component 1, q subcomponent, alpha polypeptide
45 NM_010786	Transformed mouse 3T3 cell double minute 2
46 NM_006524	Lumican
47 NM_010716	Ligase III, DNA, ATP-dependent
48 NM_009070	Ribonucleic acid binding protein S1
49 NM_010223	FK506 binding protein 8 (38 kDa)
50 NM_010012	Cytochrome P450, 8b1, sterol 12 alpha-hydroxylase
51 NM_023556	Mevkronata kinase
52 NM_010211	Four and a half LIM domains 1
53 NM_024479	cDNA sequence BC002286
54 NM_015754	Retinoblastoma binding protein 9
55 NM_133999	Expressed sequence A1326867
56 NM_010476	Hydroxysteroid (17-beta) dehydrogenase 7
57 NM_008670	Ankyrin 3, epithelial
58 NM_008452	Kruppel-like factor 2 (lung)
59 NM_009680	Adaptor-related protein complex AP-3, beta 1 subunit
60 NM_008144	G protein gamma 3 linked gene
61 NM_007594	Calumenn

62	NM_013814	UDP-N-acetyl-alpha-D-galactosamine polypeptide N-acetylgalactosaminyltransferase 1
63	NM_009381	Thyroid hormone responsive SPOT14 homolog (Rattus)
64	NM_025281	Ly1 antibody reactive clone
65	NM_138749	Plexin B2
66	NM_054071	Fibroblast growth factor receptor-like 1
67	NM_008431	Potassium channel, subfamily K, member 4
68	NM_026176	Proscudin-like
69	NM_011948	Mitogen activated protein kinase kinase kinase 4
70	NM_032002	Neuregulin 4
71	NM_011970	Proteasome (prosome, macropain) subunit, beta type 2
72	NM_011370	Selective hybridizing clone
73	NM_054043	Musashi homolog 2 (Drosophila)
74	NM_025812	High mobility group 20A
75	NM_007706	Suppressor of cytokine signaling 2
76	NM_021524	pre-B-cell colony-enhancing factor
77	NM_011971	Proteasome (prosome, macropain) subunit, beta type 3
78	NM_010207	Fibroblast growth factor receptor 2
79	NM_007590	Calmodulin 3
80	NM_009150	Selenium binding protein 1
81	NM_011970	RIKEN cDNA 1110059E24 gene
82	NM_026174	Lysosomal apyrase-like 1
83	NM_029963	Mitochondrial ribosomal protein S5
84	NM_022885	Solute carrier family 30 (zinc transporter), member 5
85	NM_021336	Small nuclear ribonucleoprotein polypeptide A'
86	NM_008479	Lymphocyte activation gene 3
87	NM_011224	Muscle glycogen phosphorylase
88	NM_009186	Silica-induced gene 41
89	NM_009171	Serine hydroxymethyl transferase 1 (soluble)
90	NM_031199	Transforming growth factor alpha
91	NM_016890	Dynactin 3
92	NM_011942	Lysophospholipase 2
93	NM_011991	COP9 (constitutive photomorphogenic) homolog, subunit 3 (Arabidopsis thaliana)
94	NM_025421	RIKEN cDNA 1110039O14 gene
95	NM_030687	Solute carrier family 21 (organic anion transporter), member 5
96	NM_011421	Sphingomyelin phosphodiesterase 1, acid lysosomal
97	NM_023912	N-terminal kinase-like
98	NM_007465	Baculoviral IAP repeat-containing 3
99	NM_134024	Expressed sequence A451582
100	NM_007455	Adaptor protein complex AP-1, gamma 2 subunit
101	NM_008543	MAD homolog 7 (Drosophila)
102	NM_025437	RIKEN cDNA 1810055E12 gene
103	NM_019581	GTP binding protein 2
104	NM_019414	Selenium binding protein 2
105	NM_016806	Ubiquitin specific protease 2
106	NM_016898	CD164 antigen
107	NM_009895	Cytokine inducible SH2-containing protein

108	NM_025419	RIKEN cDNA 1110059G10 gene
109	NM_009469	Ure-51 like kinase 1 (C. elegans)
110	NM_007408	Adipose differentiation related protein
111	NM_020566	DnaJ (Hsp40) homolog, subfamily C, member 4
112	NM_011499	Serine/threonine kinase receptor associated protein
113	NM_025523	NADH dehydrogenase (ubiquinone) 1, subcomplex, unknown, 1
114	NM_015824	Origin recognition complex, subunit 3-like (S. cerevisiae)
115	NM_008183	Glutathione S-transferase, mu 2
116	NM_008796	Phosphatidylcholine transfer protein
117	NM_030711	Type 1 tumor necrosis factor receptor shedding aminopeptidase regulator
118	NM_022313	Era (G-protein-like 1 (E. coli)
119	NM_008654	Myeloid differentiation primary response gene 116
120	NM_009193	Stem-loop binding protein
121	NM_009864	Crystatlin, alpha B
122	NM_024182	SudF, suppressor of binD6 homolog (Aspergillus nidulans)
123	NM_026095	RIKEN cDNA 1700043E15 gene
124	NM_007521	BTB and CNC homology 2
125	NM_138745	Methylene-tetrahydrofolate dehydrogenase (NADP+ dependent), methylenetetrahydrofolate cyclohydrolase, formyltetrahydrofolate synthase
126	NM_010730	Annexin A1
127	NM_008853	Praja1, RING-H2 motif containing
128	NM_009647	Adenylate kinase 4
129	NM_015731	ATPase, class II, type 9A
130	NM_019945	Syntrophin associated serine/threonine kinase
131	NM_025889	RIKEN cDNA 2410001H17 gene
132	NM_008155	Glucose phosphate isomerase 1
133	NM_025572	RIKEN cDNA 2610528J11 gene
134	NM_010260	Guanylate nucleotide binding protein 2
135	NM_007379	ATP-binding cassette, sub-family A (ABC1), member 2
136	NM_008125	Gap junction membrane channel protein beta 2
137	NM_019929	SMT3 (suppressor of mif two, 3) homolog 1 (S. cerevisiae)
138	NM_026352	Peptidylprolyl isomerase D (cyclophilin D)
139	NM_011972	Polymerase (DNA directed), iota
140	NM_011905	Toll-like receptor 2
141	NM_016883	Proteasome (prosome, macropain) 26S subunit, non-ATPase, 10
142	NM_019668	Ubiquitin-conjugating enzyme E2A, RAD6 homolog (S. cerevisiae)
143	NM_020581	Angiopoietin-like 4
144	NM_008668	Ngt-A binding protein 2
145	NM_015762	Thioredoxin reductase 1
146	NM_025999	RIKEN cDNA 2610110L04 gene
147	NM_007531	B-cell receptor-associated protein 37
148	NM_030706	Tripartite motif protein 2
149	NM_016897	Translocase of inner mitochondrial membrane 23 homolog (yeast)
150	NM_008065	GA repeat binding protein, alpha
151	NM_011529	TRAF family member-associated NF-kappa B activator
152	NM_007483	Ras homolog gene family, member AB
153	NM_016663	Synaptotagmin 3

154	NM_023595	Deoxyuridine triphosphatase
155	NM_019693	HLA-B-associated transcript 1A
156	NM_011920	ATP-binding cassette, sub-family G (WHITE), member 2
157	NM_008581	Melanoma antigen, 80 kDa
158	NM_007474	Aquaporin 8
159	NM_008662	Myosin VI
160	NM_011104	Protein kinase C, epsilon
161	NM_011834	Kynurenine aminotransferase II
162	NM_026179	RIKEN cDNA 1300003D03 gene
163	NM_008378	Imprinted and ancient
164	NM_025403	RIKEN cDNA 1110036B12 gene
165	NM_026232	RIKEN cDNA 4833433D23 gene
166	NM_019480	Estrogen receptor-binding fragment-associated gene 9
167	NM_025533	RIKEN cDNA 2310061K06 gene
168	NM_030750	Sphingosine-1-phosphate phosphatase 1
169	NM_019649	Cart lip and palate associated transmembrane protein 1
170	NM_007563	2,3-bisphosphoglycerate mutase
171	NM_009811	Caspase 6
172	NM_021301	Solute carrier family 15 (H+/peptide transporter), member 2
173	NM_010914	Nuclear transcription factor-Y beta
174	NM_010024	Dopachrome tautomerase
175	NM_008983	Protein tyrosine phosphatase, receptor type, K
176	NM_019428	Ribonuclease P2
177	NM_053094	CD163 antigen
178	NM_019922	Cartilage associated protein
179	NM_019825	Nuclear receptor coactivator 6
180	NM_023317	Nuclear distribution gene E homolog (Aspergillus)
181	NM_026551	RIKEN cDNA 6720485C15 gene
182	NM_007527	Bcl2-associated X protein
183	NM_011313	S100 calcium binding protein A6 (calyculin)
184	NM_011206	Protein tyrosine phosphatase, non-receptor type 18
185	NM_025400	RIKEN cDNA 1110028N05 gene
186	NM_008788	Procollagen C-proteinase enhancer protein
187	NM_013562	Interferon-related developmental regulator 1
188	NM_025978	RIKEN cDNA 2700016E08 gene
189	NM_011031	Procollagen-proline, 2-oxoglutarate 4-dioxygenase (proline 4-hydroxylase), alpha II polypeptide
190	NM_010376	Histocompatibility 13
191	NM_011303	Retinal short-chain dehydrogenase/reductase 1
192	NM_008599	Chemokine (C-X-C motif) ligand 9
193	NM_009058	Ret guanine nucleotide dissociation stimulator
194	NM_019952	B-cell stimulating factor 3
195	NM_013612	Solute carrier family 11 (proton-coupled divalent metal ion transporters), member 1
196	NM_025422	RIKEN cDNA 1110055L24 gene
197	NM_008698	4-nitrophenylphosphatase domain and non-neuronal SNAP25-like protein homolog 1 (C. elegans)
198	NM_025494	Expressed sequence A1413471

199	NM_025402	RIKEN cDNA 111003102 gene
200	NM_008832	Phosphorylase kinase alpha 1
201	NM_015740	General control of amino acid synthesis-like 1 (yeast)
202	NM_011847	DnaJ (Hsp40) homolog, subfamily B, member 6
203	NM_026061	RIKEN cDNA 2900010I05 gene
204	NM_01D431	Hypoxia inducible factor 1, alpha subunit
205	NM_011727	X-linked lymphocyte-regulated 3b
206	NM_007626	Chromobox homolog 5 (Drosophila HP1a)
207	NM_007508	ATPase, H+ transporting, lysosomal 70kD, V1 subunit A, isoform 1
208	NM_008854	Protein kinase, cAMP dependent, catalytic, alpha
209	NM_016846	Ret guanine nucleotide dissociation stimulator-like 1
210	NM_009242	Secreted acidic cysteine rich glycoprotein
211	NM_011361	Serumglucocorticoid regulated kinase
212	NM_013743	Pyruvate dehydrogenase kinase, isoenzyme 4
213	NM_010331	GPI anchor attachment protein 1
214	NM_019687	Solute carrier family 22 (organic cation transporter), member 4
215	NM_013467	Aldehyde dehydrogenase family 1, subfamily A1
216	NM_008529	Lymphocyte antigen 6 complex, locus E
217	NM_133255	Hook homolog 2 (Drosophila)
218	NM_016974	D site albumin promoter binding protein
219	NM_019507	T-box 21
220	NM_133973	Component of oligomeric golgi complex 4
221	NM_009278	Spogren syndrome antigen B
222	NM_013557	Eukaryotic translation initiation factor 2 alpha kinase 1
223	NM_008612	Mença a trois 1
224	NM_013916	Hoxa1 regulated gene
225	NM_016665	Stimulated by retinoic acid 13
226	NM_008059	G0/G1 switch gene 2
227	NM_025409	RIKEN cDNA 1110057H19 gene
228	NM_134054	RIKEN cDNA 111002B05 gene
229	NM_026011	RIKEN cDNA 2610313E07 gene
230	NM_009071	Rho-associated coiled-coil forming kinase 1
231	NM_009315	TAF6 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 80 kDa
232	NM_011690	Vely-HRNA synthetase 2
233	NM_010442	Heme oxygenase (decycling) 1
234	NM_028785	RIKEN cDNA 1200017A24 gene
235	NM_007414	ADP-ribosylarginine hydrolase
236	NM_023805	Solute carrier family 38, member 3
237	NM_010644	Kallikrein 26
238	NM_009008	RAS-related C3 botulinum substrate 2
239	NM_011756	Zinc finger protein 36
240	NM_024437	Nudix (nucleoside diphosphate linked moiety X)-type motif 7
241	NM_022889	Pescadillo homolog 1, containing BRCT domain (zebrafish)
242	NM_016888	UDP-GlcNAc 6-epimerase 1,3-N-acetylglucosaminyltransferase 1
243	NM_010890	Neural precursor cell expressed, developmentally down-regulated gene 4
244	NM_026160	Microtubule-associated protein 1 light chain 3

245	NM_007460	Adaptor-related protein complex AP-3, delta subunit
246	NM_009112	S100 calcium binding protein A10 (calpactin)
247	NM_013641	Prostaglandin E receptor 1 [subtype EP1], 42kD
248	NM_007444	S-adenosylmethionine decarboxylase 2
249	NM_010700	Low density lipoprotein receptor
250	NM_009297	Suppressor of Ty 6 homolog (S. cerevisiae)

1-III-1-2 解析法 1-2 Scatter Plot で y=x 方向の移動距離の大きい上位 250 遺伝子

Fig 1-III-1-2-1 y=x 方向の移動距離の大きく Spot 判定が全て陽性の上位 250 遺伝子  
Scatter Plot (direct) Aldh2 genotype 曝露前後の変動 y=x 上位 250

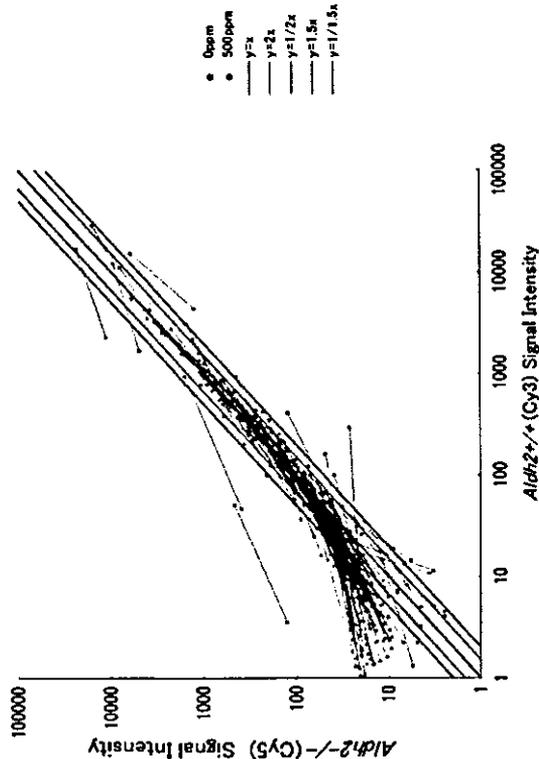


Table 1-III-1-2 y=x 方向の移動距離の大きく Spot 判定が全て陽性の上位 250 遺伝子

Gene Bank Accession	Gene name
1 NM_134046	DNA segment, Chr 12, ERATO Doi:482, expressed
2 NM_019417	Reversion induced LIM gene
3 NM_019578	Exostoses (multiple)-like 1
4 NM_011404	Solute carrier family 7 (cationic amino acid transporter, y+ system), member 5
5 NM_020618	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1
6 NM_009784	Calcium channel, voltage-dependent, alpha2/delta subunit 1
7 NM_021522	Ubiquitin specific protease 14
8 NM_008420	Potassium voltage gated channel, Shab-related subfamily, member 1
9 NM_008151	G-protein coupled receptor 12
10 NM_139145	Holo-carboxylase synthetase (biotin-[propionyl-Coenzyme A-carboxylase (ATP-hydrolyzing)] ligase)
11 NM_007552	B lymphoma Mo-MuLV insertion region 1
12 NM_010804	Myeloid/lymphoid or mixed lineage-leukemia translocation to 10 homolog (Drosophila)
13 NM_053132	Protocadherin beta 7
14 NM_015732	Axin2
15 NM_019875	ATP-binding cassette, sub-family B (MDR/TAP), member 9

16 NM_010330	Embligin
17 NM_011540	Tlin-cap
18 NM_013850	ATP-binding cassette, sub-family A (ABC1), member 7
19 NM_009603	Cholinergic receptor, nicotinic, epsilon polypeptide
20 NM_027588	5'-nucleotidase, cytosolic B
21 NM_008071	Gamma-aminobutyric acid (GABA(A)-receptor, subunit beta 3
22 NM_013709	Sp3 domain YSC-like 1
23 NM_023215	RIKEN cDNA 250003M10 gene
24 NM_019668	Heterogeneous nuclear ribonucleoprotein H2
25 NM_026175	RIKEN cDNA 1200014H24 gene
26 NM_007570	B-cell translocation gene 2, anti-proliferative
27 NM_022322	Tenomodulin
28 NM_010000	Cytochrome P450, 2b9, Phenobarbital inducible, type a
29 NM_007856	7-dehydrocholesterol reductase
30 NM_010468	Homeo box D3
31 NM_022327	v-rat simian leukemia viral oncogene homolog B (ras related)
32 NM_007540	Brain derived neurotrophic factor
33 NM_010758	Myelin-associated glycoprotein
34 NM_023129	Phospholamban
35 NM_028189	UDP-GlcNAc 6-epimerase beta-1,3-N-acetylglucosaminyltransferase 3
36 NM_133746	RIKEN cDNA 2810048G17 gene
37 NM_011360	Sarcoglycan, epsilon
38 NM_007468	Apolipoprotein A-IV
39 NM_025436	Sterol-C4-methyl oxidase-like
40 NM_016773	Nucleobindin 2
41 NM_010313	Guanine nucleotide binding protein, beta 5
42 NM_024226	Reticulon 4
43 NM_009922	Calponin 1
44 NM_013645	Parvalbumin
45 NM_010228	FMS-like tyrosine kinase 1
46 NM_007591	Calreticulin
47 NM_019934	Secretory blood group 1
48 NM_008697	Ninein
49 NM_017466	Chemokine (C-C motif) receptor-like 2
50 NM_133810	Expressed sequence A1120141
51 NM_026235	RIKEN cDNA 5430431G03 gene
52 NM_025520	RIKEN cDNA 2310034K10 gene
53 NM_007398	Adenosine deaminase
54 NM_054055	Solute carrier family 13 (sodium-dependent dicarboxylate transporter), member 3
55 NM_021465	Stromal antigen 2
56 NM_023328	ATP/GTP binding protein 1
57 NM_016866	Serine/threonine kinase 39, STE20/SPS1 homolog (yeast)
58 NM_011992	Reticulocalbin 2
59 NM_008812	Peptidyl arginine deiminase, type II
60 NM_013732	Cocaine and amphetamine regulated transcript
61 NM_019573	WW domain-containing oxidoreductase
62 NM_026401	Mitochondrial ribosomal protein 63
63 NM_022882	Lipin 2
64 NM_023320	RIKEN cDNA 2810052M02 gene
65 NM_007547	Protein tyrosine phosphatase, non-receptor type substrate 1
66 NM_080428	F-box and WD-40 domain protein 7, archipelago homolog (Drosophila)
67 NM_007825	Cytochrome P450, 7b1

68	NM_007542	Bighyan
69	NM_010941	NAD(P) dependent steroid dehydrogenase-like
70	NM_026128	RIKEN cDNA 4930403L05 gene
71	NM_021483	Peroxin 2
72	NM_009421	Interferon-stimulated protein (20 kDa)
73	NM_009912	Trif receptor-associated factor 1
74	NM_009912	Chemokine (C-C motif) receptor 1
75	NM_010930	Nephroblastoma overexpressed gene
76	NM_009623	Adenylyl cyclase 8
77	NM_008770	Claudin 11
78	NM_009808	Caspase 12
79	NM_023113	Aspartacylase (aminocyclase) 2
80	NM_136305	Adenylyl cyclase 3
81	NM_009168	Glutamate receptor, ionotropic, kainate 5 (gamma 2)
82	NM_008357	Interleukin 15
83	NM_010942	Neuron specific gene family member 1
84	NM_011876	PTK9 protein tyrosine kinase 9-like (AG-related protein)
85	NM_010266	Guanine deaminase
86	NM_033321	Purnergic receptor P2X, ligand-gated ion channel, 5
87	NM_021789	Symbiodin
88	NM_007478	ADP-ribosylation factor 3
89	NM_010715	Ligase I, DNA, ATP-dependent
90	NM_008960	Phosphatase and tensin homolog
91	NM_013606	Myxovirus (influenza virus) resistance 2
92	NM_030239	ATP-binding cassette, sub-family G (WHITE), member 3
93	NM_025285	Stathmin-like 2
94	NM_020266	DnaJ (Hsp40) homolog, subfamily B, member 10
95	NM_010135	Enabled homolog (Drosophila)
96	NM_009449	Tubulin, alpha 7
97	NM_011638	Transferrin receptor (TfR)
98	NM_011657	Tubby-like protein 3
99	NM_007498	Activating transcription factor 3
100	NM_020001	C-type (calcium dependent, carbohydrate recognition domain) lectin, superfamily member 10
101	NM_016874	Deformed epidermal autoregulatory factor 1 (Drosophila)
102	NM_025714	DNA segment, Chr 3, ERATO Doi 250, expressed
103	NM_011632	von Hippel-Lindau binding protein 1
104	NM_011592	Translocator of inner mitochondrial membrane 44
105	NM_009854	CD7 antigen
106	NM_007458	Adaptor protein complex AP-2, alpha 1 subunit
107	NM_026626	RIKEN cDNA 1700073K01 gene
108	NM_013662	Sema domain, transmembrane domain (TM), and cytoplasmic domain, (semaphorin) 6B
109	NM_016707	B-cell CLL/lymphoma 11A (zinc finger protein)
110	NM_020276	Nasal embryonic LHRH factor
111	NM_009220	Spermiogenesis gene
112	NM_023323	RIKEN cDNA 2810470K21 gene
113	NM_006532	Tumor-associated calcium signal transducer 1
114	NM_019676	Phospholipase C, delta
115	NM_020007	Muscleblind-like (Drosophila)
116	NM_008815	Polyomavirus enhancer activator 3
117	NM_053197	Sideroflexin 3
118	NM_008180	Glutathione synthetase

119	NM_008120	Gap junction membrane channel protein alpha 4
120	NM_025636	RIKEN cDNA 2310079N02 gene
121	NM_009609	Actin, gamma, cytoplasmic
122	NM_008942	Puromycin-sensitive aminopeptidase
123	NM_009148	SECB (S. cerevisiae)
124	NM_013683	Transporter 1, ATP-binding cassette, sub-family B (MDR/TAP)
125	NM_026662	RIKEN cDNA 2810101M19 gene
126	NM_009653	Ubiquitin conjugating enzyme 7 interacting protein 4
127	NM_009672	Acidic (leucine-rich) nuclear phosphoprotein 32 family, member A
128	NM_054046	Differentially expressed in FDCC 8
129	NM_010387	Histocompatibility 2, class II, locus Mb1
130	NM_006537	Alpha-methylacyl-CoA racemase
131	NM_031247	Immune associated nucleotide 4
132	NM_007891	E2F transcription factor 1
133	NM_008669	N-acetyl galactosaminidase, alpha
134	NM_025437	RIKEN cDNA 1500010B24 gene
135	NM_009360	Transcription factor A, mitochondrial
136	NM_007796	Cytotoxic T lymphocyte-associated protein 2, alpha
137	NM_008515	Leucine rich repeat (in FLII) interacting protein 1
138	NM_009178	Sialyltransferase 4C (beta-galactosidase alpha-2,3-sialyltransferase)
139	NM_008624	Muscle and microspikes RAS
140	NM_026603	RIKEN cDNA 1500003K04 gene
141	NM_025888	RIKEN cDNA 2410004N11 gene
142	NM_013398	Solute carrier family 25 (mitochondrial carrier, brain), member 14
143	NM_007572	Complement component 1, q subcomponent, alpha polypeptide
144	NM_013693	Tumor necrosis factor
145	NM_026288	Cullin 4B
146	NM_021877	Hairless
147	NM_008524	Lumican
148	NM_026139	RIKEN cDNA 3230401N03 gene
149	NM_010786	Transformed mouse 3T3 cell double minute 2
150	NM_009070	Ribonucleic acid binding protein S1
151	NM_010223	FK506 binding protein 8 (38 kDa)
152	NM_006039	Tissue inhibitor of metalloproteinase 4
153	NM_026108	RIKEN cDNA 1700121L12 gene
154	NM_010276	GTP binding protein (gene overexpressed in skeletal muscle)
155	NM_026290	RIKEN cDNA 4930511H11 gene
156	NM_007807	Cytochrome b-245, beta polypeptide
157	NM_011060	Peptidyl arginine deaminase, type III
158	NM_025987	RAB5A, member RAS oncogene family
159	NM_011093	Paired-like receptor A6
160	NM_008085	Glyceraldehyde-3-phosphate dehydrogenase, spermatogenic
161	NM_009614	A disintegrin and metalloproteinase domain 15 (metarginin)
162	NM_133999	Expressed sequence A825867
163	NM_008009	Fibroblast growth factor binding protein 1
164	NM_006670	Ankyrin 3, epithelial
165	NM_010476	Hydrocortisoid (17-beta) dehydrogenase 7
166	NM_007672	Cerebellar degeneration-related 2
167	NM_054048	RE1-silencing transcription factor (REST) co-repressor
168	NM_010716	Lipase III, DNA, ATP-dependent
169	NM_007640	CD11c2 antigen
170	NM_008144	G protein gamma 3 linked gene

171	NM_009830	Cyclin E2
172	NM_024479	cDNA sequence BC002286
173	NM_011767	Zinc finger RNA binding protein
174	NM_009680	Adaptor-related protein complex AP-3, beta 1 subunit
175	NM_007594	Calumenin
176	NM_136749	Plexin B2
177	NM_025724	RIKEN cDNA 4821510H08 gene
178	NM_008013	Fibrinogen-like protein 2
179	NM_009783	Calcium channel, voltage-dependent, I type, alpha 1G subunit
180	NM_015754	Retinoblastoma binding protein 9
181	NM_009381	Thyroid hormone responsive SPOT14 homolog (Rattus)
182	NM_011948	Mitogen activated protein kinase kinase 4
183	NM_008452	Kruppel-like factor 2 (lung)
184	NM_010211	Four and a half LIM domains 1
185	NM_008431	Potassium channel, subfamily K, member 4
186	NM_026096	RIKEN cDNA 1700054O13 gene
187	NM_007477	ADP-ribosylation factor 2
188	NM_011992	Home1, neuronal immediate early gene, 1
189	NM_011970	Proteasome (prosome, macropain) subunit, beta type 2
190	NM_026176	Phoducrin-like
191	NM_031870	MutS homolog 4 (E. coli)
192	NM_025281	Ly1 antibody reactive clone
193	NM_054043	Musashi homolog 2 (Drosophila)
194	NM_015759	Fgfr1 family, member 3
195	NM_013925	Adenosine deaminase, tRNA-specific 1
196	NM_007706	Suppressor of cytokine signaling 2
197	NM_013814	UDP-N-acetyl-alpha-D-galactosamine polypeptide N-acetylglactosaminyltransferase 1
198	NM_007590	Calmodulin 3
199	NM_011370	Selective hybridizing clone
200	NM_011971	Proteasome (prosome, macropain) subunit, beta type 3
201	NM_025812	High mobility group 20A
202	NM_010207	Fibroblast growth factor receptor 2
203	NM_054071	Fibroblast growth factor receptor-like 1
204	NM_009127	Stearyl-Coenzyme A desaturase 1
205	NM_010208	Gardner-Rasheed feline sarcoma viral (Fg7) oncogene homolog
206	NM_008008	Fibroblast growth factor 7
207	NM_027943	RIKEN cDNA 2310066I10 gene
208	NM_008163	Growth factor receptor bound protein 2
209	NM_028756	RIKEN cDNA 1010001J06 gene
210	NM_015825	SH3-binding domain, glutamic acid-rich protein
211	NM_023556	Mevahonete kinase
212	NM_026174	Lysosomal sphyrase-like 1
213	NM_029963	Mitochondrial ribosomal protein S5
214	NM_022865	Solute carrier family 30 (zinc transporter), member 5
215	NM_016877	CCR4-NOT transcription complex, subunit 4
216	NM_009619	A disintegrin and metalloprotease domain 3 (cyrtasin)
217	NM_019793	Transmembrane 4 superfamily member 8
218	NM_013911	F-box and leucine-rich repeat protein 12
219	NM_015823	Activin receptor-interacting protein 1
220	NM_130454	RecQ protein-like 5
221	NM_025423	RIKEN cDNA 1110059E24 gene
222	NM_008154	G-protein coupled receptor 3

223	NM_011402	Solute carrier family 34 (sodium phosphate), member 2
224	NM_021318	Activator of CREM in testis
225	NM_021336	Small nuclear ribonucleoprotein polypeptide A
226	NM_009186	Silica-induced gene 41
227	NM_016890	Dynein 3
228	NM_009468	Dihydropyrimidinase-like 3
229	NM_009171	Serine hydroxymethyl transferase 1 (soluble)
230	NM_031199	Transforming growth factor, alpha
231	NM_011942	Lysophospholipase 2
232	NM_011991	COP9 (constitutive photomorphogenic) homolog, subunit 3 (Arabidopsis thaliana)
233	NM_025430	RIKEN cDNA 1110066C01 gene
234	NM_011783	Anterior gradient 2 (Xenopus laevis)
235	NM_009424	Traf receptor-associated factor 6
236	NM_009150	Selenium binding protein 1
237	NM_016712	Tropomodulin 4
238	NM_011421	Sphingomyelin phosphodiesterase 1, acid lysosomal
239	NM_008479	Lymphocyte-activation gene 3
240	NM_007455	Adaptor protein complex AP-1, gamma 2 subunit
241	NM_134024	Expressed sequence AH451582
242	NM_010012	Cytochrome P450, 8b1, sterol 12 alpha-hydroxylase
243	NM_009020	Recombination activating gene 2
244	NM_023912	N-terminal kinase-like
245	NM_026437	RIKEN cDNA 1810055E12 gene
246	NM_010308	Guanine nucleotide binding protein, alpha o
247	NM_009946	Complexin 2
248	NM_019561	GTP binding protein 2
249	NM_025421	RIKEN cDNA 1110039D14 gene
250	NM_010789	Myeloid ecotropic viral integration site 1

Fig 1-III-1-2-2 y=x 方向の移動距離の大きい蛍光強度 10000 以上の遺伝子

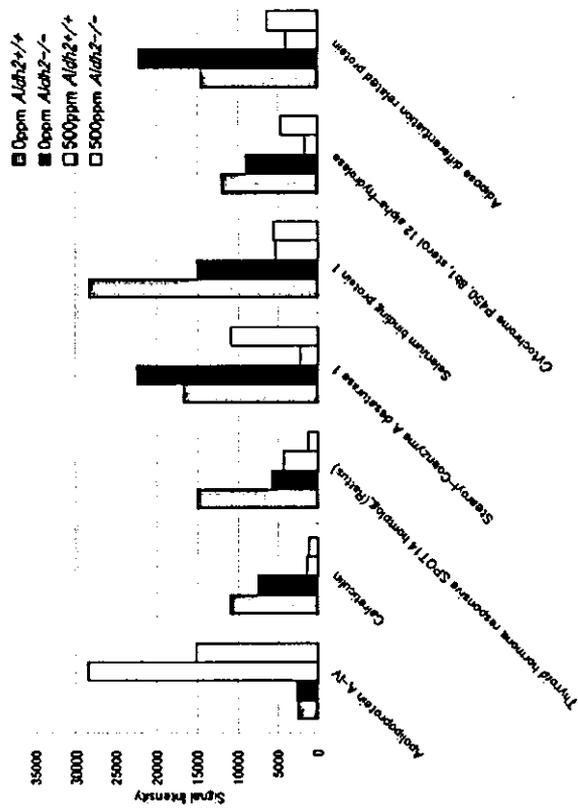


Fig1-III-1-3-1 y=-x 方向の移動距離の大きく Spot 判定が全て陽性の上位 100 遺伝子

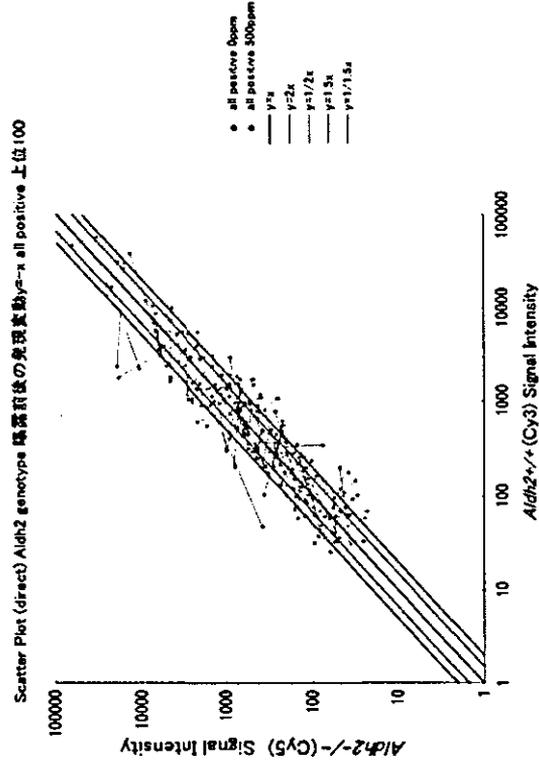


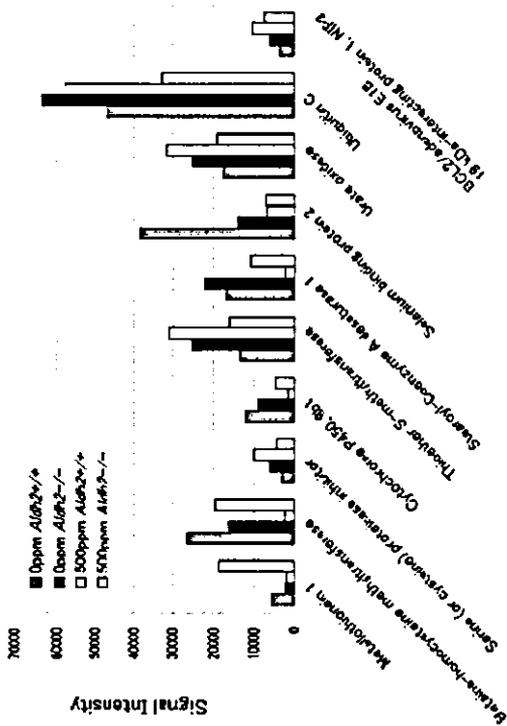
Table 1-III-1-3 y=-x 方向の移動距離の大きく Spot 判定が全て陽性の上位 100 遺伝子

GenBank	Accession	Gene name
1	NM_013602	Metallothionein 1
2	NM_016668	Betaine-homocysteine methyltransferase
3	NM_016808	Ubiquitin specific protease 2
4	NM_008581	Melanoma antigen, 80 kDa
5	NM_026232	RIKEN cDNA 493343D23 gene
6	NM_009647	Adenylate kinase 4
7	NM_032002	Neuregulin 4
8	NM_010024	Dopochrome tautomerase
9	NM_011727	X-linked lymphocyte-regulated 3b
10	NM_009895	Cytokine inducible SH2-containing protein
11	NM_016974	D site albumin promoter binding protein
12	NM_010831	SNF1-like kinase
13	NM_009744	B-cell leukemia/lymphoma 6
14	NM_021301	Solute carrier family 15 (H+/peptide transporter), member 2
15	NM_010000	Cytochrome P450, 2b9, Phenobarbital inducible, type a
16	NM_011224	Muscle glycogen phosphorylase
17	NM_007913	Early growth response 1
18	NM_021524	pre-B-cell colony-enhancing factor
19	NM_007618	Serine (or cysteine) proteinase inhibitor, clade A, member 6
20	NM_008509	Lipoprotein lipase

21	NM_008230	Histidine decarboxylase
22	NM_009112	S100 calcium binding protein A10 (calpactin)
23	NM_011802	Caseinolytic protease X (E.coli)
24	NM_010012	Cytochrome P450, 8b1, sterol 12 alpha-hydroxylase
25	NM_016887	Cytochrome P450, 39a1 (oxysterol 7alpha-hydroxylase)
26	NM_029436	Steroid-C4-methyl oxidase-like
27	NM_009349	Thioether S-methyltransferase
28	NM_007474	Aquepoin 8
29	NM_009127	Stearoyl-Coenzyme A desaturase 1
30	NM_011066	Period homolog 2 (Drosophila)
31	NM_023341	RIKEN cDNA 4632432J16 gene
32	NM_033374	Dedicator of cyto-kinesis 2
33	NM_011752	Zinc finger protein 259
34	NM_009628	Activity-dependent neuroprotective protein
35	NM_025341	RIKEN cDNA D610041D24 gene
36	NM_023556	Mevalonate kinase
37	NM_008295	Hydroxysteroid dehydrogenase-5, delta-5--3-beta
38	NM_024226	Retinonin 4
39	NM_009964	Crystallin, alpha B
40	NM_013490	Choline kinase
41	NM_030706	Tripartite motif protein 2
42	NM_009366	Transforming growth factor beta 1 induced transcript 4
43	NM_007825	Cytochrome P450, 7b1
44	NM_008804	Phosphodiesterase 9A
45	NM_019414	Selenium binding protein 2
46	NM_009117	Serum amyloid A 1
47	NM_009255	Serine (or cysteine) proteinase inhibitor, clade E, member 2
48	NM_011704	Venin 1
49	NM_011314	Serum amyloid A 2
50	NM_023132	Retin binding protein
51	NM_011396	Solute carrier family 16 (monocarboxylic acid transporters), member 5
52	NM_011391	Solute carrier family 16 (monocarboxylic acid transporters), member 7
53	NM_008669	N-acetyl galactosaminidase, alpha
54	NM_011281	RAR-related orphan receptor gamma
55	NM_018731	ATPase, H+K+ transporting, alpha polypeptide
56	NM_008710	Nicotinamide nucleotide transhydrogenase
57	NM_011868	Peroxisomal delta3, delta2-enoyl-Coenzyme A isomerase
58	NM_008330	Interferon gamma inducible protein, 47 kDa
59	NM_007444	S-adenosylmethionine decarboxylase 2
60	NM_008543	MAD homolog 7 (Drosophila)
61	NM_007865	Delta-like 1 (Drosophila)
62	NM_020594	Fetal liver zinc finger 1
63	NM_009721	ATPase, Na+/K+ transporting, beta 1 polypeptide
64	NM_016861	PDZ and LIM domain 1 (elfin)
65	NM_007933	Enolase 3, beta muscle
66	NM_017373	Nuclear factor, interleukin 3, regulated
67	NM_010324	Glutamate oxaloacetate transaminase 1, soluble
68	NM_007796	Cytotoxic T lymphocyte-associated protein 2 alpha
69	NM_026180	ATP-binding cassette, sub-family G (WHITE), member 8
70	NM_015747	Solute carrier family 20, member 1
71	NM_009114	S100 calcium binding protein A9 (calgranulin B)
72	NM_031881	Neural precursor cell expressed, developmentally down-regulated

73	NM_011756	gene 4-like
74	NM_009474	Zinc finger protein 36
75	NM_009847	Urate oxidase
76	NM_007414	Phosphatidylinositol-4-phosphate 5-kinase, type 1 beta
77	NM_019887	ADP-ribosylarginine hydrolase
78	NM_019639	Neuronal guanine nucleotide exchange factor
79	NM_023502	Ubiquitin C
80	NM_003181	RIKEN cDNA 2610036A20 gene
81	NM_026529	Glutathione S-transferase, alpha 1 (Ye)
82	NM_028810	RIKEN cDNA 2700062C07 gene
83	NM_003121	Ras homolog gene family, member E
84	NM_020573	Spermidine/spermine N1-acetyl transferase
85	NM_025572	Axiroptin
86	NM_010211	RIKEN cDNA 2610528J11 gene
87	NM_008898	Four and a half LIM domains 1
88	NM_026731	P450 (Cytochrome) oxidoreductase
89	NM_019975	Protein phosphatase 1, regulatory (inhibitor) subunit 14A
90	NM_011068	2-Hydroxyphytanoyl-CoA lyase
91	NM_009665	Peroxisomal biogenesis factor 11a
92	NM_023719	S-adenosylmethionine decarboxylase 1
93	NM_007437	Thioredoxin interacting protein
94	NM_011584	Aldehyde dehydrogenase family 3, subfamily A2
95	NM_009760	Thyroid hormone receptor alpha
96	NM_009107	BCL2/adenovirus E1B 19 kDa-interacting protein 1, NIP3
97	NM_026211	RIKEN cDNA 2400003B06 gene
98	NM_016888	Retinoid X receptor gamma
99	NM_030687	UDP-GlcNAc:betaGal beta-1,3-N-acetylglucosaminyltransferase 1
100	NM_010550	Solute carrier family 21 (organic anion transporter), member 5 Interleukin 11 receptor, alpha chain 2

Fig1-III-1-3-2 y=x 方向の移動距離の大きい蛍光強度 10000 以上の遺伝子



1-III-2 解析法 2 染色体毎の表示

Fig1-III-2-1 第 5 番染色体

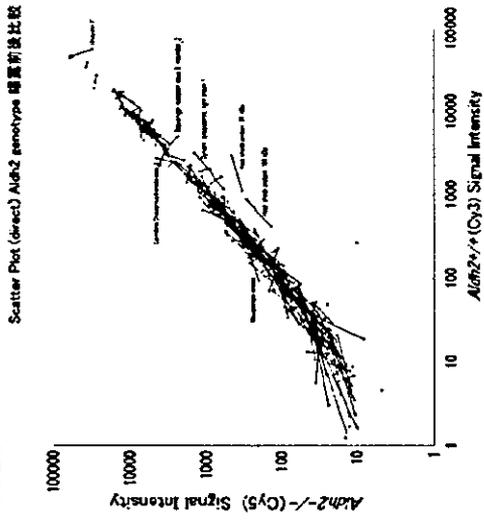


Fig1-III-2-2 X 染色体

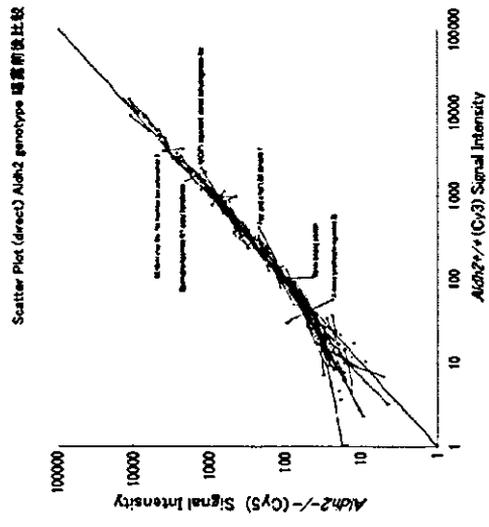


Fig1-III-2-3 Y染色体

Scatter Plot (direct) Auh2 genotype 测序前後比较

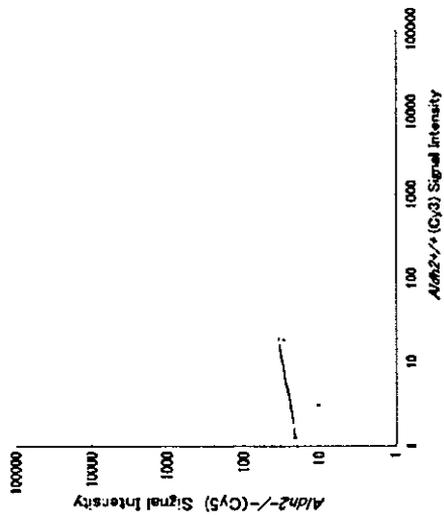


Fig1-III-2-5 第2番染色体

Scatter Plot (direct) Auh2 genotype 测序前後比较

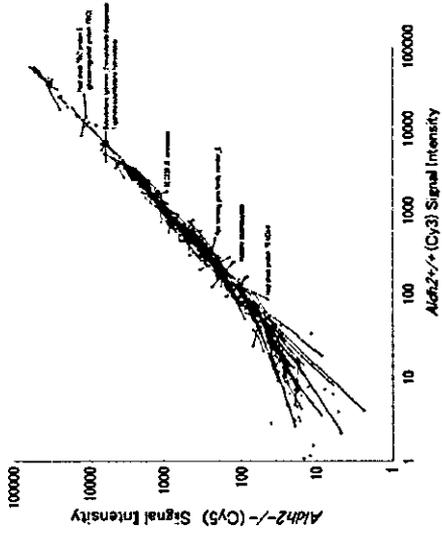


Fig1-III-2-4 第1番染色体

Scatter Plot (direct) Auh2 genotype 测序前後比较

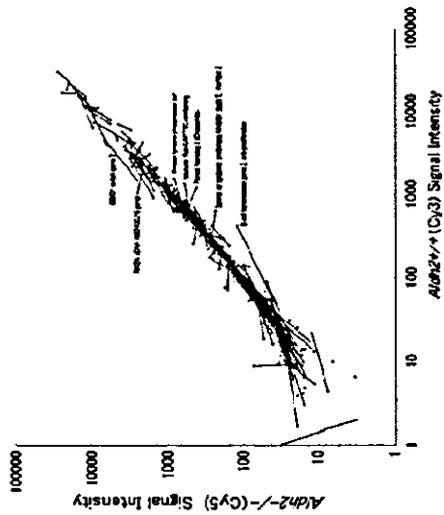


Fig1-III-2-6 第3番染色体

Scatter Plot (direct) Auh2 genotype 测序前後比较

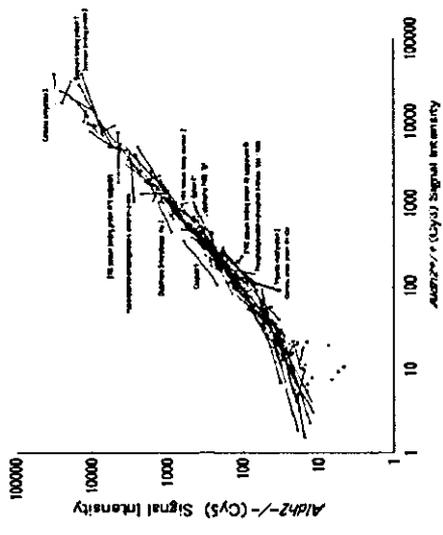


Fig1-III-2-7 第 4 番染色体

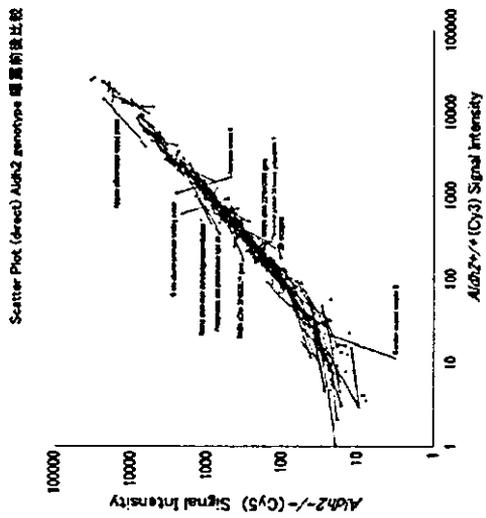
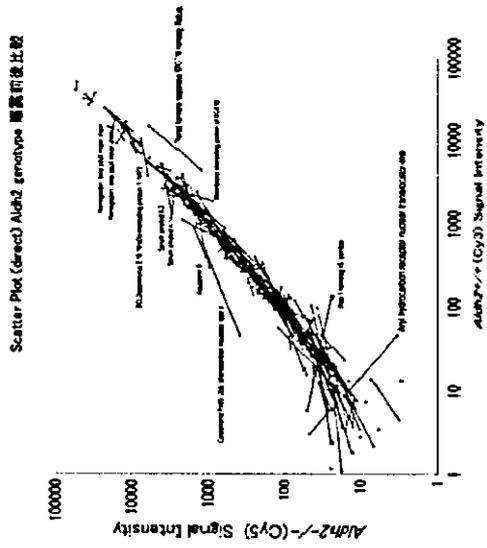


Fig1-III-2-9 第 7 番染色体



117 Fig1-III-2-8 第 6 番染色体

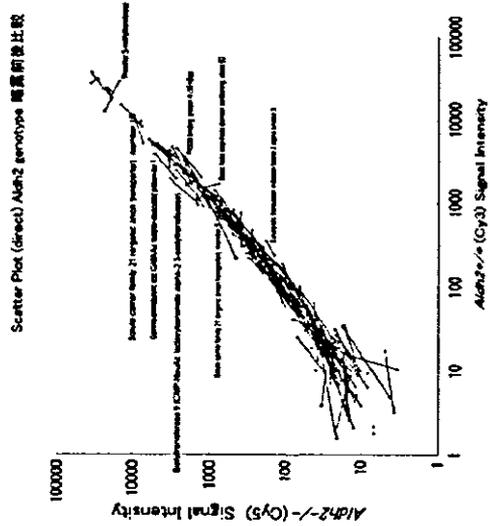


Fig1-III-2-10 第 8 番染色体

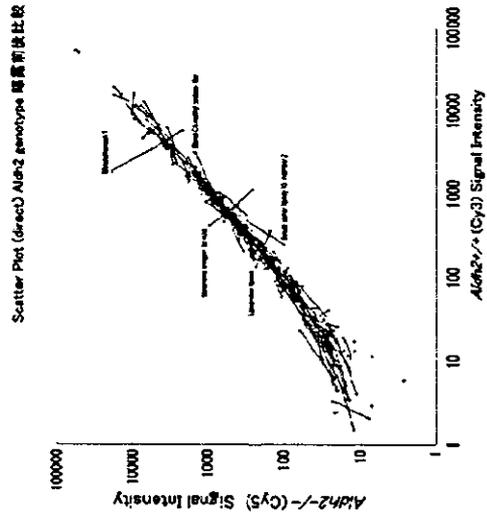


Fig1-III-2-11 第9番染色体

Scatter Plot (direct) Ahi2 genotype 曝露前後比較

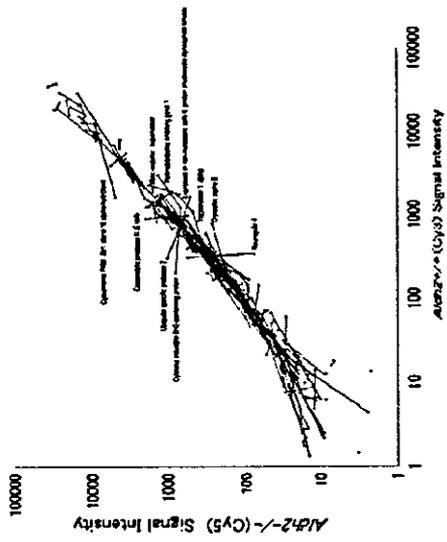
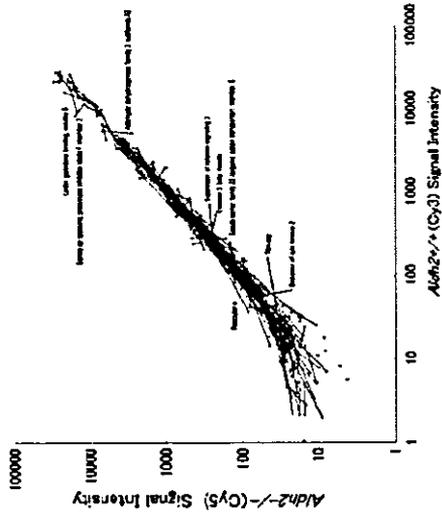


Fig1-III-2-13 第11番染色体

Scatter Plot (direct) Ahi2 genotype 曝露前後比較



18 Fig1-III-2-12 第10番染色体

Scatter Plot (direct) Ahi2 genotype 曝露前後比較

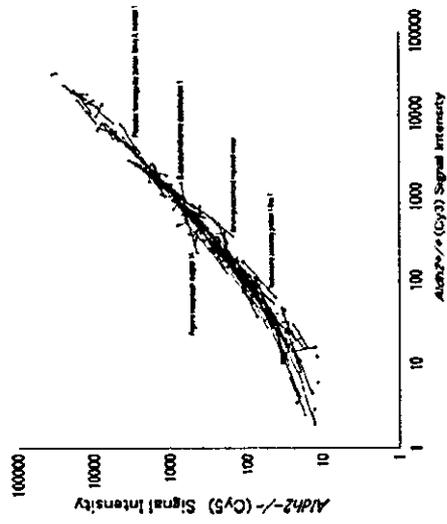


Fig1-III-2-14 第12番染色体

Scatter Plot (direct) Ahi2 genotype 曝露前後比較

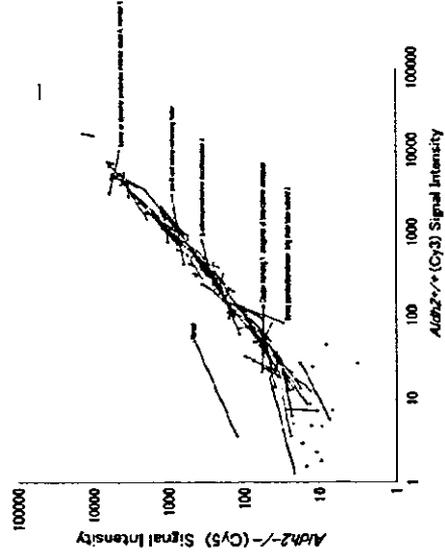


Fig1-III-2-15 第13 番染色体

Scatter Plot (direct) Aish2 genotype 繪圖前後比較

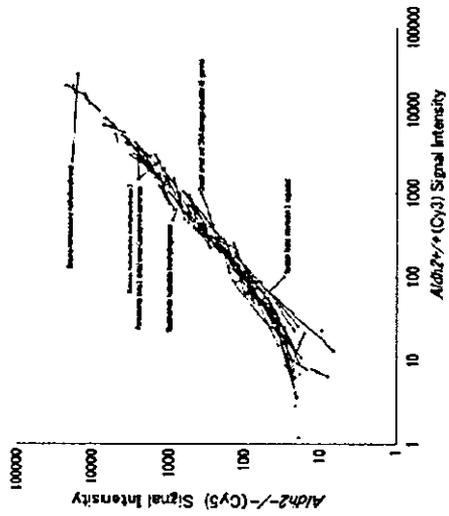


Fig1-III-2-17 第15 番染色体

Scatter Plot (direct) Aish2 genotype 繪圖前後比較

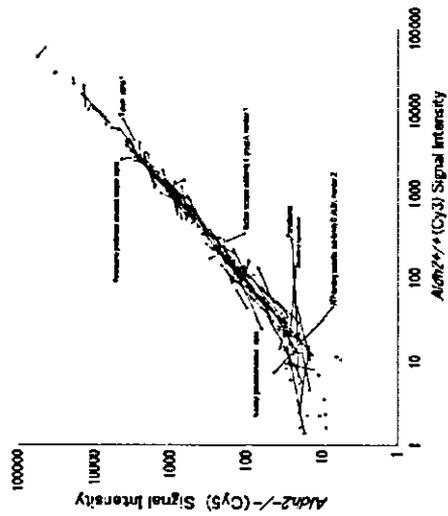


Fig1-III-2-16 第14 番染色体

Scatter Plot (direct) Aish2 genotype 繪圖前後比較

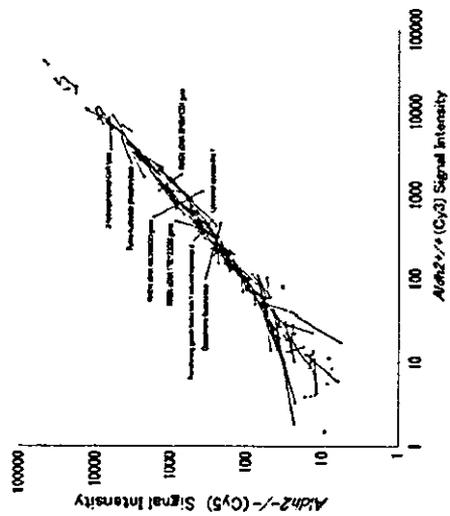


Fig1-III-2-18 第16 番染色体

Scatter Plot (direct) Aish2 genotype 繪圖前後比較

