Table 1. 短時間のメチル水銀処理により発現が上昇する遺伝子群(機能による分類)

Functional group	Gene name	% of contro	Function
Neurological disorder	CDK5R1	258.71	Cyclin-dependent kinase 5 regulatory subunit 1, a non-cyclin regulatory subunit for CDK5; cleavage to the constitutively activating form p25 occurs in affected regions of the brain from people with Alzheimer's disease
	HRK	260.77	Harakiri, protein with a putative BH3 domain, interacts with and may inhibit the antiapoptotic activities of BCL2 and BCL-XL (BCL2L1), induces apoptosis, may play a role in apoptotic events in amyotrophic lateral sclerosis (ALS) patients
	MAP1B	261.71	Microtubule-associated protein 1B, neuronal microtubule-binding protein that may play a role in development of the central nervous system, may be involved in the pathogenesis of Lewy bodies associated with Parkinson's disease and dementia
	NEF3	308.2	Neurofilament 3 (150kD medium), a neurofilament component, affects neurofilament organization, increased phosphorylation correlates with neuroblastoma and Alzheimer disease; gene mutation is linked to early onset severe Parkinson disease
	PLXNA2	296.61	Plexin A2, member of the plexin family of semaphorin receptors involved in mediating cell guidance, involved in semaphorin 3 signaling, binds neurophilin-1 (NRP1) and FYN, binds CDK5 through FYN
Signal transduction	ARHGDIB	255.92	Aplysia Ras homolog GDP dissociation inhibitor beta, a hematopoietic cell oriented protein that inhibits dissociation of GDP from the rho subfamily of ras-related proteins; likely involved in apoptosis and the immune response
	CDKN1A	391.33	Cyclin-dependent kinase inhibitor 1A (p21, CIP1, WAF1), induced by p53 (TP53), involved in DNA damage response and repair, cell cycle control, and apoptosis; altered expression may be therapeutic for various cancers and rheumatoid arthritis
	DKK1	284.06	Dickkopf homolog 1 (Xenopus laevis), member of the Dickkopf protein family, ligand for Wnt coreceptor LRP6, inhibits Wnt signaling by blocking Wnt-induced Frizzled (FZD5) and LRP6 complex formation, involved in apoptosis following DNA damage
	ENPP2	277.19	Ectonucleotide pyrophosphatase-phosphodiesterase 2 (autotaxin), multifunctional ecto enzyme and tumor-associated cytokine, hydrolyzes lysophosphatidylcholine to lysophosphatidic acid, promotes cell motility and angiogenesis, enhances tumor aggressiveness

	ETV5	2259.97	Ets variant gene 5 (ets-related molecule), a member of the PEA3 subfamily of the ETS family, acts as a transcriptional activator, activated by JUN and PKA, marker for chronic B-cell leukemia and mantle-cell lymphoma
Signal transduction	FZD1	377.95	Frizzled homolog 1 (Drosophila), member of the frizzled/taste2 receptor family of G protein-coupled receptors, enhances Wnt family-mediated signal transduction
	FZD7	254.11	Frizzled (Drosophila) homolog 7, member of the frizzled/taste2 receptor family of G protein-coupled receptors, predicted to bind Wnt, may contribute to gastric and esophageal cancers by indirectly enhancing beta-catenin (CTNNB1) mediated signaling
	G3BP	268.08	Ras-GTPase-activating protein SH3-domain-binding protein, protein with both DNA and RNA helicase activities, binds GAP (RASA1) in RAS activated cells, may have a role in the regulation of cell proliferation
	HEY1	285.31	Hairy enhancer-of-split related with YRPW motif 1, a transcriptional corepressor of a family of basic helix loop helix (bHLH) proteins, involved in Notch signaling and angiogenesis, may play a role in embryonic development
	PSA	284.61	Kallikrein 3, (prostate specific antigen), serine protease, dissolves seminal coagulum, may play a role in regulation of cell growth, may be involved in prostate cancer invasion and metastasis, used as marker to test for and monitor prostate cancer
	SHB	304.32	Src homology 2 domain containing adaptor protein B, an adapter protein that links signaling proteins and various receptors (including TCR), mediates apoptosis, cell differentiation, CD3-induced IL2 expression, Erk activation (MAPK1, MAPK3) and Ca2+ flux
	STK17A	309.98	Serine threonine kinase 17a, contains an N terminal catalytic domain and C terminal regulatory domain, may play a role in cross resistance against DNA damaging anti-cancer drugs, overproduction induces apoptosis
Stress response	DNAJB4	264.08	DnaJ (Hsp40) homolog subfamily B member 4, member of the DNAJ-like heat shock protein 40 family, a predicted heat shock protein and chaperone whose expression is inducible by heat
	GCLM	892.87	Glutamate-cysteine ligase modifier subunit, involved in the first step of glutathione synthesis and in drug and environmental chemical detoxification, associated with myocardial infarction and a possible predisposition to mesothelioma upon gene mutation
	HMOX1	741.62	Heme oxygenase (decycling) 1, cleaves the heme ring at the alpha methene bridge to form biliverdin and carbon monoxide, involved in oxidative stress response, altered expression is associated with Alzheimer disease, Parkinson disease, and some cancers

	HSPA1A	290.74	Heat shock 70 kDa protein 1A, an HSP70 family chaperone that modulates stress responses; gene polymorphism is associated with ankylosing spondylitis, celiac disease, and rheumatoid arthritis; altered expression is associated with lung cancer and diabetes
Stress response	HSPA1B	298.09	Heat shock 70kDa protein 1B, involved in the heat shock response; gene polymorphism correlates with breast cancer, Celiac disease, type I diabetes, non-Hodgkin's lymphoma, ankylosing spondylitis, systemic lupus erythematosus, and nasopharyngeal carcinoma
	NQO1	471.19	NAD(P)H dehydrogenase quinone 1, cytosolic reductase targeting quinones, predicted to function in detoxification and oxidative stress responses; gene polymorphisms are associated with increased benzene hematotoxicity, urolithiasis and various cancers
Transporter	SLC6A11	272.38	Solute carrier family 6 member 11 (gamma-amino butyric acid (GABA) transporter GAT-3), a high-affinity GABA transporter, activity is specifically inhibited by (S)SNAP 5114, may participate in temporal lobe epilepsy
	SLC7A5	262.99	Solute carrier family 7 member 5, an L-type and neutral amino acid transporter, binds CD98 heavy chain (SLC3A2) to mediate large neutral amino acid transport, increased expression may correlate with disease progression in colon cancer
Tumor progression	IFI16	371.29	Interferon gamma-inducible protein 16, a transcriptional regulator that binds AIM2 and p53 (TP53) and functions in TP53 -mediated apoptosis and cell cycle regulation, downregulated in breast carcinoma and may function in autoimmune disease pathogenesis
	STC1	301.36	Stanniocalcin 1, a glycopeptide hormone that regulates growth, reproductive events, calcium homeostasis, bone and muscle mass and structure, and angiogenesis, may serve as a marker for detection of tumor cells in blood
	TIMP3	292.64	Tissue inhibitor of metalloproteinase 3, involved in extracellular matrix remodeling, has a role in apoptosis; increased expression may be therapeutic for rheumatoid arthritis, breast cancer, and malignant melanoma
Unknown function or poorly characterized	ALCAM	302.06	Activated leukocyte cell adhesion molecule, an immunoglobulin superfamily member and ligand for CD6, involved in hematopoietic cell adhesion, may play a role in osteogenesis, marker for tumor progression in malignant
	BAIAP2	449.9	Brain-specific angiogenesis inhibitor 1-associated protein 2, interacts with many different proteins (such as BAI1, WASF1, CDC42, RAC1, and DRPLA), may be a substrate for INSR, involved in cytoskeletal organization and lamellipodia and filopodia formation

	CXCL12	290.62	Chemokine C-X-C motif ligand 12, an alpha-chemokine ligand for CXCR4, stimulates leukocyte adhesion, migration, and chemotaxis, inhibits infection by lymphocyte-tropic HIV-1, upregulation is associated with metastasis,
	EPM2A	287.36	Epilepsy progressive myoclonus type 2 (laforin), a protein tyrosine-serine-threonine phosphatase, binds glycogen and may play a role in glycogen metabolism; mutations of the corresponding gene result in Lafora's disease, a progressive myoclonus epilepsy
Unknown function or poorly characterized	HSU53209	275.97	Transformer 2 alpha, putative splicing factor that may regulate female-specific gene expression and sexual differentiation
	ID3	298.9	Inhibitor of DNA binding 3, basic helix-loop-helix family member that negatively regulates cell differentiation by inhibiting DNA binding of certain bHLH transcription factors; decreased expression may correlate with
	ID4	655.97	Inhibitor of DNA binding 4 dominant negative helix-loop-helix protein, HLH transcription factor inhibitor, downregulated in gastric adenocarcinoma, may act in breast and ovarian cancer; rat Id4 is strongly upregulated in mammary carcinomas
	NT5C2	251.31	5'-nucleotidase cytosolic II, a regulatory allosteric enzyme of purine nucleotide catabolism, activity is stimulated by glycerate 2,3 bisphosphate and ATP; reduced activity in lymphocytes is associated with systemic lupus erythematosus
	PCDH8	273.83	Protocadherin 8, a member of the protocadherin subfamily of the cadherin superfamily, may mediate cell-cell adhesion, predominantly expressed in
	PDE3B	250.15	cGMP-inhibited phosphodiesterase 3B, activated by phosphatidylinositol 3-kinase, downregulates lipolysis in the insulin receptor pathway, may be involved in cardiovascular tissue responses to cAMP along with cGMP-inhibited phosphodiesterase 3A (PDE3A)
	PGF	271.67	Placenta growth factor, a secreted dimeric angiogenic factor that potentiates the effects of VEGF on vascular endothelial cell proliferation and permeability, may play a role in angiogenesis and pathologic neovascularization
	PIGL	260.91	Phosphatidylinositol glycan class L, a N-acetylglucosaminylphosphatidylinositol de-N-acetylase, likely involved in glycosylphosphatidylinositol anchor biosynthesis
	POLR2A	293.71	RNA polymerase II polypeptide A, the largest subunit of RNA polymerase II, involved in transcriptional initiation and elongation and termination and mRNA cleavage and polyadenylation, putative target of viral proteins involved in viral
	SETMAR	295.92	SET domain and mariner transposase fusion, a putative protein encoded by Hsmar1 mariner transposon that is apparently a product of the splicing of transposase to a cellular gene encoding a SET domain

	SFRS11	435.6	Splicing factor arginine serine rich 11, a pre-mRNA splicing factor containing arginine-serine rich and RRM domains, involved in mRNA splicing, binds to the 65 kDa subunit of the U2 auxiliary splice factor

Table 2. 短時間のメチル水銀処理により発現が上昇する遺伝子（発現変動順）

Gene name	% of control
ETV5	2259.97
GCLM	892.87
HMOX1	741.62
ID4	655.97
NQO1	471.19
BAIAP2	449.90
SFRS11	435.60
CDKN1A	391.33
FZD1	377.95
IFI16	371.29
STK17A	309.98
NEF3	308.20
SHB	304.32
ALCAM	302.06
STC1	301.36

Gene name	% of control
ID3	298.90
HSPA1B	298.09
PLXNA2	296.61
SETMAR	295.92
POLR2A	293.71
TIMP3	292.64
HSPA1A	290.74
CXCL12	290.62
EPM2A	287.36
HEY1	285.31
PSA	284.61
DKK1	284.06
ENPP2	277.19
HSU53209	275.97
PCDH8	273.83

Gene name	% of control
SLC6A11	272.38
PGF	271.67
G3BP	268.08
DNAJB4	264.08
SLC7A5	262.99
MAP1B	261.71
PIGL	260.91
HRK	260.77
CDK5R1	258.71
ARHGDIB	255.92
FZD7	254.11
NT5C2	251.31
PDE3B	250.15

Table 3. 短時間のメチル水銀処理により発現が減少する遺伝子群（機能による分類）

Functional group	Gene name	% of contro	Function
Chromatin remodeling	EZH1	34.59	Enhancer of zeste homolog 1 (Drosophila), a member of the E(z) family of proteins, interacts with the Polycomb-group related protein (EED), may be involved in chromatin silencing
	H1F0	41.33	H1(0)-type member of the H1 histone family involved in compaction of DNA into nucleosomes and into high-order chromatin structures
	SMARCA2	44.1	SWI-SNF related matrix associated actin dependent regulator of chromatin subfamily a member 2, mediates transcriptional regulation by nuclear receptors by remodeling chromatin, controls cell cycle through association with RB1, regulates myogenesis
	TACC2	41.94	Transforming acidic coiled-coil containing protein 2, a putative tumor suppressor that binds microtubules, putative transcription factor GAS41, and the SWI/SNF chromatin remodeling complex, decreased expression correlates with breast neoplasms
G-protein	RAB33A	44.14	Ras-related GTP-binding protein 33a, a putative GTP-binding protein and GTPase
	RAB7L1	42.29	RAB7 member RAS oncogene family-like 1, a putative RAB monomeric GTPase
	RPGR	20.17	Retinitis pigmentosa GTPase regulator, a putative guanyl nucleotide exchange factor involved in vision; gene mutations cause X-linked retinitis pigmentosa type 3, X-linked progressive cone dystrophy, atrophic macular degeneration, and deafness
	RREB1	41.12	Ras responsive element binding protein 1, a transcription activator that binds a distal Ras-responsive element in the calcitonin (CALCA) gene, implicated in the transcriptional activation response to Ras- and Raf-induced cell differentiation
Intracellular trafficking	BET1	45.54	S. cerevisiae Bet1 homolog, may be involved in ER to Golgi transport
	EHD1	49.78	H-domain containing 1, a member of the eps15 homology domain containing family, interacts with synaptosomal protein SNAP29, interacts with IGF1R, represses IGF1 -mediated signaling and may be involved in endocytosis
	GOLGA2	43.99	Golgi autoantigen golgin subfamily a 2 (Golgin 95, Golgi matrix protein 130), interacts with GRASP65 (GOLPH5) and the GTP-bound forms of RAB33B, RAB1, and RAB6A, involved in Golgi transport; autoantigen in some autoimmune disorders

	STX10	39.89	Syntaxin 10, a member of the syntaxin family of proteins involved in regulation of membrane transport, docking, and fusion, may be involved in vesicular transport
	STX4A	48.81	Syntaxin 4, broadly expressed target SNAP receptor (t-SNARE), involved in targeting and exocytosis of a variety of secretory vesicles, interacts with SNAP23, regulates alpha granule release in platelets
Neurological disorder	BCHE	37.68	Butyrylcholinesterase, serum cholinesterase that regulates smooth muscle tone in pulmonary artery and is found in amyloid plaques in Alzheimer's disease; mutations in the gene cause acholinesterasemia and apnea upon succinylcholine administration
	CASP6	37.67	Caspase 6, a cysteine protease that induces apoptosis when activated, mediates lamin cleavage and nuclear fragmentation during apoptosis, cleaves beta amyloid precursor protein (APP) and may play a role in neuronal cell death in Alzheimer disease
	DSCR1	40.63	Down syndrome critical region gene 1 (myocyte-enriched calcineurin interacting protein 1), inhibits calcineurin A (PPP3CA)-dependent pathways, has a role in muscle and CNS development, expression is elevated in Down syndrome and Alzheimer's disease
Signal transduction	MPP2	33.3	Membrane protein palmitoylated 2 (discs-large 2), a palmitoylated membrane protein that contains PDZ, SH3 and guanylate kinase domains and may have roles in signal transduction
	MPP5	50.03	Membrane protein palmitoylated 5 (MAGUK p55 subfamily member 5), binds Crumbs 3 (CRB3) to participate in establishment of polarity in epithelial cells
	RANBP8	43.85	Importin 8 (Ran binding protein 8), interacts with the Ran GTPase (RAN), may be involved in signal transduction
	TRAF5	46.95	TNF receptor-associated factor 5, member of a family of proteins that interact with the cytoplasmic domain of oligomerized TNF receptors, binds CD40 (TNFRSF5) and mediates signaling through activation of NF-kappaB and JNK pathways
	WIG1	39.91	p53 target zinc finger protein, a zinc finger protein that has transient expression which inhibits tumor cell growth, expression is upregulated by DNA damaging agent, mitomycin C
Transporter	SLC1A1	47.33	Solute carrier family 1 member 1, a high affinity glutamate transporter that mediates synaptic reuptake of glutamate, functions in excitatory neurotransmission; mutation of the mouse Slc1a1 gene causes dicarboxylic aminoaciduria

	SLC35A1	49.43	Solute carrier family 35 member (CMP-sialic acid transporter) A1, a transporter present in the Golgi membrane that is important for normal sialylation of glycoproteins and glycolipids, truncated variants cause congenital type IIf glycosylation disorders
Tumor progression	CD83	45.71	CD83 antigen (activated B lymphocytes immunoglobulin superfamily), may play a role in antigen presentation and lymphocyte activation, expressed on dendritic cells at final stage of maturation
	CPO	41.72	rotein containing a zinc carboxypeptidase domain, has moderate similarity to carboxypeptidase B2 (plasma) (mouse Cpb2), which is an acute phase protein that is upregulated in inflammation and inhibits
	MAGE-E1	45.17	Melanoma antigen family E 1 (cancer and testis specific), a member of the MAGE-C family, serves as a tumor antigen associated with various tumors but normally expressed only in testis, may be a potential target for cancer immunotherapy
	OGG1	32.57	8-oxoguanine DNA glycosylase 1, a nuclear and mitochondrial base excision DNA repair enzyme that also has DNA-AP lyase activity; loss and mutations and in the corresponding gene are found in a variety of
Unknown function or poorly characterized	CALD1	41.26	Caldesmon 1, member of the caldesmon family of actomyosin binding proteins, contains myosin, tropomyosin, actin and calmodulin binding domains, binds actomyosin, inhibits myosin MgATPase activity, and is involved in muscle contraction and cell growth
	CGI-57	46.93	Protein of unknown function, has strong similarity to uncharacterized mouse 1810031K17Rik
	DOM3Z	30.34	DOM-3 homolog Z (C. elegans), a nuclear protein with a leucine zipper motif, has similarity to C. elegans DOM-3 which may be involved in germ cell development
	EMILIN	41.45	Protein containing two collagen triple helix repeats and an EMI domain, has moderate similarity to collagen type XXVI alpha 1 (mouse Emid2), which is part of the extracellular matrix and binds mouse Emu1 and mouse Serpinh1
	JWA	46.68	ADP-ribosylation-like factor 6 interacting protein 5, binds CC chemokine receptor 5 (CCR5), and PRAF2
	LIG4	37.57	ATP-dependent DNA ligase IV, acts in nonhomologous end-joining during DNA double-strand break repair and V(D)J recombination; mutations are associated with immunodeficiency syndromes and leukemia, polymorphism correlates with breast cancer
	MDM1	39.44	Protein of unknown function, has high similarity to uncharacterized transformed mouse 3T3 cell double minute 1 (mouse Mdm1)

	MLF1	49.51	Myelodysplasia/myeloid leukemia factor 1, a cytoplasmic protein; gene fusion with NPM (NPM1) in acute myeloid leukemia results in misdirection of the fusion protein to the nucleus
	NDP52	47.15	Nuclear domain 10 protein, contains an extended central coiled-coil domain, a leucine zipper motif, and a putative C-terminal LIM domain, interacts with itself to form homodimers, may play a role in viral life
Unknown function or poorly characterized	OSRF	39.22	Protein containing two tetratricopeptide repeats, which may mediate protein-protein interactions, has strong similarity to uncharacterized mouse 2900001O04Rik
	PCL1	48.68	Prenylcysteine oxidase 1 (prenylcysteine lyase), a lysosomal FAD-dependent thioether oxidase that catalyzes the cleavage of prenylcysteine residues from prenylated proteins to form free cysteine and an isoprenoid product in prenylprotein degradation
	RBPMS	47.7	RNA-binding protein gene with multiple splicing, a protein containing RNA recognition motifs, may play a role in RNA metabolism
	TCEAL1	41.78	Transcription elongation factor A (SII)-like 1, a nuclear phosphoprotein that represses or activates transcription depending on promoter context
	TRO	44.45	Trophinin, an adhesion molecule that forms a complex with tastin (TROAP) and bystin (BYSL) and may play a role in homophilic cell adhesions formed between endometrial epithelia and trophoblast cells during the embryonic implantation process
	TYRP1	43.14	Tyrosinase-related protein 1, catalyzes the oxidation of 5,6-dihydroxyindole-2-carboxylic acid and related compounds in melanin biosynthesis, binds and stabilizes tyrosinase (TYR); gene mutations are associated with oculocutaneous albinism type 3
	ZNF261	41.13	Zinc finger protein 261, member of the MYM zinc-binding family; rearrangement of corresponding gene is associated with nonspecific X-linked mental retardation

Table 4. 短時間のメチル水銀処理により発現が減少する遺伝子（発現変動順）

Gene name	% of control
RPGR	20.17
DOM3Z	30.34
OGG1	32.57
MPP2	33.30
EZH1	34.59
LIG4	37.57
CASP6	37.67
BCHE	37.68
OSRF	39.22
MDM1	39.44
STX10	39.89
WIG1	39.91
DSCR1	40.63
RREB1	41.12
ZNF261	41.13

Gene name	% of control
CALD1	41.26
H1F0	41.33
EMILIN	41.45
CPO	41.72
TCEAL1	41.78
TACC2	41.94
RAB7L1	42.29
TYRP1	43.14
RANBP8	43.85
GOLGA2	43.99
SMARCA2	44.10
RAB33A	44.14
TRO	44.45
MAGE-E1	45.17
BET1	45.54

Gene name	% of control
CD83	45.71
JWA	46.68
CGI-57	46.93
TRAF5	46.95
NDP52	47.15
SLC1A1	47.33
RBPMS	47.70
PCL1	48.68
STX4A	48.81
SLC35A1	49.43
MLF1	49.51
EHD1	49.78
MPP5	50.03

Table 5. 長時間のメチル水銀処理により発現が上昇する遺伝子群（機能による分類）

Functional group	Gene name	% of control	Function
Intracellular trafficking	DNM2	250.98	Dynamin II, member of a family of 100-kD guanosine triphosphatases, regulates budding of endocytic vesicles at the plasma membrane and may function in the formation of transport vesicles at the trans-Golg
	FLJ11116	213.35	WD repeat domain 44 (rab11-binding protein), binds GTP-charged rab11, may play a role in receptor recycling
Neurological disorder	ADARB1	253.52	Double-stranded RNA adenosine deaminase, mediates mRNA editing of glutamate receptor subunit B and the small delta antigen (HDAg S) of hepatitis delta virus (HDV); overexpression may play a role in Down Syndrome phenotype development
	CLN8	222.62	ceroid-lipofuscinosis, neuronal 8 (epilepsy, progressive with mental retardation)
	CTDP1	252.84	Ceroid-lipofuscinosis neuronal 8, a protein that cycles between endoplasmic reticulum and Golgi and may play a role in central nervous system development; gene mutation is detected in ceroid lipofuscinosis with progressive epilepsy and mental retardation
	STMN2	240.5	Superiorcervical ganglia neural specific protein 10, a member of the stathmin family involved in microtubule depolymerization and induced by nerve growth factor; metabolism and compartmentalization may be altered in Alzheimer's disease
	VGF	310.64	VGF nerve growth factor inducible, expressed in neuroendocrine cells
Signal transduction	DKK1	250.12	Dickkopf homolog 1 (Xenopus laevis), member of the Dickkopf protein family, ligand for Wnt coreceptor LRP6, inhibits Wnt signaling by blocking Wnt-induced Frizzled (FZD5) and LRP6 complex formation, involved in apoptosis following DNA damage
	DUSP9	202	Dual specificity phosphatase 9, inactivates mitogen-activated protein kinases via phosphotyrosine and phosphothreonine residue dephosphorylation, acts in MAP kinase signal transduction; may act as a diagnostic and prognostic marker in kidney carcinomas
	ETV5	257.89	Ets variant gene 5 (ets-related molecule), a member of the PEA3 subfamily of the ETS family, acts as a transcriptional activator, activated by JUN and PKA, marker for chronic B-cell leukemia and mantle-cell
	FZD1	238.04	Frizzled homolog 1 (Drosophila), member of the frizzled/taste2 receptor family of G protein-coupled receptors, enhances Wnt family-mediated signal transduction

Stress response	HUS1	223.62	Hydroxyurea sensitive 1, part of a DNA damage-responsive complex that includes RAD1 and RAD and is predicted to function as a DNA clamp loader, participates in DNA checkpoints, and may contribute to ovarian carcinogenesis
Stress response	NQO1	213.5	NAD(P)H dehydrogenase quinone 1, cytosolic reductase targeting quinones, predicted to function in detoxification and oxidative stress responses; gene polymorphisms are associated with increased benzene hematotoxicity, urolithiasis and various cancers
Tumor progression	APBA2	267.12	Amyloid beta precursor protein binding family A member 2, modulates amyloid precursor protein (APP) metabolism and production, may be involved in synaptic vesicle docking and fusion, may play a role in Alzheimer's disease
	CDKN1A	221.69	Cyclin-dependent kinase inhibitor 1A (p21, CIP1, WAF1), induced by p53 (TP53), involved in DNA damage response and repair, cell cycle control, and apoptosis; altered expression may be therapeutic for various cancers and rheumatoid arthritis
	EGFR	250.1	Epidermal growth factor receptor, a receptor protein tyrosine kinase that binds epidermal growth factor (EGF) and transforming growth factor alpha (TGFA), involved in cell proliferation and differentiation, implicated in tumor invasion and metastasis
	ID4	224.23	Inhibitor of DNA binding 4 dominant negative helix-loop-helix protein, HLH transcription factor inhibitor, downregulated in gastric adenocarcinoma, may act in breast and ovarian cancer; rat Id4 is strongly upregulated in mammary carcinomas
	IL1A	206.85	Interleukin 1 alpha, a cytokine that affects cell migration, cell proliferation, and the inflammatory response; inhibition may be therapeutic for rheumatoid arthritis, altered expression may be therapeutic for AIDS and
	TNFRSF6B	234.05	Tumor necrosis factor receptor superfamily member 6b, has multiple splice forms, a helicase-like protein and a decoy receptor, which binds and inhibits Fas (TNFSF6) and LIGHT (TNFSF14)-mediated cell death; overexpressed in some lung, GI, and colon tumors
	WIG1	220.27	p53 target zinc finger protein, a zinc finger protein that has transient expression which inhibits tumor cell growth, expression is upregulated by DNA damaging agent, m鰆tomycin C
Unknown function or poorly characterized	ARSB	201.51	Arylsulfatase B (N-acetylgalactosamine 4-sulfatase), hydrolyzes the sulfate ester group from N-acetylgalactosamine 4-sulfate residues of dermatan sulfate; genetic mutation is detected in mucopolysaccharidosis (MPS) type VI (Maroteaux-Lamy syndrome)

	BAIAP2	265.35	Brain-specific angiogenesis inhibitor 1-associated protein 2, interacts with many different proteins (such as BAI1, WASF1, CDC42, RAC1, and DRPLA), may be a substrate for INSR, involved in cytoskeletal organization and lamellipodia and filopodia formation
Unknown function or poorly characterized	BGLAP	210.57	Bone gamma-carboxyglutamate protein (osteocalcin), binds calcium and hydroxylapatite, likely involved in bone remodeling and in recruiting osteoclasts; decreased expression is associated with Saethre Chotzen syndrome
	H326	201.4	Protein containing seven WD domains (WD-40 repeats), which may mediate protein-protein interactions, has a region of low similarity to a region of breakpoint cluster region protein uterine leiomyoma 2 (human WDR22), which may have a housekeeping function
	ITGA10	204.82	Integrin alpha 10, a member of the beta 1 integrin family that associates with the beta 1 integrin (ITGB1) subunit and acts as a collagen receptor during cartilage development
	LLT1	215.85	C-type lectin superfamily 2 member D (lectin-like NK cell receptor), a lectin that regulates IFNG production by natural killer cells, inhibits osteoclastogenesis, and may mediate lymphocyte activation signals
	NR2F6	201.34	Nuclear receptor subfamily 2 group F member 6, a corepressor of transcription mediated by nuclear receptors THRB, ESR1, and NR3C1, may modulate viral genes; downregulated expression correlates with breast carcinoma
	NSD1	227.16	Nuclear receptor-binding SET-domain protein 1, putative transcription factor; mutations are associated with Sotos syndrome and some cases of Weaver syndrome, gene is fused to NUP98 in some acute myeloid leukemia patients
	POLG	204.28	DNA polymerase gamma, the catalytic subunit of mitochondrial DNA polymerase, required for mitochondrial DNA replication and repair; variants of the gene are associated with progressive external ophthalmoplegia and male infertility
	SFRS11	239.21	Splicing factor arginine serine rich 11, a pre-mRNA splicing factor containing arginine-serine rich and RRM domains, involved in mRNA splicing, binds to the 65 kDa subunit of the U2 auxiliary splice factor
	UBL3	207.29	Ubiquitin-like 3, may be involved in response to environmental stress and interacts with Epstein-Barr virus (EBV) nuclear antigen 3C

Table 6. 長時間のメチル水銀処理により発現が上昇する遺伝子(発現変動順)

Gene name	% of control
VGF	310.64
APBA2	267.12
BAIAP2	265.35
ETV5	257.89
ADARB1	253.52
CTDP1	252.84
DNM2	250.98
DKK1	250.12
EGFR	250.10
STMN2	240.50
SFRS11	239.21
FZD1	238.04
TNFRSF6B	234.05
NSD1	227.16
ID4	224.23

Gene name	% of control
HUS1	223.62
CLN8	222.62
CDKN1A	221.69
WIG1	220.27
LLT1	215.85
NQO1	213.50
FLJ11116	213.35
BGLAP	210.57
UBL3	207.29
IL1A	206.85
ITGA10	204.82
POLG	204.28
DUSP9	202.00
ARSB	201.51
H326	201.40

Gene name	% of control
NR2F6	201.34

Table 7. 長時間のメチル水銀処理により発現が減少する遺伝子群（機能による分類）

Functional group	Gene name	% of control	Function
G-protein	GPR48	43.29	G protein-coupled receptor 48, a predicted member of the G protein-coupled receptor subfamily that bind glycoprotein hormones, resembles other glycoproteins that have been implicated in some Wilms tumor deletion syndromes
	GPRK6	48.01	G protein-coupled receptor kinase 6, a protein kinase that regulates desensitization of G protein-coupled receptors by phosphorylating agonist-stimulated receptors, including muscarinic acetylcholine receptor
Metabolic pathway	C14orf1	43.12	Chromosome 14 opening reading frame 1, a putative integral membrane protein, may be involved in sterol biosynthesis
	C1orf13	45.18	N-acetylneuraminate pyruvate lyase (dihydrodipicolinate synthase), a putative N-acetylneuraminate lyase, predicted to be involved in N-acetylneuraminate metabolism, ubiquitously expressed
	FABP6	46.9	Fatty acid binding protein 6 (ileal bile acid-binding protein), member of the fatty acid binding protein family that preferentially binds bile acids, may play a role in bile acid transport and metabolism
	FPGT	38.02	Fucose-1-phosphate guanylyltransferase (GDP-beta-L-fucose pyrophosphorylase), catalyzes condensation of beta-L-fucose-1-phosphate and GTP into GDP-L-fucose
	GALNS	45.33	Galactosamine (N-acetyl)-6-sulfate sulfatase, a lysosomal enzyme involved in the degradation of glycosaminoglycans; gene mutations that decrease activity cause mucopolysaccharidosis type IV A or its most severe form, Morquio disease type A
	HIBCH	49.44	Beta-hydroxyisobutyryl-coenzyme A hydrolase, enzyme that hydrolyzes 3-hydroxyisobutyryl CoA, an intermediate of valine catabolism
	NAGK	49.81	Human NAGK N-acetylglucosamine kinase, an enzyme that phosphorylates N-acetylglucosamine and N-acetylmannosamine and promotes their entry into metabolic pathway
	SIAT9	46.75	Sialyltransferase 9 (GM3 synthase), catalyzes the addition of sialic acid to lactosylceramide forming ganglioside GM3, expressed in the brain, skeletal muscle and testis, decreased activity is associated with metastasis of melanoma and bladder cancer
Neurological disorder	CSPG5	44.64	Human CSPG5 Neuroglycan C, putative integral membrane proteoglycan; the corresponding gene is located in the chromosome region where the Sotos syndrome has been mapped

Neurological disorder	PPP1CB	39.06	Protein phosphatase 1 catalytic subunit beta, catalytic subunit of a serine-threonine phosphatase, function in metabolic processes is modulated by regulatory subunits; differentially expressed in gastric cancer and neurons of Alzheimer Disease patients
	TMEFF1	41.76	Transmembrane protein with EGF-like and two follistatin-like domains 1, inhibits cell growth and proliferation, may play a role in growth factor signaling and serve as a tumor suppressor in brain cancers
	ZNF133	40.11	Zinc finger protein 133, contains C2H2 zinc fingers and a Kruppel-associated box, may mediate transcriptional repression, amplified in neuroblastoma cells
Signal transduction	ANKRA2	48.38	Protein with strong similarity to ankyrin repeat family A (RFXANK-like) 2 (mouse Ankra2), which binds to a proline-rich motif on megalin (mouse Lrp2) and may regulate endocytosis or signal transduction, contains three ankyrin repeats #1
	CART	49.35	Cocaine and amphetamine regulated transcript, a putative neuroendocrine signaling molecule, may have appetite suppressive activity, induces expression of c Fos (FOS) in hypothalamus
	PRKACA	39.18	Protein kinase cAMP-dependent catalytic alpha, acts in transcriptional regulation, may suppress apopto瞵is, alternative form Calpha2 may act in sperm development, may serve as a tumor biomarker; reduced activity of mouse Prkaca causes neural tube defects
Stress response	BTRC	41.34	Beta-transducin repeat containing, receptor subunit of the IkappaB-ubiqutin ligase complex, mediates proteolysis of CD4 and IkappaBalpha (NFKBIA), enhances stress-induced activation of NF-kB, interaction with HIV-1 Vpu inhibits NF-kB activation
	GLRX	37.76	Glutaredoxin, a disulfide oxidoreductase, binds and inhibits ASK1, functions in apoptosis, cell differentiation, response to oxidative stress, and signal transduction, may act in embryo implantation, may provide antioxidant protection in coronary arteries
	GSTM4	49	Glutathione S-transferase M4, member of the mu class of the GST superfamily of detoxification enzymes that catalyzes the conjugation of glutathione to electrophilic compounds, may be involved in acquired drug resistance in tumors
	SMT3H2	47.24	SMT3 suppressor of mif two 3 homolog 2, member of the sentrin family of ubiquitin-like proteins, conjugated to target proteins involved in nuclear transport by sentrin-specific enzymes, may be involved in the stress response

Tumor progression	CPO	49.39	Protein containing a zinc carboxypeptidase domain, has moderate similarity to carboxypeptidase B2 (plasma) (mouse Cpb2), which is an acute phase protein that is upregulated in inflammation and inhibits
Tumor progression	MAD2L1	43.67	MAD2 mitotic arrest deficient-like 1 (yeast), mitotic spindle checkpoint complex component with BUB1B, BUB3, and CDC20, inhibits anaphase-promoting complex activation, binds MAD1L1, altered expression is linked to several cancers and adult T-cell leukemia
	MCAM	42.57	Melanoma cell adhesion molecule, adhesion molecule and tumor antigen that may act in cytoskeletal rearrangement, embryo implantation, angiogenesis and inflammation, aberrant expression is linked to tumor progression, metastasis and neovascularization
	TPM1	39.36	Tropomyosin 1 alpha (skeletal muscle alpha-tropomyosin), involved in muscle filament motility and muscle contraction, downregulated in prostate and breast carcinoma; mutations cause hypertrophic
Unknown function or poorly characterized	AGPAT2	48.83	1-acylglycerol-3-phosphate O-acyltransferase 2 (lysophosphatidic acid acyltransferase, beta)
	AXOT	49.61	Protein with strong similarity to membrane-associated ring finger 7 (axotrophin, mouse March7), which negatively regulates T cell proliferation via feedback regulation of leukemia inhibitory factor (mouse Lif), contains a C3HC4 type (RING) zinc finger
	D4S234E	49.4	Neuron-specific protein, expressed predominantly in the brain, located in the nucleus during mitosis and in the cytoplasm post mitotically
	ELAVL2	43.15	ELAV-like 2 (Hu antigen B), a 3' UTR mRNA-binding protein that promotes mRNA stability, may function in neurogenesis and the regulation of cell growth, autoantibodies are associated with paraneoplastic encephalomyelitis and sensory neuropathy
	EZH1	48	Enhancer of zeste homolog 1 (Drosophila), a member of the E(z) family of proteins, interacts with the Polycomb-group related protein (EED), may be involved in chromatin silencing
	GAS2	49.62	Growth arrest-specific 2, has very strong similarity to murine Gas2 which is a microfilament-associated protein that is proteolytically cleaved during apoptosis and that may induce actin cytoskeleton reorganization following phosphorylation
	KCNS3	46.1	Potassium voltage-gated channel delayed-rectifier subfamily S member 3, electrically silent, modulates biophysical activity of potassium channel KV2.1 (KCNB1); rat Kcns3 may play a role in pulmonary artery
	MAGOH	48.98	Protein with very strong similarity to mago-nashi homolog (human MAGOH), which may play a role in RNA localization and germ cell development, contains a mago nashi protein domain

Unknown function or poorly characterized	MLF1	31.06	Myelodysplasia/myeloid leukemia factor 1, a cytoplasmic protein; gene fusion with NPM (NPM1) in acute myeloid leukemia results in misdirection of the fusion protein to the nucleus
	NUCB2	47.59	Nucleobindin 2, a calcium binding protein with two EF-hand calcium-binding domains and a leucine-zipper motif; expression is decreased in gastric tumors
	PGRMC2	35.24	Progesterone receptor membrane component 2, putative transmembrane steroid hormone receptor, preferentially expressed in
	PTPN13	44.78	PTPN13-like Y-linked (testis-specific PTP-BL-related protein on Y chromosome), may play a role in spermatogenesis; maps to the nonrecombining region of the Y chromosome, and deletions in this region are associated with male infertility
	ROD1	44.5	ROD1 regulator of differentiation 1, a putative RNA binding protein that inhibits differentiation of leukemia cells when overexpressed
	SEC24D	34.02	SEC24 related gene family member D, binds dynactin 1 (DCTN1), may play a role in vesicle biogenesis and related trafficking events
	SELT	43.68	Protein of unknown function, has very strong similarity to uncharacterized mouse 2810407C02Rik
	SSBP2	36.89	Single-stranded DNA binding protein 2, a member of the single-stranded DNA binding protein (SSBP) family, may bind single-stranded DNA; expressed in all tissues examined, gene undergoes partial deletion in acute myeloid leukemia cells
	TM6SF1	40.25	Transmembrane 6 superfamily 1, member of superfamily of transmembrane 6 proteins; mRNA expression is observed in testis, spleen, and peripheral blood leukocytes

Table 8. 長時間のメチル水銀処理により発現が減少する遺伝子（発現変動順）

Gene name	% of control
MLF1	31.06
SEC24D	34.02
PGRMC2	35.24
SSBP2	36.89
GLRX	37.76
FPGT	38.02
PPP1CB	39.06
PRKACA	39.18
TPM1	39.36
ZNF133	40.11
TM6SF1	40.25
BTRC	41.34
TMEFF1	41.76
MCAM	42.57
C14orf1	43.12

Gene name	% of control
ELAVL2	43.15
GPR48	43.29
MAD2L1	43.67
SELT	43.68
ROD1	44.50
CSPG5	44.64
PTPN13	44.78
C1orf13	45.18
GALNS	45.33
KCNS3	46.10
SIAT9	46.75
FABP6	46.90
SMT3H2	47.24
NUCB2	47.59
EZH1	48.00

Gene name	% of control
GPRK6	48.01
ANKRA2	48.38
AGPAT2	48.83
MAGOH	48.98
GSTM4	49.00
CART	49.35
CPO	49.39
D4S234E	49.40
HIBCH	49.44
AXOT	49.61
GAS2	49.62
NAGK	49.81