

			int-1-related protein (IRP)	
452	C05d	E	integrin beta 5 precursor (ITGB5)	J05633
453	C05e	N	APEX1	NM_00164
		ad		1
		d		
454	C05f	I	histone deacetylase 3C (HD3C)	AF005482
455	C05g	A	G1/S-specific cyclin E (CCNE)	M73812
456	C05h	J	adenine phosphoribosyltransferase (APRT)	Y00486
457	C05i	N	retinoic acid receptor alpha 1 (RAR-alpha 1; RARA); PML-RAR protein	X06538; X06614; M73779
458	C05j	I	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, alpha	M69043
459	C05k	G	interleukin 2 receptor gamma subunit (IL2R-gamma; IL2RG); cytokine receptor common gamma chain precursor	D11086
460	C05l	N	IL-17 receptor	U58917
461	C05m	B	mitogen-activated protein kinase 7 (MAP kinase 7; MAPK7; PRKM7); extracellular signal-regulated kinase 5 (ERK5); BMK1 kinase	U25278
462	C05n	E	integrin alpha 7B precursor (IGA7B)	X74295
463	C06a	K	glutathione S-transferase theta 2	L38503
464	C06b	B	cAMP-dependent protein kinase type II alpha regulatory subunit (PRKAR2A; PKR2)	X14968
465	C06c	N	interferon gamma (IFN-gamma) receptor beta subunit precursor; IFN-gamma accessory factor 1 (AF1); IFN-gamma transducer 1 (IFNGT1)	U05875
466	C06d	B	allograft inflammatory factor 1 (AIF1); ionized calcium-binding adapter molecule 1	U19713
467	C06e	N	growth factor receptor-bound protein 2 (GRB2); abundant SRC homology protein (ASH)	L29511; M96995
468	C06f	C	RHO-associated coiled-coil containing protein kinase (p160ROCK)	U43195
469	C06g	E	cadherin 8 (CDH8)	L34060
470	C06h	B	mitogen-activated protein kinase 1 (MAP kinase 1; MAPK1; PRKM1); extracellular signal-regulated kinase 2 (ERK2)	M84489
471	C06i	J	cytochrome P450 IA2 (CYP1A2); P450-P3; P450-4	Z00036

472	C06j	A	retinoblastoma-binding protein 1 (RBP1) isoform I + isoform II	S57153 + S57160
473	C06k	E	matrix metalloproteinase 8 (MMP8)	J05556
474	C06l	B	3-phosphoinositide-dependent protein kinase 1 (PDK1)	AF017995
475	C06m	A	cyclin G2 (CCNG2)	U47414; L49506
476	C06n	B	protein phosphatase 2A B56-alpha	L42373
477	C07a	C	rho-GAP hematopoietic protein C1 (RGC1); KIAA0131	X78817
478	C07b	J	fatty acid synthase	S80437
479	C07c	F	transforming growth factor beta 3 (TGF-beta3; TGFB3)	J03241
480	C07d	F	growth-arrest-specific protein 1 (GAS1)	L13698
481	C07e	J	ribonucleoside-diphosphate reductase M1 subunit; ribonucleotide reductase	X59543
482	C07f	B	113-kDa signal transducer and activator of transcription 2 (STAT2; STAT113)	U18671; M97934
483	C07g	B	tyrosine-protein kinase HCK; P59-HCK & P60-HCK; hemopoietic cell kinase	M16591
484	C07h	N	MAO-A(monoamine oxidase A)	M89636
		ad		
		d		
485	C07i	B	cot proto-oncogene	D14497
486	C07j	B	mitogen-activated protein kinase kinase 1 (MAP kinase kinase 1; MAPKK1; MAP2K1; PRKMK1); MAPK/ERK kinase 1 (MEK1)	L05624
487	C07k	N	platelet-derived growth factor receptor alpha precursor (PDGFR-alpha; PDGFRA); CD140A antigen	M21574
488	C07l	A	CDC6-related protein	U77949
489	C07m	N	cathepsin D precursor (CTSD)	M11233
490	C07n	J	deoxycytidine kinase	M60527
491	C08a	B	mitogen-activated protein kinase 4 (MAP kinase 4; MAPK4; PRKM4); p63-MAPK; extracellular signal-regulated kinase 4 (ERK4)	X59727
492	C08b	B	ras-related protein RAB5A	M28215
493	C08c	J	microsomal UDP-glucuronosyltransferase 1-4 precursor (UDPGT; UGT1.4; UGT1D; GNT1); bilirubin-specific isozyme 2 (hUG-BR2)	M57951

494	C08d	N	GPX4	NM_00208
		ad		5
		d		
495	C08e	G	interferon-inducible protein AIM2	AF024714
496	C08f	N	neurotrophic tyrosine kinase receptor type 1 (NTRK1; TRK)	X03541
497	C08g	N	IRA1	NM_02466
		ad		5
		d		
498	C08h	N	SPHAR	NM_00654
		ad		2
		d		
499	C08i	B	myb proto-oncogene; c-myb	M15024
500	C08j	H	ionizing radiation resistance-conferring protein + death-associated protein 3 (DAP3)	U18321 + X83544
501	C08k	A	cyclin-dependent kinase 5 activator isoform p39I precursor (CDK5 activator; NCK5AI)	U34051
502	C08l	N	ENO3 for muscle specific enolase; enolase 3	X56832
		ad		
		d		
503	C08m	E	platelet/endothelial cell adhesion molecule 1 (PECAM1); CD31 antigen	M28526
504	C08n	H	fas soluble protein; apoptosis antigen 1 (APO1; APT1) [alternatively spliced]	Z70519
505	C09a	E	female organ- & adipocyte-specific extracellular matrix protein 2 (ECM2)	AB011792
506	C09b	N	NPY1R, neuropeptide Y receptor Y1 (neuropeptide Y/peptide YY receptor of the Y1 type)	NM_00090
		ad		9
		d		
507	C09c	N	tumor antigen (L6) (on lung, breast, colon, and ovarian)	M90657
		ad		
		d		
508	C09d	B	serine/threonine-protein kinase NEK2; NIMA-related protein kinase 2; NIMA-like protein kinase 1; HSPK 21	U11050
509	C09e	I	nucleoside diphosphate kinase B (NDP kinase B; NDKB); expressed in non-metastatic cells 2 protein (NME2); myc purine-binding transcription factor (PUF); NM23B	L16785; M36981

510	C09f	N	erbB3 proto-oncogene; HER3	M29366; M34309
511	C09g	B	phospholipase C (PLCL)	D42108
512	C09h	N	tunp; transformation upregulated nuclear protein	X72727
		ad		
		d		
513	C09i	J	uridine phosphorylase (UDRPase; UP)	X90858
514	C09j	N	VLDLR	NM_00338
		ad		3
		d		
515	C09k	B	cAMP-dependent protein kinase beta catalytic subunit (PKAC-beta; PRKACB)	M34181
516	C09l	B	mitogen-activated protein kinase p38 (MAP kinase p38); cytokine suppressive anti-inflammatory drug-binding protein (CSAID binding protein; CSBP); MAX-interacting protein 2 (MXI2)	L35253; L35263
517	C09m	E	collagen VIII alpha 1 subunit (COL8A1)	X57527
518	C09n	N	WISP2	AF083500
		ad		
		d		
519	C10a	B	ribosomal protein kinase B (RSKB)	AJ010119
520	C10b	A	cell division cycle 25 homolog A (CDC25A); M-phase inducer phosphatase 1 (MPI1)	M81933
521	C10c	I	phenylethanolamine N-methyltransferase (PNMTase); noradrenaline N-methyltransferase	J03727
522	C10d	E	cadherin 13 (CDH13); truncated cadherin precursor (T-cadherin); heart cadherin (H-cadherin)	L34058; U59289; U59288
523	C10e	A	p53 cellular tumor antigen	M14694; M14695
524	C10f	N	interferon-induced PML nuclear body-associated protein; interferon stimulated gene, gpISG20 protein	X89773
		ad		
		d		
525	C10g	B	phospholipase C gamma-2 (PLC-gamma 2; PLCG2); PLC-IV; 1-phosphatidylinositol-4,5-bisphosphate phosphodiesterase gamma 2	X14034

526	C10h	E	tissue inhibitor of metalloproteinase 1 precursor (TIMP1); erythroid potentiating activity protein (EPA); fibroblast collagenase inhibitor	X03124
527	C10i	N	TFAP2C	NM_003222
528	C10j	B	guanine nucleotide-binding protein gamma 8 subunit (GNG8); GNG8	AF001160
529	C10k	A	cyclin-dependent kinase 10 (CDK10); CDC2-related protein kinase PISLRE	L33264
530	C10l	L	Homo sapiens sulfonylurea receptor (SUR1) gene, exon 7.	L78213
531	C10m	H	MAP kinase-activating death domain protein	U77352
532	C10n	B	guanylate kinase (GMP kinase)	L76200
533	C11a	N	phorbol-12-myristate-13-acetate-induced protein 1 ,	D90070
		ad	ATL-derived PMA-responsive peptide	
		d		
534	C11b	J	phenol-sulfating phenol sulfotransferase 1 (PPST1); thermostable phenol sulfotransferase (TS-PST); HAST1/HAST2; ST1A3; STP1 + PPST2; ST1A2; STP2 + monoamine-sulfating phenol sulfotransferase	U09031 + U28170 + L19956
535	C11c	B	cGMP-dependent protein kinase beta (CGK); type I alpha cGMP-dependent protein kinase	Y07512; D45864
536	C11d	K	glutathione-S-transferase homolog	U90313
537	C11e	N	matrilin-2 precursor, the closest relative of cartilage matrix protein within the von Willebrand factor type A-like module superfamily, MATN2	U69263
		ad		
		d		
538	C11f	B	histamine H1 receptor (HRH1)	D28481
539	C11g	B	neurogenic locus notch protein homolog 4 (NOTCH4)	U95299
540	C11h	M	microtubule-associated protein 4 (MAP4)	U19727
541	C11i	N	PMP-22(PAS-II/SR13/Gas-3) human peripheral myelin	D11428
		ad		
		d		
542	C11j	L	importin beta 1 subunit; karyopherin beta 1 subunit; importin 90; nuclear factor p97	L38951
543	C11k	B	dual-specificity protein phosphatase 8; HVH5	U27193
544	C11l	G	tumor necrosis factor alpha precursor (TNF-alpha; TNFA);	X01394

			cachectin	
545	C11m	B	calcium/calmodulin-dependent 3',5'-cyclic nucleotide phosphodiesterase 1B (CAM-PDE1B); HCAM2	U56976
546	C11n	G	interleukin 12 alpha subunit precursor (IL12-alpha; IL12A); cytotoxic lymphocyte maturation factor 35-kDa subunit (CLMF p35); NK cell stimulatory factor subunit 1 (NKSF1)	M65291
547	C12a	I	G/T mismatch-specific thymine DNA glycosylase (TDG)	U51166
548	C12b	E	beta 1 catenin (CTNNB); cadherin-associated protein	X87838; Z19054
549	C12c	G	tumor necrosis factor superfamily member 5 (TNFSF5); CD40 ligand (CD40L); TNF-related activation protein (TRAP); gp39; hyper IgM syndrome protein 1 (HIGM1)	L07414
550	C12d	L	Homo sapiens MRP2 (ABCC2) gene, exon 2	AJ132287
551	C12e	E	neutrophil gelatinase-associated lipocalin precursor (NGAL); 25-kDa alpha-2-microglobulin-related subunit of MMP9); lipocalin 2; oncogene 24P3	X99133
552	C12f	J	cytochrome P450 IIIA3 (CYP3A3); CYP3A4; niphedipine oxidase; CYP3A5; CYP3A7	M13785; M18907; J04813; D00408
553	C12g	B	annexin V; lipocortin V; endonexin II; calphobindin I (CBP-I); placental anticoagulant protein I (PAP-I); PP4; thromboplastin inhibitor; vascular anticoagulant-alpha (VAC-alpha; anchorin CII	X12454
554	C12h	B	ras-related protein RAB5B	X54871
555	C12i	J	UDP-glycosyltransferase 2 family polypeptide B (UGT2B)	AF030310
556	C12j	C	ras associated with diabetes 1 (RAD1)	L24564
557	C12k	J	peroxisome proliferator activated receptor alpha (PPAR-alpha; PPARA)	L02932
558	C12l	A	retinoblastoma-like protein 2 (RBL2; RB2); 130-kDa retinoblastoma-associated protein	X74594
559	C12m	A	p21-activated kinase alpha (PAK-alpha; PAK1)	U24152
560	C12n	A	cell division protein kinase 3 (CDK3)	X66357
561	C13a	I	X-ray repair-complementing defective repair in Chinese hamster cells 1 (XRCC1)	M36089
562	C13b	B	TSG101 tumor susceptibility protein	U82130

563	C13c	J	cytochrome P450 IID6 (CYP2D6)	M20403; M19697
564	C13d	B	protein kinase C delta (PKC-delta)	D10495
565	C13e	N	ERBB2 proto-oncogene; NEU proto-oncogene; HER2	M95667; M11730
566	C13f	B	serine/threonine protein kinase PRP4 homolog	U48736
567	C13g	B	c-fos proto-oncogene; G0S7 protein	K00650
568	C13h	J	microsomal UDP-glucuronosyltransferase 1-6 precursor (UDPGT; UGT1.6; UGT1F; GNT1)	J04093
569	C13i	H	ionizing radiation resistance-conferring protein + death-associated protein 3 (DAP3)	U18321 + X83544
570	C13j	B	ras-related protein RAB28	X94703
571	C13k	B	serine/threonine protein kinase PRP4 homolog	U48736
572	C13l	B	EB1 protein	U24166
573	C13m	J	peroxisome proliferator activated receptor alpha (PPAR-alpha; PPARA)	L02932
574	C13n	E	urokinase-type plasminogen activator precursor (U-plasminogen activator; UPA)	M15476; D00244
575	C14a	J	gamma-glutamyl hydrolase precursor (GGH; GH); folylpolygammaglutamyl hydrolase; gamma-glu-X carboxypeptidase; conjugase	U55206
576	C14b	I	DNA topoisomerase II beta (TOP2B)	X68060
577	C14c	G	tumor necrosis factor type 1 receptor-associated protein (TRAP1)	U12595
578	C14d	A	putative cyclin G1-interacting protein (CG1)	U61837
579	C14e	K	heat shock 70-kDa protein 6; heat shock 70-kDa protein B	X51757; M11236
580	C14f	K	cytosolic superoxide dismutase 1 (SOD1)	K00065; X02317
581	C14g	A	retinoblastoma-related protein p107	L14812
582	C14h	Y	liver glyceraldehyde 3-phosphate dehydrogenase (GAPDH; G3PDH)	X01677
583	C14i	I	xeroderma pigmentosum group B complementing protein (XPB); excision repair cross-complementing rodent repair deficiency complementation group 3 (ERCC3); basal transcription factor 2 89-kDa subunit (BTF2p89; TFIIH)	M31899

			89-kDa subunit)	
584	C14j	E	40S ribosomal protein SA (RPSA); 34/67-kDa laminin receptor; laminin receptor 1 (LAMR1); colon carcinoma laminin-binding protein; NEM/1CHD4	U43901
585	C14k	G	tumor necrosis factor type 1 receptor-associated protein (TRAP1)	U12595
586	C14l	Y	liver glyceraldehyde 3-phosphate dehydrogenase (GAPDH; G3PDH)	X01677
587	C14m	N	retinoic acid receptor alpha 1 (RAR-alpha 1; RARA); PML-RAR protein	X06538; X06614; M73779
588	C14n	N	vascular endothelial cell growth factor 165 receptor 2 (VEGF165R2)	AF016098
981	F01a	B	ras-related protein RAB3B	M28214
982	F01b	C	G protein-coupled receptor GPR-NGA	U55312
983	F01c	N	erbB3 proto-oncogene; HER3	M29366; M34309
984	F01d	K	metallothionein 2A (MT2A)	V00594
985	F01e	F	PDGF-associated protein	U41745
986	F01f	N	GPX3	NM_00208
		ad		4
		d		
987	F01g	B	guanine nucleotide-binding protein gamma 4 subunit (GNG4)	U31382
988	F01h	B	oncostatin M-specific receptor beta subunit	U60805
989	F01i	I	xeroderma pigmentosum group D complementing protein (XPD); X-ray repair-complementing defective repair in Chinese hamster cells 2 (XRCC2)	X52221
990	F01j	N	H3F3B; hH3.3B; H3 histone, family 3B	Z48950
		ad		
		d		
991	F01k	B	adenomatous polyposis coli protein (APC); DP2.5	M74088; M73548
992	F01l	N	ephrin type-B receptor 2 precursor; tyrosine-protein kinase receptor EPH-3; DRT; HEK; ERK	L41939

993	F01m	E	hepatocyte growth factor (HGF); scatter factor (SF); hepatopoeitin A	M60718
994	F01n	K	heat shock 70-kDa protein 4 (HSPA4); HSP70RY; heat shock 70-related protein APG-2	L12723
995	F02a	N	TIEG, EGRalpha, TGFb inducible early growth response protein alpha	AF050110
		ad		
		d		
996	F02b	N	ITGB8	NM_00221
		ad		4
		d		
997	F02c	J	methylenetetrahydrofolate dehydrogenase- methylenetetrahydrofolate cyclohydrolase-formyltetrahydrofolate synthetase	J04031
998	F02d	B	stem cell factor precursor (SCF); mast cell growth factor (MGF); c-kit ligand	M59964
999	F02e	N	protein kinase C substrate (80K-H protein)	J03075
		ad		
		d		
1000	F02f	I	E2F transcription factor 3 (E2F3); KIAA0075	Y10479
1001	F02g	I	RAD50	U63139
1002	F02h	H	BCL2-like 2 (BCL2L2); BCL-W; KIAA0271	U59747
1003	F02i	J	elongation factor 2 (EEF2; EF2)	X51466
1004	F02j	N	insulin receptor precursor (INSR; IR)	M10051; X02160
1005	F02k	F	heparin-binding EGF-like growth factor (HBEGF; HEGFL); diphtheria toxin receptor (DTR)	M60278
1006	F02l	E	placental plasminogen activator inhibitor 2 (PAI-2; PLANH2); monocyte ARG-serpin; urokinase inhibitor	M18082; J02685
1007	F02m	J	geranylgeranyltransferase type I beta subunit (GGTase I beta; PGGT1B)	L25441
1008	F02n	E	prostate-specific membrane antigen (PSM)	M99487
1009	F03a	H	caspase 2 precursor (CASP2); ICH1L cysteine protease; ICH1S	U13021; U13022
1010	F03b	N	insulin receptor substrate 4	AF007567
1011	F03c	B	protein kinase C delta (PKC-delta)	D10495
1012	F03d	A	CDC42 homolog; G25K GTP-binding protein (brain isoform)	M35543 +

			+ placental isoform)	M57298
1013	F03e	E	alpha1 catenin (CTNNA1); cadherin-associated protein; alpha E-catenin	D13866; D14705; L23805; L22080
1014	F03f	N	insulin-like growth factor-binding protein 3 precursor (IGF-binding protein 3; IGFBP3; IBP3)	M31159; M35878
1015	F03g	B	protein expressed in non-metastatic cells 3 (NME3); DR-NM3; nucleoside diphosphate kinase 3 (NDP kinase 3; NDK3)	U29656
1016	F03h	I	DNA damage repair & recombination protein 52 (RAD52)	U12134
1017	F03i	A	putative cyclin G1-interacting protein (CG1I)	U61837
1018	F03j	B	A-raf proto-oncogene serine/threonine-protein kinase; PKS2	L24038
1019	F03k	E	endoglin precursor (ENG; END); CD105 antigen	J05481; X72012
1020	F03l	J	adenosine deaminase (ADA); adenosine aminohydrolase	X02994; K02567
1021	F03m	B	mitogen-activated protein kinase P38 beta (MAP kinase P38 beta); stress-activated protein kinase 2 (SAPK2)	U53442
1022	F03n	N	PHYH	NM_00621
		ad		4
		d		
1023	F04a	E	endothelial plasminogen activator inhibitor 1 precursor (PAI1; PLANH1)	X04429; M14083
1024	F04b	B	rac-beta serine/threonine kinase (rac-PK-beta); AKT2	M77198; M95936
1025	F04c	N	insulin-like growth factor binding protein 5 precursor (IGF-binding protein 5; IGFBP5; IBP5)	M65062
1026	F04d	I	BRCA2 region clone CG018	U50527
1027	F04e	B	carcinoembryonic antigen precursor (CEA); meconium antigen 100; CD66E antigen	M15042
1028	F04f	N	AML1b protein in acute myeloid leukemia	D43968
		ad		
		d		
1029	F04g	J	ornithine decarboxylase	X16277
1030	F04h	B	phosphatase & tensin homolog (PTEN); mutated in multiple	U92436

			advanced cancers protein 1 (MMAC1); TEP1	
1031	F04i	J	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase 2 (GALNACT2; GALNT2)	X85019
1032	F04j	N	STAT1	NM_13926
		ad		6,
		d		NM_00731
				5
1033	F04k	B	ras-related protein RAB6	M28212
1034	F04l	B	c-src kinase (CSK); protein-tyrosine kinase cpl	X59932
1035	F04m	J	microsomal UDP-glucuronosyltransferase 1-2 precursor (UDPGT; UGT1.2; UGT1B; GNT1); HLUGP4	S55985
1036	F04n	B	jun activation domain binding protein	U65928
1037	F05a	B	protein serine/threonine kinase STK1; cell division protein kinase 7 (CDK7); CDK-activating kinase (CAK); 39-kDa protein kinase	L20320
1038	F05b	B	diacylglycerol kinase alpha (DAGK1)	AF064771
1039	F05c	H	B-cell leukemia/lymphoma protein 2 (BCL2)	M14745
1040	F05d	B	aurora- & IPL1-like midbody-associated protein kinase 1 (AIM1); ARK2	AF008552
1041	F05e	L	Homo sapiens sulfonylurea receptor (SUR2) gene, exons 7 and 8.	AF061295
1042	F05f	I	ubiquitin-specific protease 5 (USP5); isopeptidase T (ISOT)	U35116
1043	F05g	B	signal transducer and activator of transcription 4 (STAT4)	L78440
1044	F05h	B	mitogen-activated protein kinase 6 (MAP kinase 6; MAPK6; PRKM6); p97-MAPK; extracellular signal-regulated kinase 3 (ERK3)	X80692
1045	F05i	C	ras-like small GTPase TTF	Z35227
1046	F05j	E	integrin alpha 1 (ITGA1); laminin & collagen receptor; VLA1; CD49A antigen	X68742
1047	F05k	E	cadherin 4 (CDH4); retinal cadherin precursor (R-cadherin; RCAD)	L34059
1048	F05l	N	epidermal growth factor precursor (EGF); beta-urogastrone	X04571
1049	F05m	B	ras-related protein RAB32	U71127
1050	F05n	I	growth arrest & DNA damage-inducible protein 45 beta (GADD45 beta)	AF078077

1051	F06a	K	endothelial nitric oxide synthase (EC-NOS)	M93718
1052	F06b	L	MRP/organic anion transporter (MOAT-B)	AF071202
1053	F06c	N	GRIA1	NM_00082
		ad		7
		d		
1054	F06d	B	membrane-associated phospholipase A2 group 2A precursor (PLA2G2A); PLA2B; PLA2L; synovial group II phospholipase A2; phosphatidylcholine 2-acylhydrolase; RASFA	M22430; J04704
1055	F06e	I	excision repair cross-complementing rodent repair deficiency complementation group 6 (ERCC6); Cockayne syndrome protein 2 type B (CSB)	L04791
1056	F06f	E	collagen IV alpha 6 subunit precursor (COL4A6)	D21337; U04845
1057	F06g	N	fibroblast growth factor receptor 3 precursor (FGFR3); JTK4; fibroblast growth factor receptor 2 precursor (FLG2)	M58051; X58255
1058	F06h	G	interleukin 10 precursor (IL10); cytokine synthesis inhibitory factor (CSIF)	M57627
1059	F06i	N	VAMP5	AF054825
		ad		
		d		
1060	F06j	N	endothelin 2 (ET2)	M65199
		ad		
		d		
1061	F06k	N	interleukin 2 receptor beta subunit precursor (IL2 receptor beta; IL2RB); p70-75; CD122 antigen	M26062
1062	F06l	E	collagen VI alpha 3 subunit (COL6A3)	X52022
1063	F06m	B	retinoid X receptor gamma (RXR-gamma; RXRG)	U38480
1064	F06n	G	interleukin 4 precursor (IL4); B-cell stimulatory factor 1 (BSF-1); lymphocyte stimulatory factor 1	M13982
1065	F07a	G	interferon beta (IFN-beta; IFNB); fibroblast interferon	M28622
1066	F07b	L	anthracycline resistance-associated protein (ARA)	X95715
1067	F07c	N	hD53, tumor protein D52-like 1 (tumor protein D52, TPD52 family)	U44427
		ad		
		d		
1068	F07d	K	27-kDa heat shock protein (HSP27); stress-responsive	X54079

			protein 27 (SRP27); estrogen-regulated 24-kDa protein; HSPB1	
1069	F07e	N	HADHA	NM_00018
		ad		2
		d		
1070	F07f	H	TNF-alpha converting enzyme (TACE); a disintegrin & metalloproteinase domain 17 (ADAM17)	U69611
1071	F07g	F	epidermal growth factor receptor kinase substrate EPS8	U12535
1072	F07h	K	thioredoxin reductase	X91247
1073	F07i	B	CBL-B	U26710
1074	F07j	N	ST13	NM_00393
		ad		2
		d		
1075	F07k	B	box-dependent myc-interacting protein 1	U68485
1076	F07l	N	TAF5-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa (TAF5L), mRNA.	NM_01440
		ad		9
		d		
1077	F07m	A	cyclin I	D50310
1078	F07n	H	TWEAK; APO3L	AF030099
1079	F08a	F	neuregulin 2	AB005060
1080	F08b	B	neurotrophin 3 precursor (NT3); nerve growth factor 2 (NGF2)	X53655; M37763
1081	F08c	B	GRB2-associated binder 1 (GAB1)	U43885
1082	F08d	A	cyclin-dependent protein kinase 2 (CDK2); p33 protein kinase	M68520
1083	F08e	C	rhoHP1	D85815
1084	F08f	B	ras-related protein RAB7	X93499
1085	F08g	N	HECH	AF136630
		ad		
		d		
1086	F08h	N	EGR1	NM_00196
		ad		4
		d		
1087	F08i	L	ATP-binding cassette subfamily C member 3 (ABCC3); multidrug resistance-associated protein 5 (MRP5)	U83661
1088	F08j	N	AIB1, SRC-3	NM_00653

		ad		4
		d		
1089	F08k	H	caspase 3 (CASP3); apopain precursor; cysteine protease CPP32; YAMA protein; SREBP cleavage activity 1 protein (SCA1)	U13737
1090	F08l	B	ras-related protein RAP-1A; C21KG; KREV-1 protein; GTP-binding protein SMG-p21A; G-22K	M22995
1091	F08m	B	rac alpha serine/threonine kinase (RAC-PK-alpha); c-akt proto-oncogene; protein kinase B (PKB)	M63167
1092	F08n	B	1D-myo-inositol-trisphosphate 3-kinase A; inositol 1,4,5-trisphosphate 3-kinase (IP3 3-kinase; IP3K)	X54938
1093	F09a	I	X-ray repair-complementing defective repair in Chinese hamster cells 9 (XRCC9)	U70310
1094	F09b	I	DNA repair protein RAD54 homolog	X97795
1095	F09c	B	serine/threonin protein phosphatase 2B catalytic subunit gamma; calmodulin-dependent calcineurin A subunit gamma; testic-specific calcineurin catalytic subunit (CAM-PRP catalytic subunit)	S46622
1096	F09d	I	AP-2 BETA TRANSCRIPTION FACTOR	X95694
1097	F09e	I	H1 histone family member 0 (H1F0; H10); H1FV	X03473
1098	F09f	E	integrin alpha E precursor (ITGAE); mucosal lymphocyte-1 antigen; hml-1 antigen; CD103 antigen	L25851
1099	F09g	N	nerve growth factor receptor (NGF receptor; NGFR)	M14764
1100	F09h	A	cyclin-dependent kinase 5 activator precursor (CDK5 activator); tau protein kinase II 23-kDa subunit; TPKII regulatory subunit	X80343
1101	F09i	N	chemokine receptor-like 2; IL8-related receptor DRY12; flow-induced endothelial G protein-coupled receptor (FEG1); G protein-coupled receptor GPR30; GPCR-BR)	AF015257
1102	F09j	B	protein kinase C theta (PKC-theta)	L07032
1103	F09k	N	180-kDa secretory phospholipase A2 receptor precursor (PLA2 receptor; PLA2R)	U17033
1104	F09l	A	octamer-binding transcription factor 2 (oct-2; OTF2); lymphoid-restricted immunoglobulin octamer binding protein NF-A2; POU2F2	M36542
1105	F09m	N	exportin (tRNA-specific nuclear export receptor)	AF039022

		ad		
		d		
1106	F09n	N	THOC1 (also called P84)	BC010381
		ad		
		d		
1107	F10a	I	DNA mismatch repair protein PMS1 (PMS1 protein homolog 1)	U13695
1108	F10b	B	serine kinase SRPK2	U88666
1109	F10c	H	inhibitor of apoptosis protein1 (HIAP1; API1) + IAP homolog C; TNFR2-TRAF signaling complex protein 1; MIHC	U45878 + U37546
1110	F10d	B	c-myc proto-oncogene	V00568
1111	F10e	N	zinc finger protein (SNAH) mRNA, complete cds	AF125377
		ad		
		d		
1112	F10f	F	transforming growth factor beta (TGF-beta; TGFB)	X02812; J05114
1113	F10g	N	interleukin 15 receptor alpha subunit precursor	U31628
1114	F10h	E	matrix metalloproteinase 11 (MMP11)	X57766
1115	F10i	I	DNA (cytosine-5-)-methyltransferase 2 (DNMT2)	AJ223333
1116	F10j	B	MAPK/ERK kinase kinase 3 (MEK kinase 3; MEKK3)	U78876
1117	F10k	B	mitogen-activated protein kinase kinase 6 (MAP kinase kinase 6; MAPKK6; MAP2K6; PRKMK6); MAPK/ERK kinase 6 (MEK6); SAPKK3	U39657
1118	F10l	E	tissue inhibitor of metalloproteinase 3 precursor (TIMP3)	U14394
1119	F10m	B	mitogen-activated protein kinase kinase kinase (MAPKKK; MAP3K); MTK1	AF002715
1120	F10n	I	activating transcription factor 3 (ATF3)	L19871
1121	F11a	K	glutathione S-transferase M4 (GSTM4)	M96233
1122	F11b	H	BCL2-associated death promoter (BAD); BCL2-binding component 6 (BBC6); BCL2L8	U66879
1123	F11c	B	Janus tyrosine-protein kinase 2 (JAK2); receptor-associated tyrosine kinase	AF005216
1124	F11d	K	glutathione peroxidase (GSHPX1; GPX1)	Y00483; M21304
1125	F11e	N	PKP4	NM_00362

		ad		8
		d		
1126	F11f	N	PPAR binding protein (PPARBP), mRNA	NM_00477
		ad		4
		d		
1127	F11g	E	matrix metalloproteinase 14 precursor (MMP14); MMP-X1; membrane-type matrix metalloproteinase 1 (MT-MMP1)	D26512; X83535
1128	F11h	I	zinc-finger DNA-binding protein	D45132
1129	F11i	N	pre-B cell stimulating factor homologue (SDF1b; stromal cell-derived factor 1), intercrine CXC subfamily	L36033
		ad		
		d		
1130	F11j	K	inducible nitric oxide synthase (iNOS); type II NOS; hepatocyte NOS (HEP-NOS)	L09210
1131	F11k	M	microtubule-associated protein 1B	L06237
1132	F11l	N	epidermal growth factor receptor (EGF receptor; EGFR); ERBB proto-oncogene	X00588; K03193; X00663; U48722
1133	F11m	N	breast cancer 1, early onset (BRCA1), transcript variant BRCA1a	NM_00729 4
		ad		
		d		
1134	F11n	N	breast cancer 2, early onset (BRCA2),	NM_00005 9
		ad		
		d		
1135	F12a	X		
1136	F12b	X		
1137	F12c	X		
1138	F12d	X		
1139	F12e	X		
1140	F12f	X		
1141	F12g	X		
1142	F12h	X		
1143	F12i	X		
1144	F12j	X		
1145	F12k	X		
1146	F12l	X		

1147	F12m	X		
1148	F12n	X		
1149	F13a	J	uridine phosphorylase (UDRPase; UP)	X90858
1150	F13b	I	DNA (cytosine-5-)-methyltransferase 2 (DNMT2)	AJ223333
1151	F13c	I	DNA (cytosine-5-)-methyltransferase 2 (DNMT2)	AJ223333
1152	F13d	E	cadherin 8 (CDH8)	L34060
1153	F13e	N	interleukin 3 receptor beta subunit precursor (IL3R-beta; IL3RB); interleukin 5 receptor beta subunit precursor (IL5R-beta; IL5R); cytokine receptor common beta chain precursor; CSF2RB	M59941
1154	F13f	E	urokinase-type plasminogen activator precursor (U-plasminogen activator; UPA)	M15476; D00244
1155	F13g	G	interleukin 7 (IL7)	J04156
1156	F13h	J	rab geranylgeranyltransferase alpha subunit (rab GG transferase; rab GGTase)	Y08200
1157	F13i	K	heat shock 70-kDa protein 4 (HSPA4); HSP70RY; heat shock 70-related protein APG-2	L12723
1158	F13j	I	DNA cytosine-5-methyltransferase (DNA metase; MCMT)	X63692
1159	F13k	G	interleukin 9 precursor (IL9); T-cell growth factor p40	X17543; M30134
1160	F13l	E	matrix metalloproteinase 9 (MMP9); gelatinase B; 92-kDa type IV collagenase precursor (CLG4B)	J05070; D10051
1161	F13m	J	nm23-H4; nucleoside-diphosphate kinase; nucleoside 5'-diphosphate phosphotransferase (NDK)	Y07604
1162	F13n	B	c-fos proto-oncogene; G0S7 protein	K00650
1163	F14a	F	transforming growth factor beta (TGF-beta; TGFB)	X02812; J05114
1164	F14b	E	matrix metalloproteinase 8 (MMP8)	J05556
1165	F14c	E	focal adhesion kinase (FADK); proline-rich tyrosine kinase 2 (PYK2)	L13616
1166	F14d	E	platelet-derived growth factor B subunit precursor (PDGFB; PDGF2); bacaplermin; c-sis	X02811; X02744; M12783; M16288
1167	F14e	E	matrix metalloproteinase 9 (MMP9); gelatinase B; 92-kDa type IV collagenase precursor (CLG4B)	J05070; D10051

1168	F14f	Y	liver glyceraldehyde 3-phosphate dehydrogenase (GAPDH; G3PDH)	X01677
1169	F14g	G	MHC class I molecule; MHC class I subunit-related protein A (MICA); PERB11.1	U65416; U69631; X92841
1170	F14h	Y	liver glyceraldehyde 3-phosphate dehydrogenase (GAPDH; G3PDH)	X01677
1171	F14i	X		
1172	F14j	Y	liver glyceraldehyde 3-phosphate dehydrogenase (GAPDH; G3PDH)	X01677
1173	F14k	X		
1174	F14l	B	mitogen-activated protein kinase p38 (MAP kinase p38); cytokine suppressive anti-inflammatory drug-binding protein (CSAID binding protein; CSBP); MAX-interacting protein 2 (MXI2)	L35253; L35263
1175	F14m	X		
1176	F14n	X		

資料2 臨床サンプル管理と抽出された RNA の品質管理に関する資料

1 臨床サンプルの非連結可能匿名化とその管理

通し番号を添付し、非連結可能匿名化を施した臨床サンプルには、RNA の抽出および品質確認、アレイデータのシグナル値の確認が取れるまでの各過程で管理されている (表 1)。

No.	交付に関する情報		由来に関する情報		処理に関する情報		bioanalyzer		amplify		NCC New Array		コメント
	通し	交付日	種別	特記事項	定容		amount	conc	予定日	結果			
Neo-001-CNB	1 CNB-001	N1-1226	030116	乳癌生検	●		0.97	○					
Neo-002-CNB	2 CNB-002	N2-1227	030116	乳癌生検	●								
Neo-003-CNB	3 CNB-003	N3-1228	030116	乳癌生検	●								
Neo-004-CNB	4 CNB-004	N4-0109	030115	乳癌生検	●								
Neo-005-CNB	5 CNB-005	N5-0111	030122	乳癌生検	●								
Neo-006-CNB	6 CNB-006	N6-0127	030122	乳癌生検	●								
Neo-007-CNB	7 CNB-007	N7-0130	030304	乳癌生検	●								
Neo-008-CNB	8 CNB-008	N8-0219	030304	乳癌生検	●								
Neo-009-CNB	9 CNB-009	N9-0214	030304	乳癌生検	●								
Neo-010-CNB	10 CNB-010	N10-0219	030304	乳癌生検	●								
Neo-011-CNB	11 CNB-011	N11-0224	030304	乳癌生検	●								
Neo-012-CNB	12 CNB-012	N12-0226	030304	乳癌生検	●								
Neo-013-CNB	13 CNB-013	N13-0228	030304	乳癌生検	●								
Neo-014-CNB	14 CNB-014	N14-0305	030603	乳癌生検	●								
Neo-015-CNB	15 CNB-015	N15-0311	030603	乳癌生検	●								
Neo-016-CNB	16 CNB-016	N16-0324	030603	乳癌生検	●								
Neo-017-CNB	17 CNB-017	N17-0328	030603	乳癌生検	●								
Neo-018-CNB	18 CNB-018	N18-0404	030603	乳癌生検	●								
Neo-019-CNB	19 CNB-019	N19-0414	030603	乳癌生検	●								
Neo-020-CNB	20 CNB-020	N20-0415	030603	乳癌生検	●								
Neo-021-CNB	21 CNB-021	N21-0418	030603	乳癌生検	●								
Neo-022-CNB	22 CNB-022	N22-0418	030603	乳癌生検	●								
Neo-023-CNB	23 CNB-023	N23-0425	030603	乳癌生検	●								
Neo-024-CNB	24 CNB-024	N24-0425	031021	乳癌生検	●								
Neo-025-CNB	25 CNB-025	N25-0513	031021	乳癌生検	●								
Neo-026-CNB	26 CNB-026	N26-0613	031021	乳癌生検	●								
Neo-027-CNB	27 CNB-027	N27-0621	031021	乳癌生検	●								
Neo-028-CNB	28 CNB-028	N28-0521	031021	乳癌生検	●								
Neo-029-CNB	29 CNB-029	N29-0520	031021	乳癌生検	●								
Neo-030-CNB	30 CNB-030	N30-0528	031021	乳癌生検	●								
Neo-031-CNB	31 CNB-031	N31-0811	031021	乳癌生検	●								
Neo-032-CNB	32 CNB-032	N32-0816	031021	乳癌生検	●								
Neo-033-CNB	33 CNB-033	N33-0818	031021	乳癌生検	●								
Neo-034-CNB	34 CNB-034	N34-0819	031021	乳癌生検	●								
Neo-035-CNB	35 CNB-035	N35-0824	031021	乳癌生検	●								
Neo-036-CNB	36 CNB-036	N36-0901	031021	乳癌生検	●								
Neo-037-CNB	37 CNB-037	N37-0901	031021	乳癌生検	●								
Neo-038-CNB	38 CNB-038	N38-0901	031021	乳癌生検	●								
Neo-039-CNB	39 CNB-039	N39-0901	031021	乳癌生検	●								
Neo-040-CNB	40 CNB-040	N40-0703	031021	乳癌生検	●								

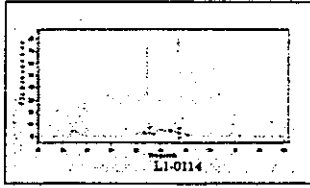
表 1

2 処理された RNA の品質管理

臨床検体から得られた RNA の品質はバイオアナライザーを用いて行われている。RNA の品質は組織に合わせた抽出過程を経て良好なものが得られる。RNA 抽出には RNA 分解酵素 (RNase) からの保護が最も重要かつ難しい問題点となる。それらを解決するために、日本および世界中で一般的に使用されている 2 試薬 RNeasy および ISOGEN が存在する。初期臨床サンプルはそれら 2 試薬を用いて RNA を抽出し比較検討も行った。末梢血単核球から RNA を抽出する場合、RNeasy を 24 時間浸透後 ISOGEN で抽出した場合も ISOGEN で直接凍結保存し抽出した場合でも良好な RNA が回収された。しかしながら、乳癌生検組織では RNeasy を用いた場合殆どの RNA が変性をしていたのに対し、ISOGEN で凍結保存した場合には良好な RNA が抽出されたことから、後者の方法で臨床サンプルから RNA を抽出することが決定された。RNeasy での RNA 変性は乳癌生検組織が脂肪組織を多く含むことが多く、RNeasy の浸透が充分に行われない結果と推察され、乳癌生検サンプル特異的な問題である可能性が高いとも推察された (図 1)。

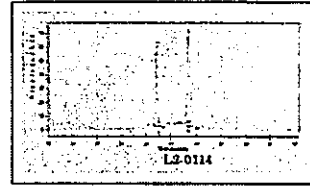
末梢血単核球

RNAlater 24時間浸透後、抽出



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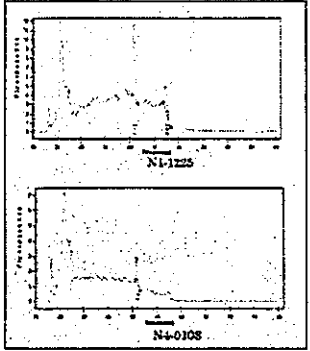
ISOGEN 浸透凍結後、抽出



同等

乳がん生検組織

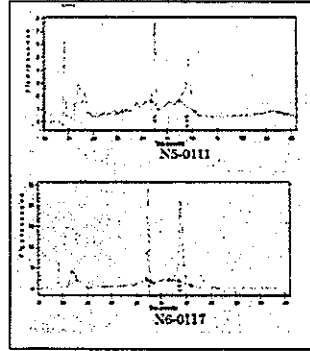
RNAlater 24時間浸透後、抽出



RNAの変性

改善

ISOGEN 浸透凍結後、抽出



良好なRNA

図 1