A	Anti-ALe ^b 357, 358
A antigen 44–46	Anti-An ^a 519
A1 antigen 49, 50	Anti-AnWj 684
A,B antigen 47–49	Anti-At ^a 682
ABCB6, see Lan blood group system	Anti-Au ^a 289
ABCG2, see JR blood group system	Anti-Au ^b 291
ABO blood group system 27	Anti-B 47
amino acid sequence 28–29	Anti-BARC 254
antigens, see A antigen; A1 antigen;	Anti-Be ^a 238
A,B antigen; B antigen	Anti-BLe ^b 359
carrier molecule description 29	Alloantibodies, see also specific alloantibodies
database accession numbers 28	characteristics in vitro 20-21, 704-705
disease association 43	clinical significance 21, 704
expression 27–28	hemolytic properties 708
gene 28	Anti-BOW 406
glycosyltransferase functions 42–43	Anti-Bp ^a 400, 408–409
molecular basis of phenotypes	Anti-c 208
A subgroup phenotypes 32–35	Anti-C 205
A_1 and A_2 phenotypes 30–31	Anti-Can 674
B phenotype 36	Anti-CD99 426
B subgroup phenotypes 36–38	Anti-cE 228
cisAB and B(A) phenotypes 38–40	Anti-Ce 212
O phenotype 40–42	Anti-CE 225
overview 29–30	Anti-CEAG 262
phenotype distribution 43	Anti-CELO 261
terminology 27	Anti-CENR 259
ABTI antigen 669	Anti-CEST 227, 260
Acetylcholinesterase, see Yt blood group	Anti-CH1 483
system	Anti-Cla 93
3 <i>N</i> -Acetylgalactosaminyltransferase, <i>see</i>	Anti-Co3 464, 465
Globoside blood group system	Anti-Co4 466
6 <i>N</i> -Acetylglucosaminyltransferase, <i>see</i> I	Anti-Co ^a 462
blood group system	Anti-Co ^b 463
Acid treatment, effects on antigen expression	Anti-Cra 530
693	Anti-CRAM 547
AET, see 2-Aminoethylisothiouronium	Anti-Crawford 244
bromide	Anti-CROV 546
ALe ^b antigen 357, 358	Anti-CROZ 548
Anti-A 45, 46	Anti-Cs ^a 649
Anti-A1 50	Anti-Cs ^b 650
Anti-A,B 48	Anti-C ^W 214
Anti-ABTI 669	Anti-C ^X 215

Anti-DAK 256, 257	Anti-GUTI 542, 543
Anti-DANE 116	Anti-Gya 448, 449
Anti-Dantu 105	Anti-H 497, 498
Anti-Dh ^a 520	Anti-HAG 128
Anti-Di ^a 389	Anti-He 77
Anti-Di ^b 390	Anti-Hg ^a 402
Anti-DISK 414	Anti-Hil 98
Anti-Do ^a 446	Anti-Hop 107
Anti-Do ^b 447	Anti-Hr 221
Anti-DOLG 454	Anti-Hr ₀ 220
Anti-DOMR 453	Anti-hr ^B 231
Anti-DOYA 452	Anti-Hr ^B 235, 236
Anti-Dr ^a 535	Anti-hr ^S 222
Anti-DSLK 627	Anti-Hu 672
Anti-Duclos 625	Anti-Hut 96
Anti-DW 226	Anti-Hy 450
Anti-e 209	Anti-i 653
Anti-E 206	Anti-I 608
Anti-ELO 398	Anti-IFC 537
Anti-Emm 683	Anti-In ^a 572
Anti-En ^a 110	Anti-In ^b 573
Anti-ENAV 129	Anti-INFI 574
Anti-ENDA 132	Anti-INJA 575
Anti-ENEH 127	Anti-JAHK 255
Anti-ENEP 126	Anti-JAL 248
Anti-ENEV 67, 133	Anti-Jk3 7, 381
Anti-ENKT 111	Anti-Jk ^a 378
Anti-Er3 658	Anti-Jkb 380
Anti-Era 656	Anti-JMH 595
Anti-Er ^b 657	Anti-JMHG 599
Anti-ERIK 124	Anti-JMHK 596, 597
Anti-Es ^a 536	Anti-JMHL 598
Anti-Evans 239	Anti-JMHM 600
Anti-E ^W 217	Anti-JMHQ 601
Anti-f 211	Anti-Jn ^a 409
Anti-Far 101	Anti-Jo ^a 451
Anti-FORS1 633	Anti-Jr ^a 639
Anti-FPTT 251	Anti-Js ^a 316
Anti-Fr ^a 412	Anti-Js ^b 317
Anti-Fy ^a 366, 367	Anti-k 310, 311
Anti-Fy ^b 368	Anti-K 309
Anti-Fy3 370	Anti-K11 319, 320
Anti-Fy5 371	Anti-K12 321
Anti-G 219	Anti-K13 322
Anti-Ge2 511	Anti-K14 323
Anti-Ge3 513	Anti-K17 325
Anti-Ge4 515	Anti-K18 326
Anti-GEAT 523	Anti-K19 327
Anti-GEIS 521	Anti-KETI 344, 345
Anti-GEPL 522	Anti-K22 330
Anti-GETI 524	Anti-K23 331
Anti-GIL 618	Anti-K25 332
Anti-Go ^a 230	Anti-KALT 337

Anti-MER2 588

Anti-KANT 341 Anti-KASH 342 Anti-KCAM 565 Anti-KELP 343 Anti-KHUL 345-346 Anti-Km 328 Anti-Kna 555 Anti-Kn^b 556 Anti-Kp^a 312 Anti-Kpb 313 Anti-Kpc 318 Anti-KREP 410 Anti-KTIM 338, 339 Anti-Ku 314 Anti-KUC1 340 Anti-Kx 503 Anti-KYO 339 Anti-Lu11 283 Anti-Lan 644 Anti-Lea 352 Anti-Leab 355 Anti-Leb 354 Anti-Lebh 356 Anti-LKE 661 Anti-LOCR 258 Anti-Lsa 517, 518 Anti-Lu3 274 Anti-Lu4 275 Anti-Lu5 277 Anti-Lu6 278 Anti-Lu7 279 Anti-Lu8 280 Anti-Lu9 282 Anti-Lu12 284 Anti-Lu13 285 Anti-Lu14 286 Anti-Lu16 287 Anti-Lu17 288 Anti-Lu20 292 Anti-Lu21 293 Anti-Lu^a 271 Anti-Lu^b 273 Anti-LURC 294 Anti-LWa 473 Anti-LWab 474 Anti-LW^b 476 Anti-M 66, 67 Anti-M₁ 673 Anti-MAM 689 Anti-MAR 252, 253 Anti-MARS 130, 131 Anti-McCa 557, 558 Anti-McC^b 562

Anti-Mg 86 Anti-Mia 79 Anti-MINY 119 Anti-Mit 103 Anti-MNTD 134 Anti-Moa 401 Anti-Mta 89 Anti-Mur 84 Anti-MUT 121 Anti-M^v 99 Anti-N 68, 69 Anti-NFLD 407 Anti-Nob 109 Anti-NOR 145 Anti-Ny^a 94 Anti-Oka 581 Anti-OKGV 582 Anti-OKVM 583 Anti-Ola 626 Anti-Or 114 Anti-Osa 125 Anti-P 611 Anti-P1 141 Anti-PEL 688 Anti-P^k 143 Anti-PX2 662 Anti-RAZ 335, 336 Anti-Rba 396 Anti-Rh26 227 Anti-Rh29 229 Anti-Rh32 233 Anti-Rh33 234 Anti-Rh35 237 Anti-Rh42 243, 246 Anti-RHAG4 628 Anti-Ria 92 Anti-Riv 245 Anti-s 72, 90 Anti-S 70 Anti-SAT 123 Anti-Sc1 431 Anti-Sc2 432, 433 Anti-Sc3 434 Anti-Sc4 435 Anti-SCAN 438 Anti-SCER 437 Anti-s^D 102 Anti-Sda 686 Anti-Sec 246, 247 Anti-SERF 543 Anti-Sext 675 Anti-S13 564

Anti-Sl ^a 559	enzyme and chemical effects 20
Anti-St ^a 91	expression 12, 19
Anti-STAR 436	genes and loci 12, 724-725
Anti-STEM 250	molecular basis 14–16, 19
Anti-SW1 413	negative prevalence for polymorphic
Anti-Sw ^a 405	antigens 706–707
Anti-Tar 241	number in blood group systems 9–12
Anti-Tc ^a 531	phenotypes 18
Anti-Tc ^b 532, 533	suppression 708
Anti-Tc ^c 533, 534	terminology 6–7, 9–12, 19
Anti-Tm 674	AnWj antigen 684, 685
Anti-TOU 334	Aquaglyceroporin, see Gill blood group system
Anti-Tr ^a 411	Aquaporin 1, see Colton blood group system
Anti-TSEN 118	At ^a antigen 682
Anti-U 73	A transferase, see ABO blood group system
Anti-Ul ^a 318	Au ^a antigen 288–290
Anti-UMC 541	Au ^b antigen 290, 291
Anti-V 216	Autoantibody, see also specific antigens
Anti-Vel 668	overview 21
Anti-Vg ^a 403, 404	target antigen expression 710
Anti-Vil 563	warm autoantibodies 709-710
Anti-VLAN 333	
Anti-VONG 336, 337	
Anti-Vr 87	В
Anti-VS 223	Band 3, see Diego blood group system
Anti-Vw 81, 82	B antigen 46–47
Anti-WARR 397	BARC antigen 253, 254
Anti-Wb 516	B-CAM, <i>see</i> Lutheran blood group system
Anti-Wda 394, 395	Be ^a antigen 237–238
Anti-WESa 539	Biosynthetic pathways, antigens 697
Anti-WES ^b 540	Bi antigen 678
Anti-Wr ^a 392	BLe ^b antigen 358, 359
Anti-Wr ^b 393	Blood group systems, see also specific systems
Anti-Wu 398, 399	adsorbed proteins from plasma 720
Anti-Xg ^a 425	carbohydrate-based systems 718
Anti-Yk ^a 560	copy number per red blood cell by system
Anti-Yt ^a 419	721–722
Anti-Yt ^b 420	glycophosphatidylinositol-linked proteins 720
Anti-ZENA 544, 545	multipass membrane proteins 719
Amino acid	single pass membrane proteins 718
codes 16	types, genes, and loci 4–5
numbering 704	BOW antigen 405, 406
sequence 16–17	Bp ^a antigen 399, 400
2-Aminoethylisothiouronium bromide (AET),	Bromelin, substrate specificity 694
antigen identification 692-693	B transferase, <i>see</i> ABO blood group system
An ^a antigen 518, 519	Bx ^a antigen 678
Antigen	By antigen 678
amino acid sequence 16-17	- J 0, 0
antithetical antigen 19	_
carrier molecules 17–18	C
database accession numbers 12-15	c antigen 207, 208
definition 3	C antigen 204, 205
disease association 18	C4A, see Chido/Rodgers blood group system

C4B, see Chido/Rodgers blood group system	disease association 671
Can antigen 674	terminology 671
Carrier molecule	Chr ^a antigen 678
function 18	α-Chymotrypsin
model 6f	antigen identification 20, 692–693
overview 17–18	substrate specificity 694
CD44, see Indian blood group system	Cl ^a antigen 93, 94
CD99 antigen 426	Co3 antigen 464, 465
CD108, see John Milton Hagen blood group	Co4 antigen 465, 466
system	Co ^a antigen 461, 462
CD147, see OK blood group system	Co ^b antigen 462, 463
CD151, see Raph blood group system	Collections, see COST; ER; GLOB; I; MNS
CD242, see Landsteiner-Wiener blood group	CHO; Unnamed; Vel
system	Complement receptor type 1, see Knops blood
cE antigen 227, 228	group system
Ce antigen 212–213	Cord red blood cells, antigen expression 695
CE antigen 224, 225	Cost blood group collection 647
CEAG antigen 261, 262	antigens, see Cs ^a antigen; Cs ^b antigen
CELO antigen 260–261	overview 647
CENR antigen 258, 259	phenotypes 648
CEST antigen 260	terminology 647–648
C ^G antigen 224	Colton blood group system 457
Ch1 antigen 482, 483	amino acid sequence 459
Ch2 antigen 483, 484	antigens, see Co3 antigen; Co4 antigen; Co ^a
Ch3 antigen 483, 484	antigen; Co ^b antigen
Ch4 antigen 485	carrier molecule 459–460, 459f
Ch5 antigen 487	CO silencing 458
Ch6 antigen 486	database accession numbers 458
Channel-forming integral protein, see Colton	disease association 460
blood group system	expression 457
Chido/Rodgers blood group system 477	function 460
antigens, see Ch1 antigen; Ch2 antigen;	gene 457
Ch3 antigen; Ch4 antigen; Ch5 antigen;	molecular basis of phenotypes
Ch6 antigen; Rg1 antigen; Rg2 antigen;	overview 458
WH antigen	weak expression 459
carrier molecule 479, 479f	phenotype distribution 460
database accession numbers 478	terminology 457
disease association 481	CR1, see Knops blood group system
expression 477	Cr ^a antigen 529, 530
function 481	CRAM antigen 546, 547
gene 477	Crawford antigen 243, 244
molecular basis of phenotypes	Cromer blood group system 525
Chido 478	amino acid sequence 527
overview 478	antigens, see Cra antigen; CRAM antigen;
Rodgers 479	CROV antigen; CROZ antigen;
phenotype distribution 481	Dra antigen; Esa antigen; GUT1 antigen;
terminology 477	IFC antigen; SERF antigen; Tca antigen;
CHIP, see Colton blood group system	Tc ^b antigen; Tc ^c antigen; UMC antigen;
Chloroquine diphosphate, effects on antigen	WES ^a antigen; WES ^b antigen;
expression 693	ZENA antigen
antigens, see M1 antigen; Sext antigen; Sj	carrier molecule 528, 528f
antigen; Tm antigen	CROM silencing 527
carrier molecule 671	database accession numbers 525

Cromer blood group system (Continued)	Do ^a antigen 445, 446
disease association 528–529	Do ^b antigen 446, 447
expression 525	Do glycoprotein, see Dombrock blood group
function 528	system
gene 525	DOLG antigen 454
molecular basis of phenotypes 526	Dombrock blood group system 439
phenotypes 529	amino acid sequence 442
terminology 525	antigens, see Doa antigen; Dob antigen;
CROV antigen 545, 546	DOLG antigen; DOMR antigen; DOYA
CROZ antigen 547, 548	antigen; Gy ^a antigen; Hy antigen;
Cs ^a antigen 648, 649	Jo ^a antigen
Cs ^b antigen 649, 650	carrier molecule 443, 443f
C ^W antigen 213–214	database accession numbers 439
C ^X antigen 214, 215	disease association 443
	DO silencing 440–441
D	expression 439
D	function 443
D antigen 195–197, 200–204	gene 439
DAK antigen 256, 257	molecular basis of phenotypes
DANE antigen 114–116	DO*A alleles 441
Dantu antigen 103–105	DO*B alleles 442
DARC, see Duffy blood group system	overview 440
DAT, see Direct antiglobulin test	phenotype distribution
Dav antigen 247	terminology 439
Dh ^a antigen 519, 520	DOMR antigen 453, 454
Di ^a antigen 388, 389	DOYA antigen 452, 453
Di ^b antigen 390, 391	Dr ^a antigen 534, 535
Diamond-Blackfan anemia 43	Drug-induced immune hemolytic anemia
Diego blood group system 383	710–717
amino acid sequence 386	Drug-induced protein adsorption, red blood
antigens, see BOW antigen; Bpa antigen;	cells 717
Di ^a antigen; Di ^b antigen; DISK antigen;	DSLK antigen 626, 627
ELO antigen; Fr ^a antigen; Hg ^a antigen;	DTT, see Dithiothreitol
Jn ^a antigen; KREP antigen;	Duclos antigen 624, 625
Mo ^a antigen; NFLD antigen;	Duffy blood group system 361
Rb ^a antigen; SW1 antigen; Sw ^a antigen;	amino acid sequence 363
Tr ^a antigen; Vg ^a antigen;	antigens, see Fy3 antigen; Fy5
WARR antigen; Wda antigen;	antigen; Fy6 antigen; Fya antigen;
Wr ^a antigen; Wr ^b antigen; Wu antigen	Fy ^b antigen
carrier molecule 386-387, 386f	carrier molecule 364, 364f
database accession numbers 383	database accession
DI silencing 385	numbers 362
disease association 387	disease association 364–365
expression 383	expression 361
function 387	function 364
gene 383	FY silencing 362–363
molecular basis of phenotype 384–385	gene 361
phenotype distribution 387	molecular basis of phenotypes
terminology 383	Fy _{mod} phenotype 363
Direct antiglobulin test (DAT) 710-717	overview 362
DISK antigen 413, 414	phenotype distribution 365
Dithiothreitol (DTT), antigen identification	terminology 361
692–693	D ^W antigen 225–226

_	
E	FPTT antigen 250, 251
e antigen 208, 209, 210	Fr ^a antigen 411, 412
E antigen 205–207	$\alpha(1,3/4)$ Fucosyltransferase, <i>see</i> Lewis blood
ELO antigen 397, 398	group system
Emm antigen 683	2-α-Fucosyltransferase, <i>see</i> H blood group
En ^a antigen 109, 110	system
ENAV antigen 129, 130	FUT3, see Lewis blood group system
ENDA antigen 131, 132	Fy3 antigen 369, 370
Endo F, substrate specificity 694	Fy5 antigen 370–371
ENEH antigen 126, 127	Fy6 antigen 371, 372
ENEP antigen 125, 126	Fy ^a antigen 366, 367
ENEV antigen 132, 133	Fy ^b antigen 367, 368
ENKT antigen 111	
Er blood group collection 655	G
antigens, see Er3 antigen; Era antigen; Erb	
antigen	4-α-Galactosyltransferase, see P1PK blood
phenotypes 655	group system
terminology 655	G antigen 218–219
Er3 antigen 657, 658	Ge2 antigen 510, 511
Er ^a antigen 655, 656	Ge3 antigen 511–513
Er ^b antigen 656, 657	Ge4 antigen 513–515
ERIK antigen 123, 124	GEAT antigen 522, 523
ERMAP, see Scianna blood group system	GEIS antigen 520, 521
Es ^a antigen 535, 536	GEPL antigen 521
Ethnic differences	Gerbich blood group system 525
low-prevalence antigens 701–703	amino acid sequences 507
missing antigens 699–701	antigens, see Ana antigen; Dha antigen;
phenotype distribution, see specific	Ge2 antigen; Ge3 antigen; Ge4 antigen;
antigens	GEAT antigen; GEIS antigen; GEPL
Evans antigen 238, 239	antigen; GETI antigen; Ls ^a antigen;
E ^W antigen 217, 218	Wb antigen
g ,	carrier molecule 508, 508f
F	database accession numbers 505
F	disease association 508
f antigen 210–212	expression 505
Far antigen 100, 101	function 508
Ficin	GE silencing 507
antigen identification 692–693	gene 505
substrate specificity 20, 694	molecular basis of phenotypes 506-509
FORS1 antigen 632, 633	phenotype
Forssman blood group system 629	differentiation of negative phenotypes
amino acid sequence 631	509
carrier molecule 631, 631f	distribution 509
database accession numbers 630	terminology 505
disease association 631-632	GETI antigen 523, 524
expression 629	GIL antigen 617, 618
FORS1 antigen 632, 633	Gill blood group system 615
function 631	amino acid sequence 616
gene 629	carrier molecule 616
molecular basis of phenotypes	database accession numbers 615
FORS1- phenotype 630	disease association 617
FORS1+ phenotype 630	expression 615
terminology 629	function 616–617

Gill blood group system (Continued)	H+W phenotype in secretions 493
Gill blood group system (Continued)	weak H antigens 491
gene 615	•
GIL antigen 617, 618	phenotype characteristics 496
GIL silencing 616–617	terminology 489
terminology 615	He antigen 74–77
Globoside 3-α- <i>N</i> -acetylgactosamyltransferase	Hemolysis
1, see Forssman blood group system	alloantibodies 708
Globoside blood group collection 659	causes
terminology 659	immune 708–709
carrier molecule 659	non-immune 709–710
disease association 659	drug-induced immune hemolytic anemia
null phenotypes 660	710–717
Globoside blood group system 609	Hermes antigen, see Indian blood group system
amino acid sequence 611	Hg ^a antigen 402, 403
carrier molecule 611, 611f	Hil antigen 96–98
database accession numbers 610	HJK antigen 679
disease association 611	HOFM antigen 679
expression 609	Hop antigen 105, 106, 107
function 611	Hr antigen 148–194, 220–221
gene 609	Hr ₀ antigen 219–220
molecular basis of phenotypes	hr ^B antigen 230–232
p phenotype 610	Hr ^B antigen 235, 236
P ^k phenotype 610	hr ^H antigen 228
P antigen 612, 613	hr ^S antigen 221, 222
phenotypes 612	Hu antigen 671, 672
terminology 609	Hut antigen 95
Glossary 725	Hy antigen 449, 450
Glycophorin A, see MNS blood group system	11y untigen 447, 430
Glycophorin B, see MNS blood group system	
Glyphorin C, see Gerbich blood group system	1
Glyphorin D, see Gerbich blood group system	i antigen 652, 653
	I antigen 607–608
Go ^a antigen 229–230	I blood group system 603
GUTI antigen 542	amino acid sequence 605
Gy ^a antigen 448, 449	carrier molecule 605
	database accession numbers 604
Н	expression 603
H antigen 497, 498	function 605
•	
HAG antigen 108, 128	GCNT2*01 silencing 604, 605 gene 603
H blood group system 489	•
amino acid sequence 495	I antigen 607–608
carrier molecule 495, 495f	molecular basis of phenotypes 604–606
database accession numbers 490	phenotypes 606
disease association 496	terminology 603
expression 489	ICAM-4, see Landsteiner-Wiener blood group
function 496	system
FUT1*1 silencing 492–493	IFC antigen 536, 537
gene 489	Ii blood group collection 651
H antigen 497, 498	carrier molecule 651
molecular basis of phenotypes	disease association 651
H antigen expression 490	gene 651
H expression in secretions 493	i antigen 652, 653
H- phenotype in secretions 494-495	molecular basis of phenotypes 652
H+ phenotype 490	terminology 651

In ^a antigen 571, 572 In ^b antigen 572, 573 Indian blood group system 567	molecular basis of phenotypes 592 terminology 591 JONES antigen 679
amino acid sequence 569	Jr ^a antigen 638–639
antigens, see Ina antigen; Inb antigen; INFI	JR blood group system 635
antigen; INJA antigen	amino acid sequence 637
carrier molecule 569–570, 569f	carrier molecule 637, 637f
database accession numbers 567	database accession numbers 636
disease association 570	disease association 638
expression 567–571	expression 635
function 570	function 637–638
gene 567	gene 635
molecular basis of phenotypes 568	JR silencing 636
phenotype distribution 570	Jr ^a antigen 638–639
terminology 567	terminology 635
INFI antigen 573, 574	Js ^a antigen 315, 316
INJA antigen 575	Js ^b antigen 316, 317
International Society of Blood Transfusion (ISBT)	vo unugen e 10, e 17
amino acid and nucleotide numbering 704	
antigen terminology 6–7, 19	K
blood group collections 22	k antigen 310, 311
Working Party for Red Cell	K antigen 308, 309
Immunogenetics and Blood Group	K11 antigen 319, 320
Terminology 3, 6, 15	K12 antigen 320, 321
ISBT, see International Society of Blood	K13 antigen 321, 322
Transfusion	K14 antigen 322, 323
1141101401011	K16 antigen 324
_	K17 antigen 324, 325
J	K18 antigen 325, 326
JAHK antigen 255, 256	K19 antigen 326, 327
JAL antigen 247–249	K22 antigen 330
Je ^a antigen 678	K23 antigen 331
JFV antigen 679	K24 antigen 332
Jk3 antigen 380, 381	KALT antigen 337, 338
Jk ^a antigen 377, 379	KANT antigen 341–342
Jk ^b antigen 379, 380	KASH antigen 342–343
JMH antigen 594, 595	KCAM antigen 565
JMHG antigen 598, 599	Kell blood group system 297
JMHK antigen 596, 597	amino acid sequence 303
JMHL antigen 597, 598	antigens, see Jsa antigen; Jsb antigen; k
JMHM antigen 599, 600	antigen; K antigen; K11 antigen; K12
JMHQ antigen 600, 601	antigen; K13 antigen; K14 antigen; K16
Jn ^a antigen 408, 409	antigen; K17 antigen; K18 antigen; K19
Jo ^a antigen 450, 451	antigen; K22 antigen; K23 antigen; K24
John Milton Hagen blood group system 591	antigen; KALT antigen; KANT antigen;
amino acid sequence 593	KASH antigen; KELP antigen; KETI
antigens, see JMH antigen; JMHG antigen;	antigen; KHUL antigen; Km antigen;
JMHK antigen; JMHL antigen; JMHM	Kp ^a antigen; Kp ^b antigen; Kp ^c antigen;
antigen; JMHQ antigen	KTIM antigen; Ku antigen; KUC1
carrier molecule 593, 593f	antigen; KYO antigen; RAZ antigen;
database accession numbers 592	TOU antigen; Ula antigen; VLAN
expression 591	antigen; VONG antigen
function 594	carrier molecule 303-304
gene 592	database accession numbers 298

Kell blood group system (Continued)	Kp ^c antigen 328, 329
disease association 304–305	KREP antigen 409, 410
expression 297	KTIM antigen 338, 339
function 304	Ku antigen 314, 315
gene 297	KUCI antigen 340
KEL silencing 301–302	Kx antigen 502–504
molecular basis of phenotypes	Kx blood group system 499
overview 298–308	amino acid sequence 501
weak Kell antigens 302–303	carrier molecule 501, 501f
phenotype distribution and comparison	database accession numbers 499
305–307	disease association 502
terminology 297	expression 499
KELP antigen 343–344	function 501
KETI antigen 326, 344	gene 499
Kg antigen 679	Kx antigen 502–504
KHUL antigen 345–346	molecular basis of phenotypes 499–502
Kidd blood group system 373	phenotypes 502
amino acid sequence 376	terminology 499
antigens, see Jk3 antigen; Jk ^a antigen; Jk ^b	KYO antigen 339
antigen carrier molecule 376, 376f	
database accession numbers 374	L
disease association 376	LAD, <i>see</i> Leukocyte adhesion deficiency
expression 373	Lan antigen 644, 645
function 376	Lan blood group system 641
gene 373	amino acid sequence 643
JK*A or JK*B silencing 374, 375	carrier molecule 643
molecular basis of phenotypes	database accession numbers 641
overview 374	disease association 643
weak or partial Kidd antigens 374	expression 641
phenotype distribution 377	function 643
terminology 373	gene 641
Km antigen 327, 328	Lan antigen 644, 645
Kn ^a antigen 554, 555	molecular basis of Lan _{null} phenotype 642–643
Kn ^b antigen 555, 556	terminology 641
Knops blood group system 549	Landsteiner-Wiener blood group system 467
amino acid sequence 551, 551f	amino acid sequence 469
antigens, see KCAM antigen; Kn ^a antigen;	antigens, see LWa antigen; LWab antigen;
Kn ^b antigen; McC ^a antigen; McC ^b	LW ^b antigen
antigen; Sl3 antigen; Sla antigen; Vil	carrier molecule 469-470, 470f
antigen; Yka antigen	database accession numbers 468
carrier molecule 552, 552f	disease association 470–471
database accession numbers 550	expression 467
disease association 553	function 470
expression 549	gene 467
function 553	LW silencing 468
gene 549	molecular basis of phenotypes
molecular basis of phenotypes 550	overview 468
phenotype distribution 553	weak antigens 469
terminology 549	phenotype distribution 471
Kp ^a antigen 311, 312	terminology 467, 471
Knb antigen 312, 313	Le ^a antigen 351–353

Le ^{ab} antigen 354, 355	LURC antigen 293
Le ^b antigen 353, 354	Lutheran blood group system 263
Le ^{bh} antigen 355, 356	amino acid sequence 267
Le ^c antigen 665–666	antigens, see Aua antigen; Aub antigen; Lu3
Lectin, types and specificity 726–728	antigen; Lu4 antigen; Lu5 antigen; Lu6
Le ^d antigen 666	antigen; Lu7 antigen; Lu8 antigen; Lu9
Leukocyte adhesion deficiency (LAD) 496	antigen; Lu11 antigen; Lu12 antigen;
Lewis blood group system 347	Lu13 antigen; Lu14 antigen; Lu16
amino acid sequence 349	antigen; Lu17 antigen; Lu20 antigen;
antigens, see ALeb antigen; BLeb antigen;	Lu21 antigen; Lu ^a antigen; Lu ^b antigen;
Lea antigen; Leab antigen; Leb antigen;	LURC antigen
Le ^{bh} antigen	carrier molecule 267-268, 268f
carrier molecule 349	database accession numbers 264
database accession numbers 348	disease association 269
disease association 349-350	expression 263
expression 347	function 268-269
function 349	gene 263–264
gene 347	LU silencing 265
molecular basis of phenotypes	molecular basis of phenotypes
Le(a-b-) phenotype 348–349	In(Lu) phenotype 266
Le(a+b+) phenotype 348	Lu _{mod} phenotype 266–267
overview 348-351	overview 264–265
phenotype distribution 350	phenotype distribution and comparison 269
terminology 347	terminology 263
Li ^a antigen 679	LW ^a antigen 472, 473
LKE antigen 660–661	LW ^{ab} antigen 474, 475
LOCR antigen 257, 258	LW ^b antigen 475, 476
Low-incidence antigens, see Bi antigen;	LW glycoprotein, see Landsteiner-Wiener
By antigen; Bx ^a antigen; Chr ^a antigen;	blood group system
HJK antigen; HOFM antigen; Lia antigen;	
Jea antigen; JFV antigen; JONES antigen;	
Kg antigen; Milne antigen; Pta antigen;	M
RASM antigen; Re ^a antigen;	M antigen 65–67
REIT antigen; SARA antigen; To ^a antigen	M ₁ antigen 672, 673
Ls ^a antigen 516–518	Major Duffy glycoprotein, see Duffy blood
Lu3 antigen 273, 274	group system
Lu4 antigen 275, 276	MAM antigen 689
Lu5 antigen 276, 277	MAR antigen 252, 253
Lu6 antigen 277, 278	MARS antigen 130, 131
Lu7 antigen 278, 279	McC ^a antigen 557, 558
Lu8 antigen 280, 281	McC ^b antigen 561, 562
Lu9 antigen 281, 282	M ^e antigen 87, 88
Lu11 antigen 282–283	MER2 antigen 588, 589
Lu12 antigen 283, 284	M ^g antigen 69, 85–86
Lu13 antigen 284, 285	Mi ^a antigen 77–79
Lu14 antigen 285, 286	Mi ^c antigen 79, 80
Lu16 antigen 286, 287	Milne antigen 679
Lu17 antigen 287, 288	Minor Duffy glycoprotein, see Duffy blood
Lu20 antigen 291, 292	group system
Lu21 antigen 292, 293	MINY antigen 118, 119
Lu ^a antigen 270, 271, 272	Mit antigen 67, 102
Lu ^b antigen 272, 273	MN CHO blood group collection 671

MNS blood group system 53	O
amino acid sequence 60	Ok ^a antigen 570, 580
antigens, see Cla antigen; DANE antigen;	OK blood group system 577
Dantu antigen; En ^a antigen; ENAV	amino acid sequence 578
antigen; ENDA antigen; ENEH antigen;	antigens, see Oka antigen; OKGV antigen;
ENEP antigen; ENEV antigen;	OKVM antigen
ENKT antigen; ERIK antigen;	carrier molecule 579f, 580
Far antigen; HAG antigen; He antigen;	database accession numbers 578
Hil antigen; Hop antigen; Hut antigen;	disease association 580
M antigen; MARS antigen; Me antigen;	expression 577
Mg antigen; Mia antigen; Mc antigen;	function 579
MINY antigen; Mit antigen; MNTD	gene 577
antigen; Mt ^a antigen; Mur antigen;	molecular basis of phenotypes 578
MUT antigen; M ^v antigen; N antigen;	terminology 577
'N' antigen; Nob antigen; Nya antigen;	OKGV antigen 572–573, 581
Or antigen; Os ^a antigen; Ri ^a antigen; s	OKVM antigen 573–574, 582
Antigen; S antigen; SAT antigen;	Ol ^a antigen 625, 626
s ^D antigen; St ^a antigen; TSEN antigen;	Or antigen 113, 114
U antigen; Vr antigen; Vw antigen	Os ^a antigen 124, 125
carrier molecule description 60-62, 61f	
database accession numbers 54-65	_
disease association 62	P
expression 53	P antigen 612, 613
gene 53	P synthase, see Globoside blood group system
glycophorin phenotypes and associated	P1 antigen 140–142
antigens 63	P1PK blood group system 135
hybrid phenotypes 64	amino acid sequence 139
molecular basis of phenotypes 54–59	antigens, see NOR antigen; P1 antigen;
phenotype distribution 62–63	P ^k antigen
silencing of genes 60	carrier molecule 139
terminology 53	database accession numbers 136
MNTD antigen 133, 134	expression 135
Mo ^a antigen 400–401	gene 135–136
Mt ^a antigen 88, 89	molecular basis of phenotypes 136-138
Mur antigen 82–84	phenotype distribution 139
MUT antigen 120–121	terminology 135
M ^v antigen 99, 100	Papain
	antigen identification 692–693
N	substrate specificity 20, 694
• •	PEL antigen 688
N antigen 67, 68, 69	Pepsin, substrate specificity 694
'N' antigen 112–113	P ^k antigen 142–143
NFLD antigen 407, 408	Pk synthase, see P1PK blood group system
901 Series of High-Incidence Antigens 681	Polyagglutination, types 727–728, 728f
antigens, see AnWj antigen; Pt ^a antigen;	Problem-solving, useful information 707, 724–725
Ata antigen; Emm antigen; MAM	Pt ^a antigen 678
antigen; PEL antigen; Sd ^a	PX2 antigen 661, 662
antigen	
overview 22, 681	R
Nob antigen 140 144 145	
NOR antigen 140, 144–145 Nou antigen 244	Raph blood group system 585
Nya antigen 94, 95	amino acid sequence 586
Try antigen 94, 93	carrier molecule 587, 587f

database accession numbers 586 disease association 587	Rh29 antigen; Rh32 antigen; Rh33 antigen; Rh35 antigen; Rh39 antigen;
expression 585	Rh41 antigen; Rh42 antigen; Riv
function 587	antigen; Sec antigen; STEM antigen;
gene 585	Tar antigen; V antigen; VS antigen
MER2 antigen 588, 589	carrier molecule 190–191
molecular basis of phenotypes 586	database accession numbers 148-194
RAPH silencing 586	disease association 191
terminology 585	expression 147
RASM antigen 679	function 191, 193
RAZ antigen 335, 336	gene 147–148
Rb ^a antigen 395, 396	molecular basis of phenotypes
RBC, see Red blood cell	D-negative phenotypes 169–172
Re ^a antigen 678	Del phenotype 168
Red blood cell (RBC)	partial and weak partial D phenotypes
antigen copy number by system 721-722	150–160
drug-induced protein adsorption 717	Rhce phenotypes 173
membrane components carrying	RhcE phenotypes 181–182
antigens 6f	RhCe phenotypes 179–181
REIT antigen 679	RhCE phenotypes 173–178,
Rg1 antigen 487, 488	182, 183
Rg2 antigen 488	weak D phenotypes 161-167
Rh-Associated Glycoprotein blood group	phenotype distribution 192-193
system 619	rearranged genes 184-185, 185f
amino acid sequence 622	RHCE haplotypes
antigens, see DSLK antigen; Duclos	partial and weak RhCe haplotypes 189
antigen; Ola antigen; RHAG4	189f
antigen	partial and weak RhcE haplotypes 189
carrier molecule 623, 623f	189f
database accession numbers 620	partial and weak Rhce haplotypes 188.
disease association 623	188f
expression 619	RHD haplotypes 186, 186f
function 623	Rh _{null} red blood cell protein
gene 619	expression 720
molecular basis of phenotypes 620, 622	sequence differences between RHD and
RHAG silencing 620, 621	RHCE 149–150
terminology 619	silencing
Rh blood group system 147	RhCE 184
amino acid sequences 190, 190f	RHCE 183
antigens, see BARC antigen; Bea antigen;	terminology 147
c antigen; C antigen; cE antigen;	Rh26 antigen 226, 227
Ce antigen; CE antigen; CEAG antigen;	Rh29 antigen 228–229
CELO antigen; CENR antigen; CEST	Rh32 antigen 232, 233
antigen; C ^G antigen; Crawford antigen;	Rh33 antigen 233–235
C^{W} antigen; C^{X} antigen; D antigen;	Rh35 antigen 236, 237
DAK antigen; Dav antigen; DW antigen;	Rh39 antigen 240
e antigen; E antigen; Evans antigen;	Rh41 antigen 241–242
EW antigen; f antigen; FPTT antigen;	Rh42 antigen 242, 243
G antigen; Go ^a antigen; Hr antigen; Hr ₀	RHAG4 antigen 627, 628
antigen; hr ^B antigen; Hr ^B antigen;	RHCE, see Rh blood group system
hrH antigen; hrS Antigen; JAHK antigen;	RHD, see Rh blood group system
JAL antigen; LOCR antigen;	Ri ^a antigen 92, 93
MAR antigen: Non antigen: Rh26:	Riv antigen 245–246

S	TOU antigen 334
s Antigen 71–72	Tr ^a antigen 410, 411
S antigen 69–70	Trypsin
SARA antigen 679	antigen identification 692–693
SAT antigen 121–123	substrate specificity 20, 694
Sc1 antigen 431, 432	TSEN antigen 116–118
Sc2 antigen 432, 433	
Sc3 antigen 433, 434	U
Sc4 antigen 434, 435	-
SCAN antigen 437, 438	U antigen 72, 73, 74
SCER antigen 436, 437	Ul ^a antigen 318
Scianna blood group system 427	UMC antigen 540, 541
amino acid sequence 429	Unnamed blood group collection 665
antigens, see Sc1 antigen; Sc2 antigen; Sc3	antigens, see Le ^c antigen; Le ^d antigen
antigen; Sc4 antigen; SCAN antigen;	carrier molecule 665
SCER antigen; STAR antigen	terminology 665
carrier molecule 429–430	Urea transporter, see Kidd blood group
database accession numbers 427	system
disease association 430	
expression 427	V
function 430	V antigen 216, 217
gene 427	Valugen 216, 217 Vel antigen 667, 668
molecular basis of phenotypes 428	Vel blood group collection 667
phenotype distribution 430	antigens, see ABTI antigen; Vel antigen
SC silencing 428, 429	carrier molecule 667
terminology 427	terminology 667
s ^D antigen 101, 102	Vg ^a antigen 403, 404
Sd ^a antigen 685–687	Vil antigen 562, 563
Sec antigen 246, 247	VLAN antigen 333
Semaphorin 7A, see John Milton Hagen blood	VONG antigen 336, 337
group system	Vr antigen 86, 87
SERF antigen 543, 544	VS antigen 222, 223
700 Series of Low-Incidence Antigens 22, 677	Vw antigen 81, 82
Sext antigen 675	v w antigen 61, 62
Sialidase, substrate specificity 694	
Sj antigen 675, 676	W
S13 antigen 563, 564	Warm autoantibodies 709-710
Sla antigen 558, 559	WARR antigen 396, 397
St ^a antigen 90–91	Wb antigen 515, 516
STAR antigen 435, 436	Wd ^a antigen 394, 395
STEM antigen 249, 250	WES ^a antigen 538, 539
SW1 antigen 412, 413	WES ^b antigen 539, 540
Sw ^a antigen 404, 405	WH antigen 486, 487
	Wk ^a antigen, see K17 antigen
т	Wr ^a antigen 391, 392
T	Wr ^b antigen 392, 393
Tar antigen 240–241	Wu antigen 398, 399
Tc ^a antigen 530, 531	-
Tc ^b antigen 532, 533	V
Tc ^c antigen 533, 534	X
Tetraspanin, see Raph blood group system	Xg ^a antigen 425–426
Tm antigen 673, 674	Xg blood group system 421
To ^a antigen 678	amino acid sequences

CD99 422 Ytb antigen 419, 420 Xga 422 Yt blood group system 415 antigens, see CD99 antigen; Xga antigen amino acid sequence 416 antigens, see Yta antigen; Ytb antigen carrier molecule 423 carrier molecule 416-417, 417f database accession numbers 422 disease association 423 database accession numbers 415 expression 421 disease association 417 function 423 expression 415 gene 421 function 417 molecular basis of phenotypes 422 gene 415 phenotype distribution 423 molecular basis of phenotypes 416 phenotypic relationship of antigens 424 phenotype distribution 417 terminology 421 terminology 415 Y Z ZENA antigen 544, 545 Yka antigen 559-561

Yta antigen 418, 419