

Index

Page numbers in *italic* refer to figures.

Page numbers in **bold** refer to tables.

Sorting is in letter-by-letter alphabetical order

so that, for example, 'A gene' comes after 'ageing'.

Numerals sort before letters.

5% dextrose, haemolysis, 469

9a antigen, 570

A₁B cells, plasma antibody screening with, 332

A₁ subgroup, 120–121, 428

ABO haemolytic disease, 535

B antigen acquired, 126

cis AB phenotype, 122

red cell destruction, passively acquired anti-A, 465

red cell testing, 328–329

A₂B group, missed incompatibilities, 334

A2m(–1) phenotype, anaphylactoid reactions, 674

A₂ subgroup, 120–121, 428

ABO haemolytic disease, 535

A₃ phenotype, 121

A4GALT gene, 146, 147, 287

A antigen, 153

alloimmunization, pregnancy, 136

development, 125

ethnicity, 121

neonates, 534

number of sites, 124–125

platelets, 573

storage of serum on, 128

subgroups on red cell destruction, 428

abbreviated crossmatching, 333–334

ABCB6 mutations, 239

abciximab, platelet transfusion and, 624

ABO gene, 119

alleles, 120t

carcinoma of pancreas, 126

abortions

anti-D antibody injections, 524, 527

anti-PP1P^h antibody, 149, 150

habitual, HLA antigens, 565

IgG3 antibodies, 150

maternal fetal haemoglobin, 504

transplacental haemorrhage, 507

ABO system, 118–138

antibodies *see specific antibodies*

anti-Le^a antibody and, 144

bedside group confirmation, 337

biosynthetic relationships with other systems, 153

blood grouping, 328–329

bedside confirmation, 337

serology *vs* molecular biology, 345

coagulation factors and, 60

compatible platelets, 581

competition with other systems, 84, 85

development, 61–62

discovery, 53

haemolytic disease of the newborn,

531–537

management, 535–537

immune responses, 74

incompatibility

on D immunization, 193, 509

haematopoietic stem cell

transplantation, 636–637

maternal fetal red cells, 505, 506

incompatible bone marrow

transplantation, 636

delayed haemolytic transfusion

reactions, 484–485

incompatible transfusions, 459–469, *see*

also spontaneous red cell

agglutination

differential agglutination, 490

frequency, 460–461

mortality, 461–462

severity of reactions, 462

leukaemia, 125–126

on Lewis phenotypes, 138

Lewis substances and, 142–143

red cell destruction, 414–415, 462–465,

see also anti-A antibody; anti-B antibody

reticulocytes, 62

soluble antigens, 55

A(B) phenotype, 123

abruptio placentae, haemolytic reaction in mother, 460

absolute neutrophil counts, leucapheresis donors, 773

absorption (gastrointestinal), vitamin K, 821

absorption methods, antibody isolation, 339–340

AB substance

horse, 136

plasma screening with, 332

ABTI antigen, 239

accelerated red cell destruction, *see also* hyperhaemolysis

delayed haemolytic transfusion reactions, 483–484

D-positive transfusion, 443

without demonstrable antibodies, 444–445

'acceptable' mismatches, platelet transfusion, 582

accessory spleens, 425

acetate, platelet storage, 619

acetylcholine receptor antibody, removal by plasma exchange, 782

acetylcholinesterase, Yt antigens and, 231

acid–citrate–dextrose method, red cell

labelling, 360

acid–citrate–dextrose solutions (ACD), 883

blood storage

aggregates, 682

complement, 306

red cell storage, 368, 369, 370, 372, 374

freezing point, 378

- acid citrate-phosphate-dextrose, 883
 acid-digitonin method, 340
 acid-elution methods
 fetal red cells, 501–502, 884–885
 platelet antibodies, 589
 transplacental haemorrhage, 502–503
 acidified solutions, red cell storage, 367–368, 370, 372
 acidosis, citrate load, 680
 acid-treated platelets, 583
 acquired antithrombin deficiency, 863
 acquired resistance of red cells, 262–263, 422–423
 acriflavine, 281
 activated partial thromboplastin time,
 fresh-frozen plasma on, 640
 activated prothrombin complex concentrates,
 853
 activation, stored platelets, 617
 activation motif (ITAM), B-cell receptor,
 86
 activators, enzymes, 310
 acupuncture, deferrals of donations, 5
 acute hyperleucocytic leukaemias (AHL),
 787, 788
 acute lung injury, *see also* transfusion-
 associated acute lung injury
 adult respiratory distress syndrome, 45
 acute lymphoblastic leukaemia (ALL)
 donor lymphocyte infusion, 638
 leucapheresis, 788
 acute myeloid leukaemia
 ABO system, 126
 Colton system, 234
 donor lymphocyte infusion, 638
 granulocyte colony stimulating factor,
 809
 on immune responses, 75
 leucapheresis, 788
 leucostasis, 788
 platelet transfusion, 622
 immunization, 577
 tranexamic acid, 818
 acute normovolaemic haemodilution, 41–42,
 802
 haemoglobin-based oxygen carriers,
 830–831
 perfluorochemicals, 828
 ADAMTS13, 640–641, 783–784
 on von Willebrand factor, 126
 ADCC assays, 96–97
 anti-D antibodies, 427
 subclasses, 431
 additive solutions
 blood storage, 373, 374, 375
 for premature infants, 392
 for platelets, 872
 for red cells, 882
a-deficient escape mutants, hepatitis B virus,
 702, 705
- adenine
 red cell storage, 368, 370, 373
 packed cells, 374–375
 rejuvenation, 375
 toxicity, 373
 adenine-dextrose solution, 882
 adenosine, red cell storage, 368
 adenosine monophosphate, stored red cells,
 370
 adhesion
 leucocytes, leukaemia, 788
 red cells, sickle cell disease, 394
 adjacent genes, D antigen variants, 175
 adoptive immunotherapy, 637, 639
 adrenaline, for anaphylaxis, 677
 adsorption
 bacteria, 285–286
 drugs, 279–280
 adult respiratory distress syndrome, 45
 adult T-cell leukaemia (ATL), 718, 719
 Advanced Trauma Life Support protocols,
 32
 adverse reactions, *see also* haemolysis;
 hypersensitivity
 anti-D antibody injections, 203
 anti-HPA-1a antibody, 672
 apheresis donors, 777–778
 immunoglobulins, 861–862
 transfusion, 660–684, *see also* haemolytic
 transfusion reactions; infections
 affinities, monoclonal antibodies, 77–78
 affinity constants
 functional, 89–90
 Rh antibodies, 187–188
 age
 of consent, 1
 donors, 1
 ageing
 ABO agglutinins, 130
 population, 3
 on red cell survival, 362
 ageing (of red cells), 358–359
 A, B and H antigens, 125
 storage, 369–370
 no effect on viability, 377–378
 A gene, secretions, 139t
 agglutinates, detection, 490
 agglutination of red cells, 91–93
 ABO agglutinins, 132, 287
 ABO haemolytic disease, 534
 ABO system, 131
 anti-I antibodies, 262
 anti-Le^a antibody, 143, 145
 anti-Sd^a antibody, 240
 cord blood, 289
 differential, 356–357, 490, 877
 Dolichos biflorus lectin, 240–241
 enzymes on, 92, 262, 287–288, 307–310
 by HLA antigens, 242
 immunoglobulin classes *vs*, 74–75
 by incompatible plasma, 450
 inhibition in IgA deficiency, 592
 secondary D immunization, 195–196
 warm autoantibodies, 273
 agglutination tests, 303, 311–314
 false-positives, 314
 granulocytes, 571
 human T-cell leukaemia virus antibodies,
 720
 agglutinins, *see also* anti-A antibody; anti-B
 antibody; autoagglutinins
 anti-C, 185
 D immunization, persistence, 196
 for enzyme-treated red cells, 287–288
 fatty-acid-dependent, 281
 Lima beans, 87
 aggregates, 682–683
 agitation
 antiglobulin test, 323
 granulocyte storage, 628
 platelet storage, 617–618
 AHG reagents *see* antiglobulin reagents
 AIDS *see* HIV infection
 A intermediate, 121
 air embolism, 681
 donors, 13
 alanine aminotransferase (ALT), non-A,
 non-B hepatitis, 706
 albumin
 antiglobulin test, 321
 congenital absence, 850
 hydrops fetalis, 509–510
 ¹²⁵I-labelled, plasma volume estimation,
 875
 plasticizers and, 684
 on red cell agglutination, 92
 solution, 30, 31, 32, 849–850
 burns, 44
 cold autoagglutinins in, 262
 false-positive agglutination tests, 314
 fatty-acid-dependent agglutinin and,
 281
 plasma exchange, 780
 synthesis, plasmapheresis donors, 769
 albumin autoagglutinins, 311
 ALe^b antigen, 138, 142
 alkalization
 additive solutions, red cell storage, 373
 urine, for transfusion reactions, 469
 alkylating agents, effect on IgM, 70
 alkylation, IgG3 antibodies, 311
 allele discrimination assay, 345
 alleles
 blood groups, 58–59, 120t
 frequencies, 58–59
 terminology, 54
 weak alleles, A (group), 123–124
 allele-specific primers (ASP), red cell
 grouping, 343
 allelic enhancement, 123–124

- allergies
 apheresis donors, 778
 dextran, 35, 37
 exclusion of donors, 5
 management, 676–677
 plasma alternatives, 37
 plasma transfusions, 673
 protamine, 825
- alloimmunized patients
 blood for, 345
 delayed haemolytic transfusion reactions, 482–483
 sickle cell disease, 766
- allotypes, IgG, 590–591
- allotypic markers, immunoglobulins, 67
- α_1 -antitrypsin, 863
- α -haemoglobin, dissociation curve, 829f
- alpha-alpha six-barrel fold, complement molecules, 102–103
- α -fetoprotein, 502
 chorionic villus sampling, 504
- alpha fucosyltransferases, *see also* FUT1; FUT2; FUT3
hh genotype, 125
- α -galactosidases, converting A and B cells to O, 127
- α -interferon
 autoantibodies, 280
 cold haemagglutinin disease, 265
- alphanumeric terminology, IgG subclasses, 591
- α -methyl dopa *see* methyl dopa
- α -N-acetylgalactosaminidases, converting A and B cells to O, 127
- Alphanate, 854
- Alsever's solution, 305
- alternative pathway, complement, 101–102
- amegakaryocytic thrombocytopenia, tranexamic acid, 818
- AMG 531 (TPO peptide-agonist), 812–813
- Amicus cell separator, 770
- 2-aminoethylthiuronium bromide (AET), 215
- 2-aminoethylthiuronium bromide, 339
- aminoglycoside antibiotics, 305
- ammonia, blood storage, 681
- ammonia salts, fainting and, 11–12
- amniocentesis, 504, 511, 515–516
- amniotic fluid
 A, B and H antigens, 128
 immunoglobulins, 68
 optical density, 515
- amorph Rh_{null}, 181
- amphotericin B, 305
- amplification, DNA, 699
- anaemia, *see also* iron balance; *specific diseases*
 biphasic haemolysins and, 268
 burns, 45
 cancer, 806, 807
 chronic renal failure, 804, 805–807
- donations
 allowed, 6
 deferred, 3, 7
 donors, screening, 8–9
 I and i antigens, 152
 oxygen delivery and, 27, 384
 preoperative assessment, 804
 recurrent haemorrhage, 390
 red cell transfusion, 384–398
- anaerobic glycolysis, platelets, 616, 619
- anamnestic responses, 72, 436, 458, 477–488,
see also immune responses
 delayed serological transfusion reactions, 485
- anaphylaxis, 672–675
 aprotinin, 820
 Chido/Rodgers antibodies, 235
 ethylene oxide, 684
 fresh-frozen plasma, 639
 treatment, 677
 vitamin K, 824
- anaplasmosis, human, 732–733
- angioedema, hereditary, 856–857
- angiotensin, 677
- angiotensin-converting enzyme inhibitors
 blood collection, 801
 LDL apheresis and, 786
 reactions to prekallikrein activator, 677
- animal factor VIII concentrates, 853
- animals
 anti-P₁ antibody, 148–149
 group-specific substances, 136, *see also* Forsmann antigens
 Lewis antibodies from, 144
 transfusions from, 411
- anion transport protein, glycosylation abnormality, 61
- ankyrin, 56
 Rh membrane complex and, 182
- annealing, nucleic acid testing, 699
- Antarctic sea-ice diatoms, ice-binding proteins, 306
- antenatal screening, 510–511, 523, 527
- antenatal testing
 ABO haemolytic disease, 535–536
 antibodies, 510–511
 fetal D grouping, 516–517
 haemolytic disease of the newborn, 513–517
- antenatal treatment
 haemolytic disease of the newborn, 519–521
 intravenous anti-D immunoglobulin, 524–526, 527
 neonatal alloimmune thrombocytopenia, 585
- anti-A₁ antibody, 133
 as autoantibody, 133
 low ionic strength solutions, 310
 red cell destruction, 419, 465
- anti-A₁Le^b antibody, 144
- anti-A₁ lectin, 134
- anti-A antibody, 129–138
 ABO haemolytic disease, 533, 534–535
 as autoantibody, 133
 concentrations for agglutination, 132
 crossreactivity, 132–133
 development, 130
 equilibrium constants, 132
 in group A subjects, 134
 group O blood with, 332
 haemolysis, 85, 414, 417–418, 448–451, 459–469
 immunoglobulin treatment, 862
 haemolytic disease of the newborn, 531–537
 immune responses and, 138
 immunoglobulin classes, 72, 74, 130
 incompatible transfusions on titre, 135
 isolation by absorption, 339–340
 lysins
 ethnicity on frequency, 131
 tests for, 315
- monoclonal
 crossreactivity, 78
 mouse, 130
 persistence after stimulus, 138
 platelet destruction, 581
 red cell sequestration, 423
 removal
 by plasma exchange, 781
 from sera, 341
 vs volume of incompatible red cells, 436
- saliva, 132
 vaccines and, 5, 136
- anti-A₂B, crossreactivity, 132–133, 534
- anti-acetylcholine receptor, removal by plasma exchange, 782
- anti-AI antibody, 133, 152–153
- anti-A lectin, 134
- anti- α antibodies, 592
- anti-AnWj antibody, 238
- anti-B antibody, 129–138
 ABO haemolytic disease, 533, 534–535
 as autoantibody, 133
 concentrations for agglutination, 132
 crossreactivity, 132–133
 development, 130
 equilibrium constants, 132
 in group B subjects, 134
 group O blood with, 332
 haemolysis, 85, 414, 417–418, 448–450, 459–469
 immunoglobulin treatment, 862
 haemolytic disease of the newborn, 531–537
 immune responses and, 138
 immunoglobulin classes, 72, 74, 130
 incompatible transfusions on titre, 135
 isolation by absorption, 339–340

- lytic, tests for, 315
- monoclonal
- crossreactivity, 78
 - mouse, 130
- naturally occurring, 71–72
- platelet destruction, 581
- red cell sequestration, 423
- red cell survival curves, 428
- removal
- by plasma exchange, 781
 - from sera, 341
 - vs volume of incompatible red cells, 436
- saliva, 132
- serology, 75
- anti-Bg^a antibody, 459
- anti-BI antibody, 152–153
- anti-Bi antibody, 152–153
- antibiotics, 279, 280, 281
- aminoglycosides, 305
 - anticoagulant activity, reversal, 824
 - blood grouping and, 306
 - stored blood, 735
- anti-BLe^b antibody, 144
- anti-B lectin, 134
- antibodies
- ABO system, 129–134, *see also specific antibodies*
 - antenatal testing, 510–511
 - in antiglobulin reagents, 316–317
 - artificial construction, 78
 - binding fractions, 433
 - against bound antigens, 279–281
 - complement activation, 104
 - complement on binding, 103
 - crossreactivity *see* crossreactivity of antibodies
 - cytomegalovirus, 723
 - delayed haemolytic transfusion reactions, plasma levels, 482–483
 - disappearance between transfusions, 334–335
 - Duffy system, 220
 - effects on red cells, 93–95, 414–429, 443–448, *see also* anti-A antibody; anti-B antibody; anti-K antibody
 - elution *see* elution, antibodies
 - febrile reactions, 660–662
 - freshly-washed red cells, 288
 - haemolytic disease of the newborn, 501
 - HIV infection, 712, 713
 - human T-cell leukaemia virus infections, 719
 - identification, 337–342
 - in vitro* sensitization of red cells, 429–431
 - Kell system, 216–218
 - autoimmune haemolytic anaemia, 275–276
 - pregnancy, 528–530
 - Kidd system, 221, 421
 - on enzyme-treated red cells, 307
 - as haemolysins, 459
 - persistence, 74
 - Knops system, 237
 - Lewis system *see* Lewis system, antibodies
 - to low-frequency antigens, 241–242
 - Lutheran system, 229–230
 - macrophage-bound, 448
 - maternal, 499–501
 - MNSs system, 224–228
 - multiple transfusions, 336
 - naturally occurring *see* naturally occurring antibodies
 - to neutrophil antigens, 570
 - not found after incompatible transfusions, 443–448
 - number of molecules per red cell, 91–92, 429–434
 - P and GLOB systems, 148–150
 - passively acquired, 448–451, 490, 676
 - platelets, *see also* platelet-specific antibodies
 - tests for, 586–588
 - reactions with antigens, 88–97
 - blood grouping, 303–304, 317–319
 - cold haemagglutinins, 265–266
 - factors affecting, 306–311
 - red cell polyagglutinability, 282, 283
 - of red cells, 62–87
 - frequency, 78–81
 - removal by immunoaffinity apheresis, 786
 - removal by plasma exchange, 781–782
 - Rh system *see* Rh system, antibodies
 - screening
 - false-negative results, 330
 - solid-phase systems, 325
 - subclasses, 69, 87
 - to thrombopoietin, 812
 - titres, blood grouping, 325–326
 - transfusion-associated acute lung injury and, 666
 - Treponema pallidum*, 731
 - Trypanosoma cruzi*, 740
- antibody-dependent cell-mediated
- cytotoxicity assays, 96–97
 - ABO haemolytic disease, 533
 - haemolytic disease of the newborn, 514
- antibody-mediated rejection, 562
- anti-C3 antibodies, AHG reagents, 316
- anti-C3d reagents
- ABO haemolytic disease and, 534
 - prozone phenomenon, 319
- anti-C antibody, 185, 196–197, *see also*
- anti-C specificity
 - D-negative patients, 331
 - haemoglobinuria, 479
 - naturally occurring, 184
 - pregnancy, 528
- anti-c antibody, 184, 185
- haemolysis, 424–425, 433
 - haemolytic disease of the newborn, 528
 - neonate case, 76
 - pregnancy, 83
 - preventing formation of, 331
 - renal transplantation, 486–487
- anti-carbonic anhydrase, 503
- anti-CD147, 238
- anti-CE antibody, 180, 185
- anti-Ce antibody, 180
- haemoglobinuria, 479
- anti-cE antibody, 180
- anti-ce antibody, 180, 185
- anti-C^g antibody, 184
- anti-Ch antibody, 234
- anti-CMV antibody, 721, 723–724, 861
- anticoagulants
- on complement, 103–104
 - heparin-induced thrombocytopenia and, 590
 - paediatric autologous blood collection, 802
 - protamine as, 824
 - relative excess, 374
 - reversal, 640, 814, 821–825, 855
 - volume, 2
- anti-Co antibodies, 234
- anti-complement reagents, 316
- in antiglobulin test, 319, 322
 - for Lewis antibodies, 145
- anti-Cr antibodies, 236–237
- anti-C specificity, warm autoantibodies, 275
- anti-C^w antibody
- naturally occurring, 184
 - pregnancy, 528
- anti-C^x antibody, 184
- anti-D antibodies, 184, 185–196, *see also* Rh system, antibodies; rhesus immunoglobulin
- accidental transfusion, 476–477
 - agglutination of red cells, 490
 - cellular bioassays, 427
 - as cold agglutinins, 275
 - cold-reacting, 72, 183
 - cyclical fluctuations, 196
 - to D antigen variants, 177
 - differences between, 434
 - differences in amounts injected, 434–436
 - donor-derived, 487
 - dosage, 199–201, 203, 884–885
 - D-positive red cells and, to D-negative subjects, 431–433
 - D-positive transfusion *see* D-positive transfusion
 - elution, 340
 - equilibrium constants, 90
 - error rates in detection, 330
 - frequency, 78, 79
 - haemolysis, 415, 424, 425, 426, 862
 - donor red cells, 475
 - recipient red cells, 450–451

- haemolytic disease of the newborn, 501–527
- IgM, 185
- affinity constants, 187
 - antigen-binding sites, 89
 - passive, 202–203
 - immune responses with, 73
 - for immune thrombocytopenic purpura, 860–861
 - incomplete, febrile reactions, 476
 - injection after D-positive transfusion, 438, 475
 - in vitro* red cell sensitization, 430–431
 - laboratory separation, 69
 - monoclonal, 77, 78, 172t, 526
 - D^{VI} antigen and, 178
 - suppression of primary immune responses, 201
 - naturally occurring, 183–184
 - neonates, 500
 - estimation, 518–519
 - quantification, 187–188, 326–327, 513, *see also* dosage *under* anti-D antibodies
 - reference solutions, 328
 - removal by plasma exchange, 781
 - serology, 75
 - serum ‘Ripley’, 131, 186–187
 - storage, 858
 - suppression by passive antibody, 85–86
 - suppression of primary immune responses
 - delayed administration, 201
 - D-positive transfusion, 199–204, 438
 - tests for, 510–511, *see also* quantification *under* anti-D antibodies
 - error rates, 330
 - therapeutic, *see also* anti-D *under* intravenous immunoglobulin
 - historical aspects, 199
 - platelet transfusion, 625
 - recipient serum screening after, 330
 - safety, 675
 - transient DAT positivity, 198
 - two-component red cell survival curve, 429
- anti-D-coated particles, transplacental haemorrhage measurement, 503
- anti-dextran, IgG, 35
- anti-Di antibodies, 231
- anti-Do^b antibody, 234
- anti-Duv(+), 576
- anti-E antibody, 185, 196, 197, 241, *see also* anti-E specificity
- D-negative patients, 331
 - haemolysis, 425–426
 - immunoglobulin classes, 72
 - naturally occurring, 184
 - neonate case, 76
 - pregnancy, 79, 528
 - two-component red cell survival curve, 429
- anti-e antibody, *see also* anti-e specificity
- pregnancy, 528
 - renal transplantation, 487
- ‘anti-En^a’ antibodies, 227
- anti-Wr^b with, 231
- anti-E specificity, warm autoantibodies, 275
- anti-e specificity, warm autoantibodies, 275
- anti-F(ab’)₂ antibodies, cold haemagglutinin disease, 262
- antifibrinolytic agents
- aprotinin, 813, 819, 820
 - lysine analogues, 813, 817–820
- anti-Fy₃ antibody, 220, 459
- anti-Fy₄ antibody, 220
- anti-Fy₅ antibody, 220
- anti-Fy₆, 218–219
- anti-Fy^a antibody, 220
- haemolytic disease of the newborn, 530
 - red cell destruction, 421, 424
 - Rh D immunization on formation, 83
- anti-Fy antibody, frequency, 80
- anti-Fy^b antibody, 220
- anti-G antibody, 179, 196
- anti-Ge₃ antibody, 236, 530
- anti-Ge antibodies, 235–236
- antigenic determinants, 58
- distribution, 91
- antigen induced naturally occurring antibodies, 71
- antigen-negative platelets (HPA-1a antigen), for post-transfusion purpura, 671–672
- antigen presentation, immunosuppression and, 86
- antigen-presenting cells, 554
- alloimmunization to HLA antigens, 577, 580
- antigens
- ABO system, 118–129
 - blood groups, 118
 - on drug–antibody complex binding, 281
 - HIV infection, 712–713, 717
 - monocytes, 570, 573
 - platelets, 573–590
 - reactions with antibodies, 88–97
 - blood grouping, 303–304, 317–319
 - cold haemagglutinins, 265–266
 - factors affecting, 306–311
 - red cells *see* red cells, antigens
 - serum proteins as, 590–592
 - anti-Glm(z) antibody, 675
- antiglobulin reagents, 303
- antibodies, 316–317
 - diluents, 318
 - manual polybrene test, 313
- antiglobulin sera, on red cell agglutination, 131
- antiglobulin test, 315–323, *see also* direct antiglobulin test; indirect antiglobulin test
- abbreviated crossmatching vs, 333–334
 - automation, 324
 - crossmatching and, 334
 - enzyme-linked, 326–327
 - false-negative results, 323
 - false-positive results, 323, 330
 - serum ratio to red cells, 320, 332
 - technique, 319–323
- anti-Gm antibodies, 591, 675–676
- anti-Gy^a antibody, 234
- anti-H antibody, 134
- group O serum, 128
 - haemolytic disease of the newborn, 537
 - red cell destruction, 419–420
- anti-HBc antibody, 700, 701–702, 703
- non-A, non-B hepatitis, 706
- anti-HBe antibody, HBeAg and, 702
- anti-HbF antibody, 503
- anti-HBs antibody, 700, 701, 859, 861
- immunoassays, 702
- anti-HI antibody, 134, 152–153, 419
- anti-Hi antibody, 152–153
- anti-HiLe^b antibody, 152–153
- antihistamines, 664, 676–677
- anti-HJK antibody, 241
- anti-HLe^b antibody (anti-Le^{hH} antibody), 139, 144
- anti-H lectin, 134
- anti-HPA-1a antibody
- adverse reactions, 672
 - neonatal alloimmune thrombocytopenia, 584
 - post-transfusion purpura, 588, 670
 - removal by plasma exchange, 781
- anti-HPA-5b antibody
- neonatal alloimmune thrombocytopenia, 584
 - post-transfusion purpura, 670
- anti-HPA antibodies, post-transfusion purpura, 670
- anti-human globulin reagents *see* antiglobulin reagents
- anti-Hy antibody, 234
- two-component red cell survival curve, 428
- anti-I antibodies, 152, *see also* anti-I specificity; auto-anti-I antibody
- autoimmune haemolytic anaemia, 262
 - cold agglutinins, 263–264, 266
 - as cold antibody, 90, 340
 - complement and, 103, 262–263
 - enzymes on, 307
 - infectious diseases, 263–264
 - mycoplasma infection, 260
 - normal cold autoagglutinins, 261
 - removal, 336
- anti-i antibodies, 152
- cold autoagglutinins
 - identification, 340
 - normal, 261
 - enzymes on, 307
 - infectious diseases, 263–264
- anti-IFC antibody, 236
- anti-IgA antibodies, 591–592
- anaphylaxis, 673–675
 - in antiglobulin test, 319, 321

- of limited specificity, 592, 674
on red cell agglutination, 131
washed red cells for patients with, 397
- anti-IgG antibodies
complement binding, 421–423, 431
¹²⁵I-labelled, 326
reaction with IgG-coated red cells, 317–319
on red cell agglutination, 131
serum sickness-like syndromes, 675–676
- anti-IgM antibody, 131, 319
- anti-In antibodies, 237–238
- anti-I specificity, 275
- anti-I^T antibody, 152
- anti-Jk3 antibody, 221
- anti-Jk^a antibody, 221
autoimmune haemolytic anaemia, 222
errors in detection, 330
haemolysis, 421–422, 475
haemolytic disease of the newborn, 530
Rh D immunization on formation, 83
- anti-Jk^aJk^b antibody, 221
- anti-Jk antibodies, frequency, 80
- anti-Jk^b antibody, 221
red cell destruction, 421–422, 475
renal failure, 479–480
- anti-Jr^a antibody, 531
- anti-Js^a antibody, 217, 530
- anti-Js^b antibody, 217
- anti-K antibody, 216–218
antiglobulin test, 321
ethnicity, 81
frequency, 80
haemolysis, 85, 421, 424, 430, 433
haemolytic transfusion reactions, 218, 475–476
neonate case, 76
pregnancy, 79, 217, 528–530
preventing formation of, 331
Rh D immunization on formation, 83
serology, 217
- anti-k antibody, 217, 530
- anti-Km antibodies, 217, 592
- anti-Kp^a antibody, 217, 530
- anti-Kp^b antibody, 217
hydrocortisone and, 442
negative direct antiglobulin test, 276
- anti-Ku antibody, 217, 530
- anti-Kx antibody, 217
- anti-Le^a antibody, 143
in antiglobulin test, 319
haemolysis, 415, 419, 474
immunoglobulin classes, 72
monoclonal, 144
red cell protection from, 263
serology, 145
- anti-Le^b antibody, 144
red cell destruction, 415, 419, 474
red cell protection from, 263
- anti-Le^{bH} antibody, 139, 144
- anti-Le^{bL} antibody, 144
- anti-Le^c antibody, 144
- anti-Le^d antibody, 144
- anti-Le^s antibody, 144
- anti-Lu3 antibody, 230
- anti-Lu^a antibody, 229, 230
- anti-Lu^aLu^b antibody, 230
- anti-Lu^b antibody, 229–230
multicomponent red cell survival curve, 428
neonate case, 76
- anti-LW antibodies, 183
cold-reacting, 184
transient, 198
transient LW negativity and, 198, 276
- antilymphocyte globulin, direct antiglobulin test, 278
- anti-M antibody, 224–225
monoclonal, 311
red cell destruction, 420, 424
temperature, 421
- anti-M^s antibody, 227
- anti-Mi^a antibody, 223, 227
- anti-Nak antibody, 576
- anti-N antibody, 225–226
infectious mononucleosis, 264
monoclonal, 311
- anti-N lectins, 226
- 'anti-p' (cold agglutinin), 150
- anti-P₁ antibody, 148–149
on enzyme-treated red cells, 307
haemolysis, 419, 420
inhibition studies, 150
low ionic strength solutions, 310
- anti-P₁I antibody, 152–153
- anti-P₁I^T antibody, 152–153
- anti-P antibodies, 149
biphasic haemolysins as, 149, 267
inhibition studies, 150
removal by plasma exchange, 781
- anti-P_k antibody, inhibition studies, 150
- anti-Pl^{AI} antibody, post-transfusion purpura, 669
- anti-PP, P^k antibody, 149, 150, 467
haemolytic disease of the newborn, 530
red cell destruction, 415
- anti-Pr antibodies, 263, 266
low ionic strength solutions, 310
antipyretics, 664
- anti-Rg antibody, 234
- anti-Rh17 antibody, pregnancy, 528
- anti-Rh29 antibody, pregnancy, 528
- anti-Sa antibodies, 263
- anti-S antibody, 226, 241
haemolytic disease of the newborn, 530
red cell destruction, 424
- anti-s antibody, 226
haemolytic disease of the newborn, 530
- anti-Sc3 antibody, thalassaemia, 233
- anti-Sd^a antibody, 240–241
- anti-Sia-b1 cold agglutinins, *Mycoplasma pneumoniae* infection, 264
- antithrombin, 862–863
disseminated intravascular coagulation, 60
fresh-frozen plasma, 639
- antithrombin III, plasma exchange, 787
- anti-TJ^a antibody *see* anti-PP, P^k antibody
- anti-TJ^a antibody, stomach carcinoma and, 60
- anti-TJ^a-like specificity, 149
- anti-Tn antibody
Escherichia coli O86, 282
red cell survival, two-component curve, 428
- antitrypsin, 863
- anti-type 1 A (Lewis-related antibody), 144
- anti-U antibody, 226–227, 530
- anti-V antibody, 185
- anti-Vel antibody, 239, 415, 467
- anti-VS antibody, 185
- anti-Vw antibody, 227
- anti-Wr antibodies, 231
- anti-X antibody, 144
- anti-Xg^a antibody, 232–233
- anti-Yt antibodies, 232
on enzyme-treated red cells, 310
haemolysis, 422
monocyte–monolayer assays, 232, 427
two-component red cell survival curve, 429
- anti-Zw^a antibody, post-transfusion purpura, 669
- Anton system, 238
- anuria, 477
transfusion reaction in, 468
- AnWj antigen, 238
depression on immune response, 76
- AnWj– phenotype, 238
- anxiety, transfusion reactions, 459
- apheresis, 763–798, *see also*
erythrocytapheresis; plasmapheresis; plateletpheresis
air embolism prevention, 13
citrate solutions, 882–883
hereditary haemochromatosis, 16
indications, 780–781
infected donors, 701
red cell abnormalities and, 6
tetany, 13
- aplastic anaemia, 392–393, *see also* pure red cell aplasia
granulocyte transfusions, 629
transfused red cell survival, 365
- aplastic crises, HPV B19, 725
- ApoB-containing lipoproteins, 786
- apoptosis
red cells, 357–358
in stored blood, 562
- aprotinin, 813, 819, 820
- aquaporin 1, 234
- aquaporin 3, GIL antigen, 239
- Arabs
ABO haemolytic disease, 532
In^a antigen, 237
- Arachis hypogaea* lectin, 283, 284t
- arboviruses, 726–727
- Ariavit tartrazine, 306, 318

- arrhythmias
 citrate toxicity, 679
 cold blood transfusions, 678
- arterial puncture, inadvertent, 13
- AS-3 (preservative), 383
- ascitic fluid, immunoglobulins, 68
- ascorbic acid, arrest of red cell labelling, 360–361
- aseptic meningitis, intravenous immunoglobulin, 862
- Asians
 anti-Mi^a antibody, 223
 D antigen variants, 179
 D-negative phenotype, 173–174
- aspergillosis, granulocyte transfusions, 629, 630f
- aspirin
 as antipyretic, 664
 DDAVP on bleeding, 817
 donors ingesting
 deferrals, 5
 platelet transfusion, 626, 772
- association constants, IgG anti-A antibody, 132
- asthma, Fy(a– b–) phenotype, 219
- A subgroups, 120–121
Dolichos biflorus lectin, 120–121, 535
 serum, 128
 weak phenotypes, 121, 122
- A substance
 added to group O blood, 449
 hog, 136
 immune responses, 138
 inhibition of agglutination, 131–132
 inhibition of red cell destruction, 440
 injection, 136
 in plasma, 531
- At^a antigen, 241
- atherosclerosis, on immune responses, 76
- atopy, 67, 676
- ATP, red cells
 metabolism in, 370
 rejuvenated and frozen, 383
 stored, 368
- atypical haemolytic uraemic syndrome, factor H, 102
- Au^a/Au^b antigen, 229
- augmentation of immune responses, passive antibody, 86–87
 Rh D, 202–203
- autoagglutination, ABO haemolytic disease, 534
- autoagglutinins, 259–261, *see also* autoantibodies *under* cold antibodies
 albumin autoagglutinins, 311
- autoantibodies, 84, 259–278
 anti-A and anti-B antibodies as, 133
 anti-D, 198
 anti-I antibody as, 152
 cold *see* cold antibodies, autoantibodies
 delayed haemolytic transfusion reactions, 482–483
- drug-induced, 280
 identification, 340–341
 immune thrombocytopenia, 588–589
 neutropenia, 570–571
 post-transfusion purpura, 671
 removal, 336, 782
 to thrombopoietin, 812
 ‘auto-anti-En’, 227
- auto-anti-I antibody
 red cell destruction, 420
 complement as limiting factor, 436–437
- auto-anti-idiotypes, 67
- auto-anti-LW, cold-reacting, 184
- auto-anti-N, cold-reacting, 226
- autocontrols, crossmatching tests, 336
- Autogrouper (Technicon), 324
- autohaemolysins
 cold *see* biphasic haemolysins
 to trypsinized red cells, 288
 warm, 273
- autoimmune diseases
 on immune responses, 75
 intravenous immunoglobulin for, 861
 vasculitides, treatment, 782
- autoimmune haemolytic anaemia
 alloantibodies, 277, 278, 336
 antibodies to low-frequency antigens, 241
 anti-I antibodies, 262
 anti-Jk^a antibody, 222
 biphasic haemolysins, 267
 cold autoagglutinins, specificity, 263–264
 cold haemagglutinin disease, 261–266
 transfused red cell destruction, 365
 complement, 272, 471
 direct antiglobulin test
 negative, 273
 reagents, 316–317
 spontaneous remission, 270
 drug-induced, 279
 haemoglobin-based oxygen carriers, 830
 haemoglobinopathies, 482–483
 haemoglobinuria after transfusion, 471
 Kell antibodies, 218, 275–276
 Lu antigen, 230
 ‘mimicking anti-Rh’, 188
 naturally occurring antibodies, 72
 non-steroidal anti-inflammatory drugs, 279
 sequestration studies, 366
 warm-antibody type, 75, 188, 270, 277–278
 warm with cold autoantibodies, 273
 weakening of Rh antigens, 181
- autoimmune neutropenia, 570–571
- autoimmune responses, infections, 259
- autoimmune thrombocytopenic purpura (AITP), *see also* immune thrombocytopenic purpura
 intravenous anti-D immunoglobulin, 450
 neonatal, 585–586
 transient Kell antigen depression, 218, 276
- autologous blood transfusion, 41, 42, 800–803
 bacterial contamination, 734
 cardiopulmonary bypass, 43
 frozen red cell storage, 384
- autologous platelets, 621
- autologous red cell survival, 364–365
 donor selection, 377
- automation
 blood cell harvesting, 769
 blood grouping, 323–325
 fetal D grouping, 517
 molecular biology, 345
 quantitation, 326
 sensitivity, 328
 HLA typing, 566
 plasmapheresis, 767, 768
 platelet concentrate manufacture, 872–873
 polymerase chain reaction, 699
 red cell salvage, 802–803
- autopsy, cultures, 737
- avidin, 363
- Avitene Flour, 826
- AYD antigen, 570
- azide *see* sodium azide
- Babesia divergens*, glycophorin B binding, 228
- babesiosis, 741–742, 766
- bacteraemia
 donors, 733
 recipients, 734
- bacteria
 α-N-acetylgalactosaminidases, 127
 on anti-B titres, 71–72
 A and B antigens, 129, 465
 blood contamination, 471, 730–737
 blood transfusions on postoperative infections, 564–565
 deacetylase, 126
Nitrosomonas europaea, RHAG
 homologue, 171, 182
 platelet storage, 619
 proteins A and G, 69
 P system antigens as receptors, 148
 pyrogens, 677–678
 red cell polyagglutinability, 282, 283, 284, 285–286
 red cell sensitization, 286
- bacteriophages, antibody construction, 78
- Bak antigens *see* HPA-3 system
- band 3
 deficiency, 182
 ovalocytosis, 243
 tetrameric, 55
- band 3 genes, Diego system, hereditary spherocytosis, 230–231
- B antigen, 153
 acquired
 in A₁ subgroup, 126
 T and Tk activation, 285

- bacteria and, 129, 465
 development, 125
 high expressers, 573, 581
 immune responses, 134–138
 neonates, 428
 number of sites, 124–125
 platelets, 573
 weak, 122
- B(A) phenotype, 123
- bar codes, 337
- basal oxygen consumption, 27
- Basigin (CD147), 238
- battle casualties, 38–39
 assessment of blood loss, 24
 blood stocks and, 367
 fresh whole blood, 396
 walking donors, 396
 whole blood transfusion, 29
- Bauhinia purpurea*, anti-N lectin, 226
- B-cell receptor
 activation motif (ITAM), 86
 complement and, 102
- B cells *see* B lymphocytes
- beating heart surgery, 42, 43
- bedside confirmation, ABO system, 337
- bedside filtration
 leucoreduction, 580, 664
 reactions, 677
- Bernard–Soulier syndrome, 624
- β 2-microglobulin, 552
- β 93 cysteine, release of NO from, 371
- beta-blockers, blood collection, 801
- beta-pleated conformation, prion proteins, 728
- Bg antigens, 242
- B gene, secretions, 139t
- bicarbonate
 granulocyte storage, 628
 platelet storage, 619
 red cell storage, 373
- big endothelins, 215
- bilirubinaemia, 474, 477
 ABO haemolytic disease, 535, 536
 detection, 489
 haemolytic disease of the newborn, 522
 mother–infant ABO incompatibility, 531
- binding constants, 74
 IgG anti-A antibody, cord red cells, 132
 intrinsic, 89–90
- binding fractions, antibodies, 433
- binding studies, Rh antigen, 170
- bioassays *see* cellular bioassays
- Biopack (Optipress), platelet concentrates, 612
- Biotest Solid Screen System, 325
- biotinylated monoclonal anti-D (BRAD-3), 526
- biotinylated monoclonal anti-D (BRAD-5), 526
 quantification, 327, 431, 432
- biotinylation, red cells, 363
- biphasic haemolysins, 260t, 266–268
 antibody mimicking, 264
 anti-I antibodies *vs.*, 262
 anti-P antibody as, 149, 267
- 2,3-biphosphoglycerate *see*
 2,3-diphosphoglycerate
- birthweight *see* very-low-birthweight infants
- bishydroxycoumarin, 821
- bivalency
 anti-A antibody binding, 132, 534
 monogamous, 89
- black people
 ABO haemolytic disease, 532
 ABO phenotypes, 118
 anti-U antibody, 226–227
 Duffy antibodies, 220
 D variants, 178–179
 K antigen, 214
- bladder
 carcinoma on red cell antigens, 142–143
 lysine analogues, 820
- BL^e antigen, 138
- bleeding time
 aspirin on, 626
 DDAVP on, 817
 platelet counts *vs.*, 614–615
 uraemia, oestrogens on, 825
- ‘blocking’ antibodies, 75
- blood banks, 367
 cord blood, 636
 serum samples, antibiotics, 281
- blood-borne viruses, 4, *see also specific viruses*
 autologous blood, 802
 on availability of blood, 4
 deferrals of donations, 5
 directed donations, 14–15
 family-replacement donors, 1
 fetal transfusion and, 520
- blood components
 premature infants, irradiation for, 392
 for transfusion reactions, 469
- blood conservation, 800–844
- blood films, fetal red cells, 502
- blood grouping, 303–355, *see also* blood grouping *under* automation
 errors, 329, 330
 fetal D grouping, 511–513, 516–517
 full identification, 339
 omission in emergencies, 337
 solid-phase systems, 325
- blood groups
 alleles, 58–59, 120t
 frequencies, 58–59
 terminology, 54
 antigens, 118
 clinical importance, 55
 immunology, 53–117
 neoplastic change on, 60–61
 malaria and, 60, 142
 terminology, 54–55
- bloodless surgery, 800–844
- blood loss, *see also* oligoemia
 diagnostic phlebotomy, 804
 intermittent, 390–391
 stools, 365–366
 surgical, 24–25, 42, 43
 vasoconstriction, 25, 26
- blood pressure
 donors, 2, 9–10
 haemorrhage on, 23, 25
- blood processors, 382
- blood sampling
 blood loss from, 366, 391
 fetus, 516
 thrombocytopenia, 586
 haemolytic transfusion reactions, 488, 489
 platelet transfusion, 879–880
 red cell volume estimation, 874
- blood volume, 875–876
 haemorrhage on, 23–24
 transfusion on, 385–387
- Blundell, James (blood transfusion pioneer), 22–23
- B lymphocytes, *see also* B-cell receptor
 apheresis donors, 776–777
 HLA antigens, 554
 humoral response, 72
 immunoglobulins on surfaces, 69
 lymphocytotoxicity test, 566
- B-natriuretic peptide (BNP)
 circulation overload, 29
 transfusion-associated acute lung injury
 and, 665
- boluses, intravenous iron, 805
- Bombay phenotype *see* hh genotype; Oh phenotype
- bonds
 antigen–antibody, 88
 thioester, complement molecules, 99, 100, 102
- bone
 deformities, thalassaemia, 393
 grafts
 D immunization, 195
 Duffy antibodies, 220
 granulocyte colony stimulating factor, 809
 plasmapheresis donors, 769
 plateletpheresis donors, 772
- bone marrow
 granulocytes, 627
 PBSC donors, 775
 stimulation, leucapheresis donors, 773
 thalassaemia, 393
- transplantation
 cytomegalovirus infection, 722
 delayed haemolytic transfusion
 reactions, 484–485
 effect of previous transfusions, 561
 granulocyte transfusions, 632
 incompatible ABO, 636
 intravenous immunoglobulin, 861
 lymphocytes from, 487

- malaria, 738
 monitoring, 487
 thrombopoietin and, 811
 bone wax, 826
 borate-suspended red cells, autoagglutinin specific to, 261
Borrelia burgdorferi, 732
 bound antigens, antibodies against, 279–281
 bovine liver flukes, P₁ antigen, 148
 bovine serum albumin, blood grouping, 306, 321
 bovine spongiform encephalopathy, 729
 bovine thrombin, 827, 863–864
 Boyle, Robert (1627–1691), 763
 bradykinin, 677
 bradykinin B2 receptor antagonist (icatibant), 857
 brain, oxygen extraction, 27
 Br antigens, 575
 breast carcinoma, Tn antigen, 287
 brodifacoum, poisoning, 824
 bromelin, 307, 312
Brucella abortus, 731–732
 bruising, donors, 12, 777
 BsmI (restriction enzyme), 343
 B subgroups, 122
 weak phenotypes, 122
 B substance
 added to group O blood, 449
 in plasma, 531
 red cell destruction inhibition, 440
 uptake, 128
 BTHC (plastic), platelet storage, 617
 Buchbinder, I., 53
 buffy coat
 febrile reactions, 660–661
 platelet concentrates, 612, 615–616, 872–873
 buffy coat-reduced red cells, 397
 on colorectal carcinoma, 564
 on postoperative infections, 565
 on postoperative mortality, 565
 Burkitt's lymphoma, anti-pk antibody on, 150
 burns, 44–45
 anti-*Pseudomonas* immunoglobulin, 860
 butyryl-n-trihexyl citrate, 379, 684
 bystander haemolysis, 101, 637

 C1 esterase inhibitor, 442, 856–857
 C1q molecule, 98, 99
 anti-D antibody binding, 187
 C2 molecule (complement), 99–100
 C3a molecule (complement), 100
 cardiopulmonary bypass, 43
 transfusion reactions, 465–466
 C3b (complement product), 98, 100, 102, 263
 cleavage, 422, 423
 glycophorin A binding, 227–228
 IgG with, 95
 C3/C5 convertases
 C3bBb, 102
 C4b2b, 99
 C3 (complement molecule), 100
 C3d (complement product), 102–103, 269–270, 272, 303, 422, *see also* anti-C3d reagents
 C3dg (complement product), 95, 98, 317
 C3i (complement product), 102
 C4 (complement component), 99, 234–235
 C4d (complement product), 102–103, 269–270, 272, 317
 C5a (anaphylatoxin), 100, 101
 cardiopulmonary bypass, 43
 transfusion reactions, 465–466
 C5b67 (complex), 100
 C8 binding protein, 101, 359
 C9 (complement molecule), 100–101
 Ca^a antigen, 575
 Cad antigen, 240–241
 NOR antigen *vs.*, 287
 cadaver blood, 15
 caesarean section, maternal fetal red cells, 505
 calcium
 autoagglutinins inhibited by, 261
 citrate on levels, 772
 for citrate toxicity, 679–680, 772, 778
 calculations
 anticoagulant reversal, 823
 anti-D antibodies, dosage, 884–885
 blood volume, 876
 cryopreservation, 886–887
 factor VIII dosage, 851
 fibrinogen dosage, 850
 haemapheresis, 764–765
 intravenous iron dosage, 805
 plasma exchange, 779
 plasma volume, 875
 radioactivity from labelled platelets, 880–881
 red cell volume, 874–875
 thaw mix, 888
 Campath 1, on D immunization, 193
Campylobacter spp., anti-K antibody and, 216
 cancer, *see also* carcinoma; *specific diseases*
 anaemia, 806, 807
 recombinant erythropoietin, 806, 807–808
 red cell salvage, 803
 transmission, 686
 cannulae *see* catheters
 C antigen, 170–173, 196–197, 478
 c antigen, 82, 170–173, 197
 capillary permeability, burns, 44
 capillary tubes, agglutination tests, 312
 caprylate, 281, 850
 Capture-R systems, antibody screening, 325
 carbohydrate-coated superparamagnetic iron oxide nanoparticles, 805t
 carbohydrate structures
 on immunoglobulins, 62
 red cell antigens, 56
¹⁴C, red cell labelling, 364
 carbonic anhydrase antibody, 503
 carbon monoxide, red cell survival, 358
 carbonyl iron, 8
 carboxyhaemoglobin, red cell survival, 358
 carboxymaltose, 804
 carboxymethyl-cellulose, antibody separation, 70f
 carcinoma
 autoantibodies, 273
 blood transfusions on, 564
 pancreas, ABO system, 126
 on red cell antigens, 60–61, 142–143
 stomach
 anti-Tj^a and, 60
 group A and, 59
 T, Tn and Tk antigens, 286–287
 cardiac arrest
 calcium overdose, 679
 cold blood transfusions, 678
 cardiac output
 anaemia and, 384–385
 pulmonary artery catheters, 26
 cardiopulmonary bypass, 42–43
 aprotinin, 820
 epsilon-aminocaproic acid, 43, 818
 Epstein-Barr virus, 724
 hydroxyethyl starch and, 37
 platelets, 43, 624
 protamine, 825
 tranexamic acid, 43, 818
 cardiovascular disease
 effects of transfusion, 389–390
 protection by blood donation, 13–14
 recombinant erythropoietin, 807
 carriers of transmissible diseases, 4
 babesiosis, 741–742
 hepatitis B virus, 700–702, 703–704
 malaria, 739–740
 Trypanosoma cruzi, 740
 Cartwright system, 231–232
 cataracts
 congenital, Ii system, 151, 152
 leucapheresis donors, 774
 catheters
 blood forced through, 470
 embolism by, 683
 plasma exchange, 779
 rapid transfusion, 28
 cations, Rh antibodies as, 188
 Cc antigen, 171, 428
 CcEe antigen, 171
 CCR-4 and CCR-5 (HIV-1 receptors), 711
 CD4 (HIV receptor), 711
 CD4+ T lymphocytes, 259
 CD34-positive cells, 632, 634–635, 775
 amplification, 831

- CD44
 In antigen, 237
Mycobacterium tuberculosis binding, 238
- CD47 (surface protein), 86
 mouse, autoimmune haemolytic anaemia and, 276
 in Rh membrane complex, 182
- CD55 *see* decay accelerating factor
- CD59
 deficiency, 236
 effect of blood storage, 305
- CD147, 238
- CD151 (tetraspanin), 238
- CD177, HNA-2 system and, 569
- CD238, 214
- CDE nomenclature, 167
- CDw108 (glycoprotein), 239
- Ce antigen, 180
- CeEe* gene, 169
- ce(f) antigen, 180
- cefotetan, 279
- ceftriaxone, 279
- CE* gene, 171, 173–174
- cell separators, 768, 769–772
- cellular bioassays, 95–97, 427
 haemolytic disease of the newborn, 514–515
- cellulitis, donors, 12
- cellulose (compounds)
 carboxymethyl-cellulose, antibody separation, 70f
 dextran sulphate–cellulose columns, 785
 diethylaminoethyl-cellulose, anti-D separation, 69
 oxidized, 826
- cellulose acetate filters, platelet concentrates, 579
- central venous pressure, haemorrhage on, 23, 25
- centrifugation
 aggregate reduction, 682
 DiaMedID Micro Typing System, 322
 donors' *vs* recipient's red cells, 343
 immediate-spin methods, 334
 plasmapheresis, 767, 768
 platelet concentrates, 612, 615–616
 platelet-rich plasma, 878
 on red cell agglutination, 92
 'spin-tube' antiglobulin test, 321
- centrifuged red cells, packed cell volume, 397
- cephalosporins, 279, 280
- CE polypeptide, 171
- cerebral blood flow, 27
- cerebral haemorrhage *see* intracranial haemorrhage; subarachnoid haemorrhage
- Chagas' disease, 740–741
- channel-forming integral protein (CHIP), 234
- Ch antigenic determinant, 234–235
- chelating agents
¹¹¹In platelet labelling, 613
¹¹¹In red cell labelling, 873
 iron, 685–686
 on thiol proteases, 307
- chemiluminescence assay, 97, 572, 698, 720
- chemokines, Fy antigen as receptor, 219
- chemotaxis, granulocyte assay, 627–628
- chemotherapy
 anaemia, 806, 807
 febrile neutropenia, 808
 platelet transfusion, 622–623
 thrombocytopenia, thrombopoietin for, 811–813
- chest pain, transfusion reactions, 466
- chest radiography, transfusion-associated acute lung injury, 664
- Chido/Rodgers system, 234–235
- chikungunya virus, 727–728
- childbirth, transplacental haemorrhage, 504–505
- children
 ABO agglutinins, 130
 autologous blood donation, 802
 biphasic haemolysins, 266–267
 cord blood progenitor cell transplantation, 633–634
 Epstein–Barr virus, 724
 HIV infection, 714
 intravenous immunoglobulin, 859
 incompatible transfusions, 462
 Jehovah's Witnesses, 44
 recombinant factor VIIa, 815
 red cell survival, 362
 sickle cell disease, exchange transfusion, 395, 765
 thalassaemia, 393
- chills, apheresis, 777
- chimeras, 84, *see also* microchimerism
 A₃ phenotype *vs*, 121
 anti-A and anti-B antibodies, 129
 lymphocytes, 667
 twins
 groups O and A, 128
 groups O and B, 460
 Lewis substance red cell uptake, 142
 weak A phenotypes, 124
- Chinese ethnicity
 gene frequencies, 59
 red cell antibodies, 80
- chloroquine
 removal of autoantibodies, 336, 341
 removal of HLA antigens, 242, 587
- chlorpheniramine, 664
- chlortetracycline, stored blood, 735
- CHOIR trial, 807
- cholera, group O and, 60, 142
- choline transporter-like protein-2 gene, 569
- chorionic villus sampling, 504
- Ch/Rg system, antigens, 56
- Christmas disease, 854–855
- ⁵¹Cr, 356
 platelets labelled with, 613
 red cell survival estimation, 360–362, 375–376, 413–414, 438–440, 490, 876–877
 red cell volume estimation, 873, 874
 release method, 315
 spleen scintigraphy, 366
- ⁵²Cr, red cell survival, 362–363
- chromium ion, 289
- chromosomes
 gene locations, 58, 59
 HLA complex, 550f
- chronic granulomatous disease
 FCGR3B genes, 569
 granulocyte transfusions, 629
 reactions, 662
- chronic lymphocytic leukaemia
 i antigen and, 152
 on immune responses, 75
 immunoglobulin therapy, 860
 leucostasis, 788
 red cell survival, 366
- chronic myeloid leukaemia
 ABO system, 126
 donor lymphocyte infusion, 637–638
 graft-versus-tumour effect, 559
 granulocyte donors, 626, 627
 leucostasis, 788
 on Rh system, 61
- chronic neutropenia, 808–809
- chronic transfusion *see* multiple transfusions
- chymotrypsin, 215, 307
- ciclosporin, on D immunization, 193
- cirrhosis
 antithrombin therapy, 863
 hepatitis C, 706
- cis AB phenotype, 122
- citrate
 apheresis, 882–883
 blood storage, 368, 372–373, 882
 cell separators, 770–771
 effects of bacteria, 734
 plasma exchange, 882–883
 plasma storage, 847
 potassium and, 680–681
 toxicity, 678–680, 772, 777–778, 787
- citrate-induced hypocalcaemia, 13
- citrate–phosphate–dextrose 50, 883
- citrate–phosphate–dextrose–adenine solution, version CPDA-1, 374, 882
 potassium distribution, 680
- citrate–phosphate–dextrose solution (CPD), 882–883
 aggregates, 682
 half-strength, 882
 LOX antigen and, 281
- citrate wash method, red cell labelling, 360
- citric acid
 elution of platelet antibodies, 589
 platelet treatment, 583

- citric acid–phosphate buffer, removal of HLA antigens, 587
- classical pathway, complement, 98–101
- classifications, *see also* nomenclatures
partial D antigens, 174–175
- class-specific anti-IgA, 591–592, 673–674
- clonal thrombocytosis, 789
- cloning, hybridoma cells, 77
- clonorchiasis, P₁ antigen, 148
- clopidogrel, platelet transfusion and, 624
- Clostridium perfringens*, 284
- clotted blood, red cell antigens, 305
- c-Mpl (thrombopoietin receptor), 809
- coagulation factors, *see also* prothrombin complex concentrates; *specific factors*
ABO system and, 60
fresh-frozen plasma, 639–640
inhibitors, immunoabsorption, 786
plasma exchange, 780, 787
- coagulopathy
cardiopulmonary bypass, 43
immunoabsorption for, 786
plasma alternatives, 35–36, 37
transfusion reactions, 466
trauma, 39–40
- Co antigens, 234
- COBE® Spectra Apheresis System, 771f
- cobra venom, 227–228
- codes
error prevention, 337
ISBT 128, 2
- Cohn fractionation, 846–847
- cohort labelling, red cells, 364
- cold antibodies, 82, 90
anti-D antibodies, 72, 183, 275, *see also*
cold-reacting anti-D
anti-p agglutinin, 150
autoantibodies, 259–268
anti-LW, 184
anti-N, 226
apparent donor incompatibility, 335–336
delayed haemolytic transfusion reactions, 483
false-positive agglutination tests, 314
haemodialysis, 561
identification, 340–341
specificity, 263–264
structure, 265–266
warm autoantibodies with, 273
- Ii system antibodies, 152
- low ionic strength solutions, 310
- normal incomplete, 134, 260t, 261
- red cell agglutination experiment, 91
- red cell destruction
extravasacular, 474–475
in hypothermia, 420–421
vs stored red cells, 288
- cold autohaemolysins *see* biphasic haemolysins
- cold blood, 28, 678
- cold haemagglutinin disease
autoimmune haemolytic anaemia, 261–266, 365
- Chido/Rodgers antibodies, 235
- complement, 103
- red cell destruction
acquired resistance, 422
auto-anti-I antibody, 420
autoimmune haemolytic anaemia, 365
hypothermia, 420–421
red cell sequestration, 423
red cell transfusion, 264–265
- cold-reacting anti-D, 72, 183
- cold-reacting auto-anti-LW, 184
- cold-reacting auto-anti-N, 226
- collagen, microfibrillar, 826
- collapse curves, 443–444, 446–448
- collection of blood, *see also* venesection
avoiding bacterial contamination, 737
for components, 368–369, 769–776, *see also* apheresis
cord blood, 633, 889–890
errors, 461
for plasmapheresis, 847
preoperative autologous, 800–803
- collections (antigen families), 55, 239–240
- colloidal silica, 289
- colloids, 30–34, *see also* alternatives *under* plasma
blood grouping, 306
burns, 44
polymers, on red cell agglutination, 92
- colon carcinoma
blood transfusions on, 564
on red cell antigens, 142–143
- colony-forming cell content, placental cord
blood transfusion, 634
- colony-stimulating factors *see* granulocyte colony stimulating factor
- colostrum
ABO agglutinins, 132
immunoglobulins, 68
- colour
plasma and urine, haemolytic transfusion reactions, 489
stored red cells, 737
- colouring agents, blood grouping reagents, 306
- Colton system, 234
enzymes on antibodies, 307
- combat casualties *see* battle casualties
- combination, antigens with antibodies, 88–95
- commercial cord blood banks, 636
- compartment syndrome, 12
- compatibility testing, *see also* blood grouping;
crossmatching
neonates, 335
- competition
blood groups, 84, 85
A *vs* B transferases, 122
- competitive assays, infectious agents, 698
- complement, 95, 97–104, *see also* anti-complement reagents; *specific components*
acquired resistance of red cells to
destruction, 422–423
anti-D antibody and, 186–187
antiglobulin test, 323
anti-I antibodies, 103, 262–263
autoimmune haemolytic anaemia, 272, 471
bacteria killing, 733
biphasic haemolysins and, 267
cardiopulmonary bypass, 43
cellular bioassays, 97
Chido/Rodgers system, 234
glycophorin A binding, 227–228
haemolysis, 458
as limiting factor, 436–437
IgG antibodies binding, red cell
destruction, 421–423, 431
IgG warm autoantibodies, 271
IgM on, 66–67, 417–421
immunofluorescence and, 786
immunoglobulin classes, ABO agglutinins, 130–131
inhibitors, 99, 442
Kidd antibodies and, 221
lymphocytotoxicity test, 566
MN system antibodies, 225
serum sources, 315
storage, 306
transfusion-associated acute lung injury and, 666
transfusion reactions, 465–466
warm autoantibodies
IgG, 271
and Rh antigens, 274
- complementary DNAs, nucleic acid testing, 699
- complementoid, 104
- Compomat, platelet concentrates, 612
- computer issue, abbreviated crossmatching, 333–334
- concentrations for agglutination, ABO agglutinins, 132
- confirmation of ABO group, bedside, 337
- confirmatory assays
anti-HCV, 707
HIV infection, 717–718
human T-cell leukaemia viruses, 720
infectious agents, 698
- conformation
ABO glycosyltransferases, 119
prion proteins, 728
- congenital afibrinogenemia, 850
- congenital cataracts, Ii system, 151, 152
- congenital dyserythropoietic anaemias, 61
- consent, 1
- constant regions, immunoglobulins, 62–63

- consumptive coagulopathy *see* disseminated intravascular coagulation
- contaminants, red cells as, 193–195, 460, 625
- contamination *see* infections, transmission by transfusion
- continuous flow systems
blood grouping, 324
cell separators, 770–771
- convulsions, donors, 13
- Coombs' test *see* antiglobulin test
- COPII coat protein, 243
- copper sulphate method, haemoglobin, 8–9
- cord blood
collection, 889–890
neonates, 517–518
progenitor cells, 633–636
cryopreservation, 887
red cell agglutination, 289
- cord lymphocytes, I and i antigens, 151
- cordocentesis, 516
- cord red cells
agglutination, 289
anti-Le^x antibody, 144
IgG anti-A antibody, binding constant, 132
Ii system, 151
incompatible, 412
Lewis system, 140
- cord serum, anti-A and anti-B antibodies, 130
- coreceptors, retroviruses, 710–711
- coronary artery bypass graft, 42
hydroxyethyl starch and, 37
transfusion and mortality, 390
- coronary artery disease
DDAVP and, 817
LDL apheresis, 786
- coronary blood flow, 27
- corrected count increment, platelets, 625
- corticosteroids
adverse effects, 778
autoimmune haemolytic anaemia with
warm autoantibodies, 277
on D immunization, 193
with intravenous iron, 805
leucapheresis, 773
post-transfusion purpura, 671
- Corynebacterium aquaticum*, 285
- Cosmc (chaperone protein), 286
- Cost *see* Cs antigens
- Council of Europe standard, whole blood units, 368
- counting, leucocytes, 578
- cows, transgenic, 850
- CR1 (complement receptor), 95, 100
red cell density, 358
- CR2 (complement receptor), 95
- CR3 (complement receptor), 95
platelets, 620
- CR4 (complement receptor), 95
- CRASH-2 trial, 819
- cremaphor excipients, hypersensitivity, 824
- Creutzfeldt–Jakob disease, 4, 728–730
- CRiG (type I transmembrane Ig), 95, 96
- Cromer blood group protein *see* decay accelerating factor
- Cromer system, 236–237
antibody inhibitors, 338–339
crossmatching, 328, 332–336
dextran and, 36
granulocyte transfusions, 630–632
multiple transfusions, 334–335
sickle cell disease, 766
omission in emergencies, 337
platelets, 581–583
solid organ transplantation, 561–562
solid-phase systems, 325
- 'crossover', autologous blood, 802
- crossreactive idiotypes, major, 67
- crossreactivity of antibodies
anti-A,B, 132–133, 534
to bovine thrombin, 827
in HLA system, 557
Lewis antibodies, 144
monoclonal antibodies, 77–78
post-transfusion purpura, 670–671
thrombopoietin antibodies, 812
- cryoglobulinaemia, treatment, 782
- cryoprecipitate, 641–642, 847
bacterial contamination, 733, 736
fibrinogen, 641–642, 850
fibronectin deficiency, 863
HIV infection, 715
- cryoprecipitate-poor plasma, 639, 641
- cryopreservation
autologous blood, 802
fresh-frozen plasma, 639
granulocytes, 628
human cells and tissue-based products, 885–887
peripheral blood-derived progenitor cells, 633, 885–887
platelets, 587
red cells, 305–306, 379–384, 883–884
–20°C, 381
–80°C, 381–382
–120°C or –196°C, 382
depots, 18
subnormal survival after, 444
- cryptantigens, 282
autoantibodies, 589
red cell ageing, 359
- crystalloids, 30–34
burns, 44
plasma exchange, 780
platelet storage, 619
- crystal violet, for *Trypanosoma cruzi*, 740
- Cs antigens, 240
- cultures, bacteria, 733, 734–735, 736–737
- C^w antigen, 180, 197
- C^w antigen, immunogenicity, 82
- C^x antigen, 180
- cyclical fluctuations, anti-D antibodies, 196
- cyclosporin, for autoimmune haemolytic anaemia, 277
- cysteine, on stability of papain, 310
- cytokines, *see also* granulocyte colony stimulating factor
antenatal intravenous anti-D immunoglobulin, 524
dengue, 727
febrile reactions, 663
HLA immunization, 558
thrombopoiesis stimulation, 809
transfusion reactions, 465–466
- cytomegalovirus (CMV), 720–724
antibody-negative donors, platelet transfusion, 626
antibody *vs.*, 721, 723–724, 861
donor lymphocyte infusion, 638
leucoreduction and, 579
- cytoplasmic inhibitory motif (ITIM), FcγRIIB, 86
- cytoskeletons, red cells, 55, 93
- cytotoxic drugs, *see also* chemotherapy; immunosuppression
on D immunization, 193
cytotoxicity negative absorption positive (CYNAP) phenomenon, 567
- cytotoxic T lymphocytes
for CMV infection, 638
HLA class I molecules, 552–553
suppression by blood transfusions, 563
- D^{Iva} antigen, 178
- D^{Vl} antigen, 177–178
- D^{Vll} antigen, 178
- DAF *see* decay accelerating factor
- danaparoid, 824
- danazol, cold haemagglutinin disease, 265
- Dane particles, 700
- dangerous universal donors, 462–463
- D antigens, 167, *see also* D-positive transfusion
immune responses, 73
formation of non-Rh antibodies, 83–84
secondary, 84, 195–196, 197–198
immunization *see* immunization, D antigens
oral, 204
partial, 174–179, 527
auto-anti-D antibody and, 198
immunogenicity of red cells, 191–192
pronormoblasts, 62
structure, 170–173
variants, 174–179
weak *see* weak D antigens
- darbopoietin alfa, 806, 807
- DARC (Duffy glycoprotein), 218–219
- DAR (partial D variant), 178–179, 192
- DAU alleles, 178
- Dccee phenotype, sickle cell disease, 81

- DCE/ce* red cells, D immunization, 191
DcE/DcE red cells, intravenous vs intramuscular anti-D, 200
DCE/Dce red cells, D immunization, 191
Dc- haplotype, 180–181
 DDAVP (desmopressin), 813, 815–817
 cardiac surgery, 43
 haemophilia, 852
 von Willebrand disease, 854
 deacetylase, bacteria, 126
 decay accelerating factor (DAF), 100, 236–237
 deficiency, 471
 effect of blood storage, 305
 red cell density, 358, 359
 deferasirox, 686
 deferiprone (L1), 686
 deferrals of donations, 3–6
 anaemia, 3, 7
 fainting, 10, 11
 HIV risk reduction, 716–718
 malaria, 4, 739
 risks in haemochromatosis patients, 17
 deformability loss, stored red cells, 371, 378
 DEHP (plasticizer)
 plasma haemoglobin, 371, 379
 platelet storage, 617
 toxicity, 683, 684
 D₄ antigen, 174, 179, 192
 delayed donor red cell engraftment, 636
 delayed fainting, 10
 delayed haemolytic transfusion reactions, 458, 477–488
 Duffy antibodies, 220
 frequencies, 485
 investigations, 488
 Kell antigens, 218
 Kidd antibodies, 222
 mortality, 485–486
 red cell antibodies, 80, 81
 relative frequencies of alloantibodies, 484
 speed of onset, 480–481
 undetectable antibodies, 446
 delayed serological transfusion reactions, 485
 delayed surgery, due to blood shortages, 3
Delta1 ligand, cord blood progenitor cell expansion, 635
 delta virus, 705
 dendritic cells
 HLA antigens, 554
 macrophages vs, 86
 prion proteins, 728
 UV-B irradiation, 580
 dengue virus, 727
 density, red cell separation by, 358
 dental treatment
 antifibrinolytic agents, 818, 819
 donors, 5
 dermatitis herpetiformis, 431
 descending method of enquiry, transfusion errors, 461
 desensitization, factor VIII, 853–854
 desferrioxamine (DFO), 685–686
 desmopressin *see* DDAVP
 dexamethasone, granulocyte collection and storage, 628, 773, 774
 dextrans, 31, 35–36
 allergies, 35, 37
 frozen red cell storage, 383
 hypertonic saline with, 34
 on red cell agglutination, 92
 rouleaux formation, 35, 36, 288, 314
 dextran sulphate–cellulose columns, 785
 dextrose
 5% solution, haemolysis, 469
 red cell storage, 367, 373, 374–375
 D-galactose, red cell membranes, 88
D gene, 58, 168–169, 171, 173–174
 Di^a antigen, 230–231
 red cells, antibody identification, 338
 dialysis, *see also* haemodialysis
 removal of glycerol from red cells, 883–884
 DiaMedID Micro Typing System, 322
 diaspirin crosslinked human haemoglobin, 830
 diatoms, Antarctic sea-ice, ice-binding proteins, 306
 Di^b antigen, 230–231
 diclofenac, 279, 280
 Dicumoral®, 821
 Diego system, 230–231
 diethylaminoethyl-cellulose, anti-D separation, 69
 di-2-ethylhexyl phthalate *see* DEHP (plasticizer)
 differential agglutination, red cells, 356–357, 490, 877
 dihydrorhodamine-123, 662
 di-isopropyl phosphofluoridate (e.g. DF³²P)
 granulocyte labelling, 627
 red cell labelling, 359, 360, 363, 364
 diluents, antiglobulin reagents, 318
 dilutional thrombocytopenia, 38, 39
 dilutions
 blood grouping, 326
 indirect antiglobulin test, 317–319
 dimeric Fab fragments, 311
 dimethylsulphoxide (DMSO), 885
 frozen red cell storage, 383
 peripheral blood-derived progenitor cells, 633
 platelet storage, 620–621
 2,8-dioxadenine, 373
 diphenhydramine, 664, 676
 2,3-diphosphoglycerate (DPG), 370, 372
 delayed cooling on, 378–379
 red cell rejuvenation and freezing, 383
 restoration *in vitro*, 375
 restoration *in vivo*, 374
 diphtheria vaccine, 136
 dipstick tests, blood grouping, 325
 direct antiglobulin test (DAT), 315
 ABO haemolytic disease, 533–534
 ADCC(M) assay, 96
 antilymphocyte globulin, 278
 apparently normal donors, 268–269
 biphasic haemolysins and, 268
 C3d and Cd4 on red cells, 270
 D immunization, 84, 197–198
 disease associations, 270
 drugs and, 279–281
 fetus, 499
 haematopoietic stem cell transplantation, 636
 haemolytic transfusion reactions, 490
 delayed, 482, 483–484
 immunoglobulin treatment and, 861
 incompatible plasma transfusion, 450
 methyldopa, 269, 270, 274, 280
 mixed field agglutination, 314
 mother–infant ABO incompatibility, 531–532
 negative
 autoimmune haemolytic anaemia, 273
 with warm autoantibodies, 276
 reagents, 316–317
 renal transplantation, 486
 direct differential agglutination, 357
 directed donations, 14–15
 disappearance curves, platelets, 614
 disasters, 17–18, 384
 discontinuous-flow cell separators, 770
 disqualification of donors, 4–6
 disseminated intravascular coagulation (DIC), 40, 462, 467–468, 640
 antithrombin therapy, 863
 lysine analogues, 819–820
 management, 469
 platelet transfusion, 625
 dithioerythritol (DTE), 70–71
 dithiothreitol (DTT), 70–71, 130, 310, 340–341
 diversion of aliquot, 737
 divided doses, anti-D antibody injections, 203
DMA gene, 556
DMB gene, 556
 DNA-based blood grouping, 304, 343–345, *see also* genotyping
 fetal D group, 511–513, 516–517
 DNA-based genotyping
 neutrophil antigens, 572–573
 platelet-specific antigens, 587–588
 red cell antigens, 84
 DNA-based HLA typing, 565–566
DNA gene, 556

- DNA polymerase
assays for, 702
nucleic acid testing, 699
- DNB (D variant), 178
- DOB gene, 556
- Dolichos biflorus* lectin, 284t
- Cad red cell agglutination, 240–241
A subgroups, 120–121, 535
- Dombrock system, 233–234
enzymes on antibodies, 307
- Donath–Landsteiner antibody *see* biphasic haemolysis
- donation numbers (codes), 2
- donor lymphocyte infusion, 559, 637–638
- donors, 1–22, *see also* walking donors
antibodies from, 676, *see also* passenger lymphocyte syndrome
apheresis, 776–778
apparent incompatibility, 335–336
apparently normal, direct antiglobulin test, 268–269
aspirin ingestion
deferrals, 5
platelet transfusion, 626, 772
autologous transfusion, 800–802
bacteraemia, 733
CMV antibody-negative, platelet transfusion, 626
Creutzfeldt–Jakob disease, 4, 729
D antigen variants, 174, 177
differences, red cell survival, 446
disasters, 17–18, 384
disqualifying, 4–6
factor VIII, 851–852
follow-up for infections, 737
frequency of anti-D, 79
frequency of red cell antibodies, 78, 79, 80
of granulocytes, 626–627
stimulation, 628
group O *see* group O, donors
HBsAg carriers, 700–701
health benefits, 13–14
high expressers, A and B antigens, 573
HIV risk reduction, 716–718
ii type, 264
ill effects of venesection, 9–13
illness after donation, 2, 9–13
interviews, 2
leucapheresis, 773–774, 777–778
lymphocytes from, 562–564
malaria, 739
paid, 700–701
physical examination, 2
plasmapheresis, 768–769, 847
plasma screening, 331–332, 333
plateletpheresis, 7, 470, 582–583, 772–773, 777–778
platelet transfusion, aspirin ingestion, 626, 772
for premature infants, 391–392
qualifications, 1–2, *see also* disqualification of donors
red cells from
by cell separators, 777–778
destruction, 475–476, 536, *see also* incompatible transfusions *under* red cells
immunization from, 521
monitoring, 8
phenotype determination, 345
quantitative differences, 304
syphilis, 731
toxoplasma-negative, 741
transfusion-associated acute lung injury and, 666
universal, 448–449
dangerous, 462–463
vaccinations, 136–137
variation, red cell survival, 376–377
donor-specific blood transfusions, 563
dopamine, 469
Doppler blood flow velocity, fetus, 516
double dose of dexamethasone, leucapheresis, 773
double-label method, red cell survival estimation, 375–376
double membranes, congenital
dyserythropoietic anaemias, 61
double plasmapheresis, 767–768
D phenotypes, *see also* weak D antigens
Dccee phenotype, sickle cell disease, 81
D•• phenotype, 180
D– – phenotype, 180
elution of antibodies, 340
D polypeptide, autoimmune haemolytic anaemia, 278
D-positive transfusion, 330–331
anti-D antibodies and, 188–189
to D-negative subjects, 431–433
injection after, 438, 475
primary immune responses, 188–195
antibodies not found, 443
suppression by anti-D antibodies, 199–204, 438
red cell destruction, 437–438
DPx genes, HLA system, 556
DQx genes, HLA system, 556, 584, 585
drains (surgical), blood from, 803
mediastinal, 43
Dr^s-negative red cells, 236
DR antigens
matching, renal transplantation, 563
neonatal alloimmune thrombocytopenia, 584–585, 671
dropper pipettes, antiglobulin test, 320
drotrecogin alpha, 856
drug abuse, D immunization, 195
drug adsorption mechanism, 279–280
drug-dependent antibodies, 259
drug-induced immune haemolytic anaemia, 279–281
drug-induced immune neutropenia, 571
drug-induced immune thrombocytopenia, 589–590
drugs *see* medications
DRx genes, HLA system, 555–556, 557
DSLK antigen, 182
DTT (dithiothreitol), 70–71, 130, 310, 340–341
D type 4 cluster, 178
D^u *see* weak D antigens
Duclos antigen, 182
Duffy glycoprotein, 218–219
Duffy system, 218–220
duration of collections, fainting, 11
Duv antigens, 576
DUZO antigen (obsolete), 576
DWI (D variant), 178
Dw polymorphism, 557
dyes
antiglobulin reagents, 318
fetal D grouping, 512
dyserythropoiesis, *see also* hereditary erythroblastic multinuclearity with a positive acidified serum
aquaporin 1 deficiency, 234
on red cell antigens, 61
EI antigen, 179
EII antigen, 179
EIII antigen, 179
EIV antigen, 179
E-64 (papain inhibitor), 312
E antigen
immunization, 82, 196–197
numbers of red cell sites, 170
structure, 170–173
variants, 179
e antigen
immunization, 197
numbers of red cell sites, 170
structure, 170–173
warm autoantibodies, 273–274
ear lobe puncture, haemoglobin levels, 9
early loss, ⁵¹Cr from red cells, 362
ear-piercing, deferrals of donations, 5
Echinococcus cyst fluid, P₁ antigen and antibody, 148, 150
ectopic gestation, maternal fetal haemoglobin, 504
eculizumab
cold haemagglutinin disease, 265
paroxysmal nocturnal haemoglobinuria, 472
EDTA
on complement, 104
antiglobulin test, 323
platelet agglutination, 589
Ee antigen, 171

- Ehrlichia* spp., 733
- EKLF gene *see* erythroid transcription factor
- EKLF gene
- electric potential, red cells, 91
- electrolysis, deferrals of donations, 5
- electronically controlled processes, error prevention, 337
- electronic remote blood issue, 334
- electrophoresis, 56
- eltrombopag, 813
- elution, *see also* acid-elution methods
- antibodies, 92–93, 340
- ABO haemolytic disease, 534
- from platelets, 589
- ⁵¹Cr from red cells, 360, 362
- Fy antigens, 219
- radioactivity from platelets, 880–881
- weak A and B antigens, 122
- EM antigens, monocytes, antibodies, 573
- embolism, 682–683, *see also* air embolism; venous thromboembolism
- embryonic stem cells, human, 831
- embryos
- A, B and H antigens, 129
- red cell antigens, 61–62
- emergencies, *see also* battle casualties; disasters
- group O blood transfusion, 332
- omission of compatibility testing, 337
- Emm PEL antigen, 241
- EMMPRIN (extracellular matrix metalloproteinase inducer), 238
- emphysema, α_1 -antitrypsin on, 863
- En(a–) red cells, 222–223
- encephalopathy
- dimethylsulphoxide, 633
- hypertensive, 388
- endo- β -galactosidases, 285
- endoglycosidase F, on Fy^a antigen, 219
- endoscopy, thrombocytopenia, 624
- endothelial cells
- HPA-1 system antigens, 576
- leukaemia, 788
- endothermic reactions, 90
- endotoxaemia, 26
- endotoxins, 677–678
- engulfment, red cells, 94, 95
- entropy, 90
- env* gene
- HIV-1, 711
- human T-cell leukaemia viruses, 718
- retroviruses, 710
- enzyme-linked antiglobulin test, 326–327
- enzyme-linked immunosorbent assay, 697–698
- anti-HCV, 707
- blood grouping, 303
- HIV screening, 697–698, 716, 717
- human T-cell leukaemia virus antibodies, 719–720
- IgG antibodies, 326
- malaria, 739
- platelet antibodies, 586
- enzyme-only antibodies, 313
- enzymes
- on agglutination of red cells, 92, 262, 287–288, 307–310
- agglutination tests using, 312–313
- in antiglobulin test, 321, 323
- automation, 324
- converting A and B red cells to O, 127
- on lysis of red cells, 104
- red cells treated with
- dextran on, 36
- isolation of antibodies, 340
- epitopes *see* antigenic determinants
- eplets, HLA molecules, 582
- Eprex®, pure red cell aplasia, 807
- epsilon-aminocaproic acid (EACA), 43, 817, 818
- Epstein–Barr virus, 724
- lymphocyte transformation, monoclonal antibody production, 77
- lymphoproliferative disorders, 638
- equilibrium constants
- ABO agglutinins, 132
- antibodies, 89, 90
- IgG anti-K antibody, 217–218
- Er antigens, 240
- errors
- abbreviated crossmatching, 334
- arterial puncture as, 13
- blood grouping, 329
- recipient serum screening, 330
- D-positive blood transfusion, anti-D antibody for, 201, 203–204, 438
- of identification, 336–337, 461, 488
- reporting of, 460–461
- eryptosis *see* apoptosis
- erythema migrans, 732
- erythroblasts
- ABO haemolytic disease, 535
- red cell antigens, 62
- erythrocytapheresis, 763–766
- alloimmunization, 81
- erythrocyte-magnetized technology, 324
- erythrocyte membrane-associated protein (ERMAP), Sc antigens, 233
- erythrocyte sedimentation rate, 288
- erythrocyte sedimenting agents, *see also* hydroxyethyl starch
- leucapheresis, 774
- erythrocytosis, 15
- erythroderma syndrome, postoperative, 667
- erythroid transcription factor EKLF gene, 234
- erythroleukaemia, ABO system, 126
- erythropoiesis
- exchange transfusion on, 521
- experimental suppression, 359
- fetus, anti-K antibody, 529
- normal levels, 392
- preoperative, 801
- red cell antigens appearing, 62
- red cell transfusion on, 388–389
- erythropoietin (therapeutic), 806–808
- ABO haemolytic disease, 536
- iron supplements with, 804, 805, 806
- preoperative, 801
- very-low-birthweight infants, 392
- escalating dose regimen, donor lymphocyte infusion, 638
- escape mutants
- a-deficient, hepatitis B virus, 702, 705
- Escherichia coli*, uropathogenic
- Dr^a antigen and, 236
- P system antigens as receptors, 148
- Tamm–Horsfall glycoprotein and, 241
- Escherichia coli* O86
- on anti-B titres, 71–72
- anti-T and anti-Tn, 282
- Escherichia coli* O125: B15, anti-K antibody and, 216
- Escherichia coli* O157, group O and, 142
- ether-elution method, platelet antibodies, 589
- ethics, 636, *see also* Jehovah's Witnesses
- ethnicity, *see also* Arabs; Asians; black people; Melanesians
- ABO haemolytic disease, 532
- ABO phenotypes, 118, 119t
- non-secretors, 127
- anti-A and anti-B antibodies, 129
- anti-A antibody lysins, 131
- antibody identification, 338
- A antigen, 121
- D-negative phenotype, 173–174
- Duffy antibodies, 220
- gene frequencies, 59
- haemoglobin levels, 9
- K:6 antigen, 478
- Le(a+ b+) phenotype, 139t
- lele* genotype, 140
- Rh genotypes, 170
- sickle cell disease
- alloimmunization, 81
- donor blood selection, 331
- West African, gene frequencies, 59
- ethylene oxide, 684
- etiocolanalone, 773
- European ethnicity, gene frequencies, 59
- evidence retention, haemolytic transfusion reactions, 488
- Ex30 (Compomat), platelet concentrates, 612
- examination, donors, 2
- exchange transfusion, 394–396, 763–766, *see also* plasma exchange
- ABO haemolytic disease, 536
- babesiosis, 742, 766
- D-negative red cells, 203–204

- for haemolytic disease of the newborn, 521–522
- malaria, 738, 766
- partial, delayed haemolytic transfusion reactions, 485
- for post-transfusion purpura, 671
- potassium levels, 681
- red cell abnormalities, 6
- Exjade (deferasirox), 686
- exons, 58
- exothermic reactions, 90
- expansion, cord blood progenitor cells, 635
- explosion risk, sodium azide, 306
- exsanguination–transfusion, 763
- external cephalic version, transplacental haemorrhage and, 506
- extracellular matrix metalloproteinase inducer (EMMPRIN), 238
- extracorporeal photopheresis, 789
- extracorporeal volume, apheresis, 777
- extraction ratio, oxygen, 27
- extravascular destruction of red cells, 415–417, 474–477
 - disseminated intravascular coagulation, 468
 - intravascular destruction *vs.*, 458–459
- ex vivo* expansion, cord blood progenitor cells, 635
- ex vivo* generation, red cells, 831
- F(ab')₂ fragment
 - antibodies against, cold haemagglutinin disease, 262
 - IgG splitting, 65
- Fab fragments
 - cold haemagglutinins, 265
 - contact with D polypeptide, 179
 - dimeric, 311
 - IgG, 64
 - complement binding, 99
- Fabry disease, plasma exchange, 784f
- factor I *see* fibrinogen
- factor V
 - antibodies to bovine thrombin, 827
 - fresh-frozen plasma, 639
- factor VII
 - fresh-frozen plasma, 639, 640
 - plasma-derived concentrate, 855
 - vitamin K on levels, 821
- factor VIIa, recombinant, 813, 814–815, 823–824, 853, 855
- factor VIII, 851–854
 - ABO system and, 60
 - antibodies, 590, 853–854
 - immunoaffinity apheresis, 786
 - concentrates, 852–854
 - anti-A and anti-B antibodies, 464
 - hepatitis A virus, 710
 - HIV infection, 715
 - von Willebrand disease, 854
 - DDAVP on, 815, 816
 - dextran on, 35–36
 - donors, 851–852
 - hydroxyethyl starch on, 37
 - prophylactic, 851
 - treatment with, 851
- factor IX deficiency, 854–855
- factor XIII, 855–856
- factor B, C3iB complex, 102, 104
- factor D, 102
- factor H, 102, 103
- factor I, 102
- faeces, blood loss, 8, 365–366
- failure of response to transfusion, 29
- fainting, 10–12, 773, 777
- false-negative results
 - antibody screening, 330
 - antiglobulin test, 323
 - HIV screening, 717
- false-positive results
 - agglutination tests, 314
 - antiglobulin test, 323, 330
 - exclusion of donors due to, 4
- familial hypercholesterolaemia, 783, 785, 786
- familial incidence, ABO haemolytic disease, 533
- family-replacement donors, blood-borne viruses, 1
- fatalities, *see also* mortality donors, 13
 - Jehovah's Witnesses, 44
 - neonates, potassium, 392
- fatty-acid-dependent agglutinin, 281
- Fc α RI, 272
- Fc fragments
 - IgG, 64
 - receptors for, 66, 93, 271–272, *see also* neonatal Fc receptor
- Fc γ RI (IgG receptor), 271–272, 431
- Fc γ RIIA (IgG receptor), 93, 272
- Fc γ RIIB (IgG receptor), 86, 93, 94, 272
- Fc γ RIII (IgG receptor), 431
- Fc γ RIIIA, 271–272
- Fc γ RIIIB, 93, 272, 568–569
 - deficiency, 568–569
 - granulocyte-specific antigens, 570
- FCGR3 genes, 567–568, 569
 - genotyping, 573
- FcR III, 93
- Fc receptor blocking antibodies, on ADCC assays, 514
- FcRn (Fc receptor), 499–500
 - intensive plasma exchange on, 519
 - neonatal, 66
- febrile neutropenia, chemotherapy, 808
- febrile reactions, 476–477, 660–669
- FEIBA (activated prothrombin complex), 855
- Fenwal ALYX cell separator system, 771
- ferritin, iron status monitoring, 8, 684–685
- Ferrlecit, 805t
- fetal haemoglobin
 - hereditary persistence, 501
 - induction, 393
 - pregnancy, 503–504
- fetus, *see also* haemolytic disease of the newborn; hydrops fetalis
 - anti-A and anti-B antibodies, 130
 - anti-PPiP^b antibody on, 149
 - blood sampling, 516
 - thrombocytopenia, 586
 - cytomegalovirus infection, 722
 - determination of D group, 511–513
 - immunoglobulins, 68
 - intravenous immunoglobulin to, 520
 - maternal Rh D immunization and, 508–509
- red cells, 501–506
 - acid-elution methods, 501–502
 - antigens, 153
 - maternal, 506
 - thrombocytopenia, 584, 585
 - transplacental haemorrhage on, 506
 - ultrasonography, 516
- fever
 - febrile reactions, 661
 - red cell destruction, 365, 488
- fiberoptic blankets, phototherapy, 522
- fibrin, screen filtration pressure, 682
- fibrin bandage, 826t
- fibrin degradation products, DIC, 467
- fibrinogen, 850
 - concentrate, 850
 - cryoprecipitate, 641–642, 850
 - DIC, 40, 467, 640
 - fresh-frozen plasma, 639
 - plasma exchange, 780, 787
- fibrinolysis, cardiopulmonary bypass, 43
- fibrin sealants, 641–642, 826t, 827
- fibrin-stabilizing factor, 855–856
- fibronectin, 863
- ficin, 307
- ficolins, 101
- filgrastim, 808
- filtration
 - aggregates, 682, 683
 - leucocyte removal, 577–579
 - bedside, 580, 664
 - cytomegalovirus and, 723
 - effect on blood, 470
 - plasma exchange, 778–779
 - of platelets, leucocyte reduction, 772
 - prion protein removal, 730
 - reactions, 677
 - selective, 785
- fingerprick, haemoglobin levels, 9
- first-time donors
 - fainting, 10, 11
 - testing for D antigens, 174
- fixation of red cells, automated blood grouping, 325

- flat-bed agitators, platelet storage, 617–618
 flora, skin, 733
 flow cytometry
 granulocyte immunofluorescence
 technique, 572
 leucodepleted platelet concentrates, 578
 platelet immunofluorescence test, 586
 red cells, 357, 413, 490
 donor vs recipient, 343
 D-positive, 327
 transplacental haemorrhage, 502–503
 weak D antigens, 174
 young vs old, 412
 fludarabine
 on D immunization, 193
 on stem cells, 775
 TA-GvHD and, 668
 fluid therapy, 26–34, 764–765, 779
 burns, 44–45
 haemorrhage, 26–27
 fluorescein isothiocyanate
 anti-Ig serum, 571–572
 monoclonal anti-D conjugate, 503
 fluoroquinolones, 279
 Fluosol DA, 828
 flushing, 661
 focal segmental glomerulosclerosis,
 treatment, 782
 fondaparinux, 824
 Food and Drugs Administration, mortality
 reporting, 461–462
 formaldehyde, dialysers, anti-Nf antibody,
 226
 Forsmann antibody, binding to sheep red
 blood cells, 89
 Forsmann antigens, 60, 136
 biphasic haemolysins and, 267
 Foxp3 (transcription factor), 259
 FP24 (late-frozen plasma components), 639
 fractional rate of red cell clearance (*k*), 415
 fractional surgical blood loss, 42
 fractionation of plasma, 369, 846–871
 for albumin, 30
 HIV, 714
 HPV B19, 725–726
 plasmapheresis for, 767
 plasticizers and, 683–684
 fractions (numbered), plasma, 847
 fractures, from fainting, 12
 fracture surgery, effects of transfusion, 390
 free haemoglobin *see* haemoglobin, in
 plasma
 freezing, *see also* cryopreservation
 blood, accidental, 470
 frequencies, genes, 58–59
 frequency of donations, 3, 6–7
 iron loss, 8
 fresh-frozen plasma, 639–641
 anticoagulant reversal, 823
 bacterial contamination, 733, 736
 oligaemia, 40–41
 plasma exchange, 780
 red cell contamination, D immunization,
 194
 thrombotic thrombocytopenic purpura,
 785
 freshly-washed red cells
 agglutination tests, 311
 antibodies, 288
 freshness of red cells, haemolysis *in vitro*
 and, 131
 fresh whole blood, 396, 611, 612
 Treponema pallidum, 731
 Yersinia enterocolitica, 735
 frozen platelets, 620–621
 frozen storage *see* cryopreservation
 Fuc (α 1 β 2)Gal β -R, plasma, 153
 fucolipids, carcinomas, 61
 L-fucose, red cell membranes, 88
 functional affinity constants, 89–90
 functional iron deficiency, 804, 807
 functionally closed systems, frozen red cell
 storage, 382, 384
 FUT1 (alpha 1,2 fucosyltransferase), H
 antigen, 124
 FUT2 (alpha 1,2 fucosyltransferase), 138, *see*
 also Se gene
 ABH antigen non-secretors, 127
 FUT3 (alpha 1,3/4 fucosyltransferase), 138,
 see also Le gene
 Fy^a antigen, 218–219, *see also* anti-Fy^a
 antibody
 immunogenicity, 82
 Fy(a–b–) phenotype, 219, 220
 Fy^b antigen, 218–219
 Fy gene, 218
 Fy^s, 218–219

 G1227A mutation, *RHD* pseudogene, 179
 gag gene, 710, 711, 718
 D-galactose, red cell membranes, 88
 galactosyl transferases, deficiency, 286
 galectins, 72
 GalNAc(β 1,3)-D-galactosyl transferase,
 deficiency, 286
 G antigen, 179–180, 196–197
 gas channel, neutral, 182
 gas-permeability of plastics, platelet storage,
 617
 gastrectomy, partial, blood loss, 24–25
 gastrointestinal tract
 bleeding
 lysine analogues, 818
 oestrogens on, 825
 red cell survival, 365–366
 immunological tolerance, 87
 lysine analogues, 818, 819
 vitamin K absorption, 821
 GATA-1 (transcription factor), 219
 Lu(a–b–) phenotype, 228
 gating errors, flow cytometry, 503
 GB viruses, 709
 gelatins, 36, 37, 826
 gel diffusion, IgA deficiency, 592
 Gelofusine, 36
 gel test, 303, 322
 automated blood grouping, 324
 mixed red cell populations, 314
 gender differences
 fainting, 11
 fetus on maternal Rh D immunization,
 508
 frequency of donations, 6–7
 haemoglobin levels for donation, 9
 iron loss, 7
 gene conversion, Rh antigens, 175
 genes, 58, *see also* HLA genes; pseudogenes;
 specific types
 frequencies, 58–59
 repertoire shift, 187
 Rh system, 168–169, 171
 ethnicity, 173–174
 usage by Rh antibodies, 188
 genotypes
 donors, determination, 345
 hepatitis B virus, 700
 hepatitis C virus, 706
 phenotypes vs, 58
 Rh system, 169–170, 191
 genotyping, *see also* DNA-based genotyping
 fetus, Kell system, 529
 human neutrophil antigens, 571,
 572–573
 neonatal alloimmune thrombocytopenia,
 584
 platelet-specific antigens, 587–588
 gentian violet, for *Trypanosoma cruzi*, 740
 geography, antibody identification, 338
 Gerbich phenotype, 235
 Gerbich system, 235–236
 Germany, *RHCE* allele, 179
 germ-free chicks, heteroagglutinins, 71
 gestational thrombocytopenia, 585–586
 GIL antigen, 239
 Glanzmann's thrombocytopenia type I,
 574–575, 624, 670
 DDAVP and, 817
 glass, colloidal silica from, 289
 glass beads, gel test, 322
 GLOB blood group system, 146–150
 globoside, P₁ antigen as, 147
 glomerulonephritis, treatment, 782
 glucose, *see also* dextrose
 metabolism in red cells, 370
 premature infants, 681
 red cell storage, 305, 380
 glucose-6-phosphate dehydrogenase
 deficiency, 6, 471
 glucose transporter (GLUT 1), 55–56
 glucose-treated red cells
 antibodies, 281
 anti-M antibody and, 225
 anti-N antibody and, 226

- glucuronide complexes, 280
 GLUT 1 (glucose transporter), 55–56
 glutathione, 310
 glycans, 56, 142
 glycerol, 305, 379–383, 883–884
 haemolysis, 470
 removal, 382, 883–884
 ‘glycigel’, 305, 883
 glycine, ¹⁵N-labelled, red cell labelling, 364
 glycine soja, red cell polyagglutinability, 284t
 glycophorin A, 222
 antibodies, 273
 binding to C3b, 227–228
 deficiency, 223
 glycophorin B, 182, 222, 224
 binding to *Plasmodium falciparum* and
 Babesia divergens, 228
 glycophorin C, 55
 Ge antigens, 235
 relation to antibody, 76
 glycophorin D, Ge antigens, 235
 glycophorins, red cell precursors, 62
 glycosphosphatidyl inositol-linked proteins,
 transfer, 366
 glycoprotein IX, quinine-induced
 thrombocytopenia, 590
 glycoproteins, 153, *see also* lectins
 on platelet survival, 617, 619
 Rh-associated (RhAG), 182
 SDS-PAGE, 56
 glycosylation
 anti-M antibody and, 225
 Fy^a antigen, 219
 glycosylation abnormality, anion transport
 protein, 61
 glycosylphosphatidylinositol, linkage of prion
 proteins, 728
 glycosylphosphatidylinositol-anchored
 surface proteins, 57–58, 471
 glycosyltransferases, 58, 153
 A₁ vs A₂, 121
 ABO system, 118–119
 overlap, 122–123
 A vs B, 122
 group O, 123
 P gene product, 147
 Sid and Cad antigens and, 241
 Gm allotypes, 590–591
 anti-D antibody and, 186
 GM-CSF (cytokine), 775
 neonatal sepsis, 809
 gold-induced thrombocytopenia, 590
 Goodpasture syndrome, treatment, 782
 Gov antigens, 576
 GPIb molecules, platelets, 617, 620, 670
 GPIIb/IIIa molecules, platelets, 617
 GPIIIa molecules, human platelet antigens,
 574, 670
 gp41 (transmembrane protein), 711
 GP(B – A – B) hybrid protein, 223
 GP.Mur (phenotype), 223
 graft-versus-host disease, 559
 cord blood progenitor cell transplantation,
 634
 directed donations, 14
 donor lymphocyte infusion, 638
 haematopoietic progenitor cell transfusion,
 632–633
 infants, 521, 667
 photopheresis, 789
 transfusion-associated, 487, 667–669
 universal leucoreduction policy, 580
 graft-versus-leukaemia effect, 559, 637–638
 graft-versus-tumour effect, 559
 granulocyte colony stimulating factor, 628,
 808–809
 adverse effects, 774
 leucapheresis, 773
 stem cell mobilization, 775–776
 granulocytes
 antibody detection, 571–572, 630
 antigen typing, 572–573
 A, B and H antigens and, 128
 collection, 773–774
 immunofluorescence technique, 571–572,
 630
 transfusions, 626–632
 cytomegalovirus infection, 722
 reactions, 571, 662
 toxoplasmosis, 741
 granulocyte-specific antigens, 570
 graphs, red cell survival estimation, 876–877
Griffonia simplicifolia lectins, 88, 285
 Gro^a antigen, 575
 group A
 ABO haemolytic disease, 532
 anti-A antibody in subjects, 134
 conversion of O red cells to, 127
 conversion of red cells to O, 127
 donors, high-titre anti-B, 465
 neonates, 335
 stomach carcinoma, 59
 weak alleles, 123–124
 group A₁ red cells, ⁵¹Cr release method, 315
 Groupamatic (Kontron), 324
 testing for D antigens, 174
 group B
 ABO haemolytic disease, 532
 anti-B antibody in subjects, 134
 conversion of O red cells to, 127
 conversion of red cells to O, 127
 neonates, 335
 subgroups, 122
 group O
 cholera and, 60, 142
 donors
 blood from, 331–332
 vaccinations, 5, 136–137
 Escherichia coli O157 and, 142
 haemolytic transfusion reactions, Lewis
 system, 145
 immune response to ABO agglutinins, 138
 Lewis phenotypes, 139
 molecular biology, 123
 mothers, 335, 533, 537
 red cells
 A and B substance uptake, 128
 converting to A or B cells, 127
 serum, crossreacting antibodies, 132–133
 universal donors, 448–449
 growth, thalassaemia, 393
 growth factors, 806–808
 cord blood progenitor cell expansion, 635
 growth hormone, exclusion of donors, 4
 GS II lectin, 285
 Gy^a antigen, 233
 GYPA/GYPB gene, 175
 Gypsies, Jr^a antigen, 239
 habitual abortion, HLA antigens, 565
 Haemacel, 36
 haemagglutination, *see also* passive
 haemagglutination assay
 inhibition, IgA deficiency, 592
 haematocrit *see* packed cell volume
 haematoma *see* bruising
 haematopoietic progenitor cell transfusion,
 632–637, *see also* peripheral blood-
 derived progenitor cells
 compatibility testing, 630
 HLA system and, 559–561
 haematoside, red cell agglutination
 experiment, 91
 haemochromatosis, 15–17
 apheresis donors, 774
 cardiovascular disease, 14
 red cell apheresis, 766
 haemodialysis
 anti-N antibody, 226
 cold-reacting IgM autoantibodies, 561
 on immune responses, 76
 haemodilution
 acute normovolaemic, 41–42, 802
 haemoglobin-based oxygen carriers,
 830–831
 perfluorochemicals, 828
 isovolaemic, polycythaemia, 766
 haemoglobin, *see also* fetal haemoglobin
 catabolism, 358
 levels, *see also* anaemia
 ABO haemolytic disease, 535
 after donation, 9
 donor screening, 8–9
 fetus, 516
 hereditary haemochromatosis, 16, 17
 mother–infant ABO incompatibility,
 531
 neonates, 517–518
 oxygen delivery, 27
 premature infants, 391
 preoperative, 41
 red cell transfusion, 386–387
 targets for erythropoietin therapy, 807

- transfusion trigger, 389
 on viscosity of blood, 28
 loss from red cells, 364
 per unit stored blood, 368
 in plasma, 371, 372, 828
 clearance, 472–474
 DEHP and, 371, 379
 detection, 489
 extravascular red cell destruction,
 415–417
 nephrotoxicity, 468
 transfused, 470
 transfusion reactions, 465
 variants, donor vs recipient, red cell
 survival estimation, 364
- haemoglobin-based oxygen carriers, 828–831
 haemoglobinopathies, 6
 haemoglobin peroxidase, blood grouping,
 325
 haemoglobinuria, 459, 473, *see also*
 paroxysmal nocturnal haemoglobinuria
 autoimmune haemolytic anaemia, 471
 delayed haemolytic transfusion reactions,
 479
 detection, 489
 maternal, 506
 paroxysmal cold haemoglobinuria, 266
- haemolysins, 459–469, *see also*
 autohaemolysins; biphasic haemolysins;
specific antibodies
 intramuscular blood, 135
 tests for, 314–315
- haemolysis, 94–95, *see also* intravascular
 destruction of red cells
 5% dextrose, 469
 anti-D antibody injections, 203
 anti-Lutheran antibodies, 230
 apheresis donors, 778
 bystander haemolysis, 101, 637
 detection, 488–490
 differential, 877
 glycerol, 470
 haematopoietic stem cell transplantation,
 636–637
 HLA antigens, 243
 hypothermia, 420–421
 immunoglobulin treatment and, 861–862
 in vitro, 131, 458
 Lewis antibodies, 143
 sickle cell disease, 470, 472, 482
 small transfusions, 411–457
 storage, 371, 470
 survival estimation using, 357
 tests for, 314–315
 thalassaemia, 483
- haemolytic anaemias, *see also* autoimmune
 haemolytic anaemia; passenger
 lymphocyte syndrome
 drug-induced, 279–281
 methyl dopa, 270–271, 280, 281
 transfused red cells, destruction, 365–366
- haemolytic disease of the newborn,
 499–548
 ABO incompatibility, 137, 532
 ADCC(L) assay, 97
 ADCC(M) assay, 96
 anti-Ge3 antibody, 236, 530
 assessment of severity
 antenatal, 513–517
 neonates, 517–519
 clinical manifestations, 509–510
 D antigen variants and, 177
 D^{VI} antigen, 177
 epidemiological trends, 526–527
 haemolytic transfusion reactions, 335
 non-anti-D, 527–537
- haemolytic transfusion reactions, 458–498
 anti-P₁ antibody, 148
 cold autoagglutinins, 265
 delayed *see* delayed haemolytic transfusion
 reactions
 D immunization, 197–198
 haemolytic disease of the newborn,
 335
 HLA antigens, 243
 investigations, 342–345, 488–491
 Kell antigens, 218
 Kidd antibodies, 221–222
 Lewis system, 145
 management, 469
 MNSs system, 227
 pathophysiology, 465–467
 premature infants, adult A or B red cells,
 536–537
 red cell antibodies, 134
 frequency, 80
 relative importance, 81–82
 sickle cell disease, 331
 T activation, 284
 undetectable antibodies, 446
 vaccinated donors, 136–137
- haemolytic uraemic syndrome
 atypical, factor H, 102
 post-diarrhoeal, 148
- haemopexin, 473
- haemophilia, 851, *see also* factor VIII
 DDAVP, 852
 factor VIII inhibitors, 853–854
 hepatitis A virus, 710
 hepatitis B virus, 701, 705
 hepatitis C, 707
 HIV infection, 713, 714–715
 HPV B19, 726
 lysine analogues, 819
- haemophilia B, 854–855
Haemophilus influenzae, AnWj as receptor,
 238
- haemorrhage, *see also* blood loss
 dextran as cause, 35–36
 disseminated intravascular coagulation,
 467
 drugs for, 813–827
- gastrointestinal tract
 lysine analogues, 818
 oesophageal varices, rebleeding, 390
 oestrogens on, 825
 red cell survival, 365–366
 gelatins on, 36
 hydroxyethyl starch on, 37
 after massive transfusion, 39
 neonatal thrombocytopenia, 583–584
 recurrent, anaemia, 390
 red cell survival, 365–366
 into soft tissues, 472
 transplacental *see* transplacental
 haemorrhage
- haemosiderinuria, 474
 haemosiderosis, 14, 684–686, 766
 haemostasis
 cardiopulmonary bypass, 43
 drugs for, 813–827
 hetastarch vs pentastarch, 774
- half-lives ($T_{1/2}$), *see also* survival
 anti-D antibodies in neonates, 500
⁵¹Cr, 413, 874
 factor IX, 855
 fibrinogen, 850
 IgG, 66
 lysine analogues, 818
 plasma alternatives, 36
 protamine, 825
 recombinant erythropoietin, 807
 red cells, D immunization, 188, 190f, 191f
- half-survival (T_{50})
 neocytes, 394
 red cells, 361
- H allele, 138
- H antigen, 124
 development, 61–62, 125
 plasma, 153
 red cells, 153
 number of sites, 124–125
- H antigen acceptor, 119, 138
 haplotypes, 554
 hapten-carrier complexes, 279
 haptoglobin, 472–473
 deficiency and antibodies, 675
 estimation, 489
- harmful cold autoantibodies, 261–268
 harmful warm autoantibodies, 270–278
 harmless cold autoantibodies, 260–261
 harmless warm autoantibodies, 268–270
 harnesses, plasmapheresis, 768
 hay fever, 5
- HBeAg, 700
 absence
 HBV carriers, 704
 liver disease, 705
 anti-HBe and, 702
 carriers, 701
 HBsAg *see* hepatitis B surface antigen
 HBseAg, 700
 HBV-DNA, serum, 702

- H chains, immunoglobulins, 62
- head injuries, from fainting, 12
- health benefits of donation, 13–14
- health-care workers, HBsAg-positive, 704
- heart
- iron accumulation, 685–686
 - oxygen extraction, 27
 - surgery, *see also* cardiopulmonary bypass
 - aprotinin, 820
 - DDAVP, 817
 - HLA immunization, 558
 - lysine analogues, 819
 - off-pump, 42, 43
 - polymerized haemoglobin solution, 830
 - red cell salvage, 803
 - TA-GvHD, 668
 - transplants
 - cytomegalovirus infection, 722
 - HLA compatibility, 562
- heart–lung transplants
- cytomegalovirus infection, 722
 - passenger lymphocyte syndrome, 487
- heart rate, anaemia, 385
- heat, *see also* temperature
- ABO agglutinins, immunoglobulin classes, 132
 - antibody elution, 340
 - on complement, 104
 - effect on blood, 470
 - elution, 93
- heat exchangers, 678
- heat lability, immunoglobulins, 71
- heat-treated antithrombin concentrates, 862
- 'heavy' platelets, 614
- Hédon, E. (1902)
- delayed haemolytic transfusion reactions, 478
 - red cell transfusion, 397
- height (body), blood volume estimation, 876
- Helgeson phenotype, 237
- Helicobacter pylori*, Le^b antigen and, 60, 142
- helminths, Tn antigen, 282
- helper T cells, 259
- HLA antigens, 554, 557–558
- hemizyosity, 58
- HEMPAS (hereditary erythroblastic multinuclearity with a positive acidified serum), 152, 243
- heparin
- on complement, 104
 - for DIC, 469
 - protamine on, 824–825
- heparin-induced thrombocytopenia, 590
- hepatitis, ischaemic, 26
- hepatitis A virus, 709–710
- immunoglobulin prophylaxis, 858
 - solvent/detergent-treated plasma, 641
- hepatitis B immunoglobulin, 704, 859
- deferrals of donations, 5
 - hepatitis B surface antigen, 700–701
 - absence, HBV transmission, 703
 - screening, 702
 - hepatitis B virus, 699–705
 - immunoglobulin prophylaxis, 859
 - transmission, 702–704
 - variants, 704–705
 - hepatitis C virus, 705–708, *see also* blood-borne viruses
 - hepatitis D virus, 705
 - hepatitis E virus, 708–709
 - hepatitis G virus, 709
 - hereditary angioedema, 856–857
 - hereditary antithrombin deficiency, 862
 - hereditary erythroblastic multinuclearity with a positive acidified serum (HEMPAS), 152, 243
 - hereditary haemochromatosis, 15–17
 - red cell apheresis, 766
 - hereditary persistence of fetal Hb, 501
 - hereditary spherocytosis
 - Diego system band 3 genes, 230–231
 - transfused red cells, survival, 366
 - herpes viruses, 724–725
 - hetastarch, 774
 - heteroagglutinins, 71–72, 317, 323
 - removal, trypsin-treated red cells, 91
 - heterophil antibodies, 136
 - heterozygotes, antigens, 304, 428
 - hexokinase, red cell ageing, 359
 - HFE gene, 16, 551
 - H* gene, 124
 - hh* genotype, 125
 - HHV-6 (human herpes virus), 724–725
 - HHV-8 (human herpes virus), 725
 - high expressers, A and B antigens, 573, 581
 - high-incidence antigens, 240–241
 - high-molecular-weight iron dextran, 804
 - high-risk activities *see* blood-borne viruses
 - high-titre, low-avidity antibodies, Knops system, 237
 - hinge regions, immunoglobulins, 63
 - hip fracture surgery, effects of transfusion, 390
 - histocompatibility, 549
 - historical aspects, 22–23, 411
 - anti-D antibodies, 184
 - therapeutic, 199
 - blood groups, 53–55
 - crossmatching, 332
 - delayed haemolytic transfusion reactions, 478
 - enzymes on red cell agglutination, 307
 - exchange transfusion, 763–764
 - haemolytic disease of the newborn, 501
 - HLA system, 549
 - Lewis system, 143
 - mortality, 461
 - passenger lymphocyte syndrome, 486
 - plasma fractionation, 846–847
 - plasmapheresis, 766–767
 - platelet transfusion, 611–612, 621–623
 - red cell freezing, 380–381
 - red cell storage, 366–368
 - red cell transfusion, anaemia, 397
 - topical haemostatic agents, 825–826
 - transfusion-associated acute lung injury and, 665
 - transfusion-associated AIDS, 713–714
 - transfusion reactions, 466
- HIV-1 and HIV-2, 711–712, 713
- screening tests, 717
- HIV infection, 710–718, *see also* blood-borne viruses
- CD147 on, 238
 - cold autoagglutinins, 264
 - course, 712–713
 - cytomegalovirus infection, 722–723
 - Duffy groups and, 219–220
 - febrile reactions, 660, 663–664
 - intravenous immunoglobulin, 859
 - ITP, thrombopoietin, 812
 - p^k antigen and, 148
 - prevention, 715–718
 - RANTES (chemokine), 238
 - recombinant erythropoietin, 807
 - risk, 718
 - TA-GvHD and, 667–668
- HLA antibodies, 557–559
- detection, 567
 - febrile reactions, 661–662
 - as haemolysins, 459
 - platelet-specific antibodies *vs*, 587
 - refractoriness to platelet transfusions, 576–577
 - transfusion-associated acute lung injury and, 666
- HLA antigens, 549–567, *see also* DR antigens
- class I, 551–553
 - prevention of alloimmunization, 577–580
 - soluble, 557
 - class II, 551–552, 553–554, 555–556
 - inactivation of positive cells, 580
 - neonatal alloimmune thrombocytopenia, 584–585
 - on Fc receptor function, 431
 - febrile reactions, 669
 - on immune responses, 75
 - platelets, 573, 581–582, 672
 - on red cells, 242–243, 426
 - TA-GvHD and, 668
 - tests for, 565–567
- HLA genes, 551, 554–557
- Chido/Rodgers system and, 234
 - class II, 555–556
 - tests for, 565–566
- HLA-matched platelets, 581–582
- HLAMatchmaker, 582
- HLA restriction, 552–553
- HNA-1 system, 567–568
- genotyping, 572–573

- HNA-2 system, 569
HNA-3 system, 569
HNA-4 system, 569
HNA-5 system, 569
HOFM antigen, 180
hog pepsin, vaccines, 136–137
homologous restriction factor (HRF) *see* C8 binding protein
homozygotes
 antigens, 304, 428
 HLA loci, TA-GvHD and, 668
homozygous familial hypercholesterolaemia, 783, 785, 786
horse A and B substances, 138
horse serum
 antilymphocyte globulin, 278
 deferrals of donations, 5
hospital-acquired anaemia, 391
HPA-1 system, 574–575
 neonatal alloimmune thrombocytopenia, 584
 post-transfusion purpura, 670–672
HPA-2 system, 575
HPA-3 system, 575
HPA-4 system, 575
HPA-5 system, 575–576
HPA-15 system, 576
H system, 118
HTLV-associated myelopathy (HAM), 718, 719
H-transferase, colon carcinoma, 142
human anaplasmosis, 732–733
human embryonic stem cells, 831
human growth hormone, exclusion of donors, 4
human immunodeficiency virus *see* HIV infection
human monoclonal antibodies, 77
human neutrophil antigens, 567–569
 tests for, 571–573
human parvovirus B19 *see* parvovirus B19
human platelet antigens, 573–574, 670
human serum, complement from, 315
human T-cell leukaemia viruses, 718–720, *see also* blood-borne viruses
human thrombin, 864
Humate-P, 854
humoral response, 72
husband's blood, 217
Hy antigen, 233
hybrid ABO alleles, 124
hybrid genes, Rh system, 173–175, 511–512
hybridoma cells, 77
hydatid cyst fluid, P₁ antigen and antibody, 148, 150
hydrocortisone
 before anti-D antibody injections, 203
 red cell destruction inhibition, 442
³H-thymidine, granulocyte labelling, 627
hydros fetalis, 509–510
 ABO incompatibility, 535–536
 transfusion for, 520
 transplacental haemorrhage and, 506
 ultrasonography, 516
hydroxyethyl starch (HES), 31, 36–37
 adverse effects, 778
 allergy, 37
 catabolism, 37–38
 frozen red cell storage, 383
 leucapheresis, 774
hyperacute rejection, 562
hyperbilirubinaemia *see* bilirubinaemia
hypercholesterolaemia, homozygous familial, 783, 785, 786
hypergammaglobulinaemia, direct
 antiglobulin test, 269
hyperhaemolysis, sickle cell disease, 472
hyperimmune immunoglobulins, 858
hyperimmunization, *see also* vaccines/
 vaccinations
 antibodies to low-frequency antigens, 241
 anti-D antibody, 186
hypersensitivity, *see also* anaphylaxis
 anti-D antibody injections, 203
 ethylene oxide, 684
 immediate-type, 672–675
hypersplenism, 366
hypertension
 haemoglobin-based oxygen carriers, 831
 recombinant erythropoetin, 807
hypertensive encephalopathy, 388
hypertonic saline, 32–34
 burns, 45
hypertransfusion, thalassaemia, 393
hypervariable domains, immunoglobulins, 62
hyperviscosity syndrome, 783
hypocalcaemia, citrate-induced, 13
hypogammaglobulinaemia, 75
 anti-A and anti-B antibodies, 129, 418
 immunoglobulin replacement, 859, 860
 incompatible transfusion, 467
 reactions to IgG, 675
hypoglycaemia, neonates, 681
hyponatraemia, DDAVP, 817
hypoplastic anaemia, 392–393
hypotension
 haemorrhage, 25
 transfusion reactions, 467, 469
hypothermia
 cold alloantibodies, 420–421
 intravenous immunoglobulin, 862
 massive transfusion, 39, 678
hypothermia (induced), 330
hypotonic shock, platelets, 619
I antigen, 150–153
i antigen, 150–153
iC3b (complement product), 98, 102
icatibant, 857
ice-binding proteins, 306
icterus gravis neonatorum, 509
identification
 donors, 2
 errors of, 336–337, 461, 488
idiotopes, antibodies, 67
idiotypes, antibodies, 67
IgA, 62–63, 66t, 67, *see also* anti-IgA antibodies
 ABO agglutinins, 130, 131–132
 immune responses and, 138
 anti-D antibody, 186
 autoantibodies, with anti-I cold agglutinins, 266
 deficiency, 591–592
 anaphylaxis, 673–675
 gastrointestinal, immunological tolerance, 87
 neonates, 68–69
 serology, 75
 warm autoantibodies, 272
IgD, 67
IgE, 67
IgG, 66t, *see also* anti-IgG antibodies
 ABO agglutinins, 130, 131, 132, 138
 ABO haemolytic disease, 533–534
 ADCC assays, 96, 97
 adverse reactions, 861
 anti-D antibody, 185–186
 affinity constants, 187
 passive, 202–203
 anti-dextran, 35
 antigen-binding sites, 89
 anti-Le^a antibody, 145
 anti-M antibody, 225
 anti-P antibody, abortions, 149
 autoantibodies
 with anti-I cold agglutinins, 266
 IgM autoantibodies with, 273
 biphasic haemolysins as, 268
 blood grouping, 303
 C3b with, 95
 chemiluminescence assay, 97
 complement binding, 98–99
 subclasses, 99
 distribution, 65
 dithiothreitol, testing, 340–341
 effect of reduction, 70
 on enzyme-treated red cells, 92
 Fc receptors, 93
 half-lives, 66
 human T-cell leukaemia virus infections, 719
 immune responses with, 73, 74
 immune thrombocytopenia, 588
 immunosuppression, 86
 intensive plasma exchange on, 519
 laboratory separation, 69
 maternal, 499–501
 maternal–fetal transport, 514–515, 524, 570
 microwave radiation, removal from red cells, 341

- mixed red cell adherence assay, 587
 molecule, 62–65
 monoclonal antibodies, conversion to IgM, 311
 monocyt–red cell interactions, 94
 neonates, 68
 non-complement-binding antibodies, differences between, 433–434
 non-destructive, 426–427
 non-specific attachment, 91
 P¹PK and GLOB system antibodies, 149–150
 reactions, 675–676
 red cell ageing, 359
 red cell agglutination, 91, 317–319
 red cell assay, 326
 red cell destruction, 415, 417, 421–422, 424–427
 serology, 75
 subclasses, 590–591
 ABO haemolytic disease, 533
 anti-D antibody, 185–186, 430–431, 513–514, 526
 apparently normal donors, 269
 complement binding, 99
 harmless warm autoantibodies, 268
 immunoaffinity apheresis, 785, 786
 maternal, 500
 warm autoantibodies, 271–273
 subtypes, 65–66
 ABO agglutinins, 130
 synthesis, plasmapheresis donors, 769
 transfused, 449, 857–858
 transplacental transfer, 66
 warm antibodies, 270–271
 IGHV3 genes, 188
 IgM, 62, 65f, 66–67, 66t
 ABO agglutinins, 130, 131–132
 immune responses and, 138
 amounts injected, 439–440
 antibody against, 131, 319
 anti-D antibodies, 185
 affinity constants, 187
 antigen-binding sites, 89
 passive, 202–203
 antigen-binding sites, 89
 anti-K antibody, 216
 anti-Le^a antibody, 145
 anti-M antibody, 225
 autoantibodies, IgG autoantibodies with, 273
 cold haemagglutinins, 266
 complement binding, 98
 effect of reduction, 69–70
 human T-cell leukaemia virus infections, 719
 immune responses with, 73–74
 monoclonal antibodies, conversion from IgG, 311
 naturally occurring antibodies, 72
 neonates, 68
 P¹PK and GLOB system antibodies, 149–150
 paraproteins, 261
 red cell destruction, 417–421, 424
 red cells, acid-elution methods, 884–885
 red cell sequestration, 423
 serology, 74–75
 sulphydryl compounds on, 69–70, 340–341
 transfused, 449
 warm antibodies, 271
 warm autoantibodies, 272
 warm autohaemolysins, 273
IgnT genes, 151
 Ig superfamily, 69
 Ii system, 150–153
 Imferon, 804
 IMGT/HLA Sequence Database, 554
 immediate-spin methods, abbreviated
 crossmatching, 333–334
 immediate-type hypersensitivity reactions, 672–675
 immediate with delayed haemolytic transfusion reactions, 481
 immune anti-K, 216
 immune complexes
 anti-D antibody quantification, 327
 drugs, 280
 granulocyte immunofluorescence technique, 572
 post-transfusion purpura, 670
 removal from plasma, 778–779, 782–783
 ulcerative colitis, 281
 immune precipitation, antibody identification, 341–342
 immune responses, 72–87, 439, *see also* anamnestic responses; primary immune responses; secondary immune responses
 A and B antigens, 134–138
 Lewis system, 145
 to lymphocytes (passenger lymphocyte syndrome), 194–195, 486–488
 suppression, pregnancy, 199–204
 immune thrombocytopenic purpura (ITP), 588–590, 624–625
 bleeding time, 615
 eltrombopag, 813
 FCGR3B genes, 569
 intravenous immunoglobulin, 860–861
 maternal, 585–586
 platelet transfusion, 625
 RhIG for, 451, 860–861
 Rho(D) immune globulin, 475
 Romiplostim, 812–813
 thrombopoietin, 811–812
 treatment, 583
 immunization, *see also* alloimmunized patients; hyperimmunization; secondary immune responses; transplacental haemorrhage
 A antigen, pregnancy, 136
 collapse curves and, 448
 D antigens, 83–84, 188–196
 accelerated red cell destruction, 443
 amnio-centesis, 504
 anti-M antibody, 225
 D-positive transfusion after, 437–438
 earliest time of anti-D appearance, 192–193
 fetal factors, 508–509
 frequencies in pregnancy, 506–508
 minimum dose, 192
 persistence of antibodies, 196
 prevention, 527
 small amounts, 189
 suppression after pregnancy, 522–526
 switching off, 201–202
 tests for, 510–513
 timing in pregnancy, 508
 by transfusion, 188–191
 HLA molecules, 557–558, 577–580
 leucocytes, habitual abortion, 565
 non-D antigens, 196–198, 331–332, 520–521
 organ transplantation, 81, 194
 platelet antigens, 576–590
 post-transfusion purpura, 670–671
 sickle cell disease, 79, 80–81, 766
 immunization (prophylactic)
 hepatitis B virus, 704
 with immunoglobulin, 858–860
 immunoaffinity apheresis, 785–786
 immunobead assay, platelet-bound Ig, 589
 immunodeficiency
 cytomegalovirus infection, 722
 HIV infection, 713
 immunoglobulin replacement, 859
 TA-GvHD, 667–668
 immunodominant groups, antigenic determinants, 58
 immunofluorescence technique, *see also* platelet immunofluorescence test
 granulocytes, 571–572, 630
 immunogenicity *see* potency
 immunoglobulins, 62–72, *see also* hepatitis B immunoglobulin; *specific Ig classes*
 cold haemagglutinins, 265–266
 copying variable domains, 78
 deferrals of donations, 5
 deficiency, 859
 flexibility, 63
 heat lability, 71
 laboratory methods, 69–71
 markers on, 67–68
 neonatal, 68–69
 reduction, 69–71, 311
 removal from plasma, 778–779
 superfamily, 69
 therapeutic, 857–862, *see also* intravenous immunoglobulin
 anti-HAV, 710
 parvovirus antibodies, 726

- reactions, 674, 675
 - virus transmission, 846
- immunological tolerance, 84–86
- induction, D antigens, 526
- oral antigens causing, 87
- immunology of blood groups, 53–117
 - neoplastic change on, 60–61
- immunomodulation, by transfusion, 562–565
- immunosuppression
 - by passive antibody, 85–86
 - by rhesus immunoglobulin, 443
 - therapeutic, 559
 - for autoimmune haemolytic anaemia, 277
 - chimerism, 84
 - on D immunization, 193, 526
 - HBV recrudescence, 701
 - TA-GvHD and, 668
 - by transfusion, 562–565
- Inab phenotype, 236
- inadvertent arterial puncture, 13
- inadvertent transfusion
 - D-positive blood, anti-D for, 201, 203–204, 438
- In antigens, 237–238
- incompatible donors, apparent, 335–336
- incompatible transfusions, 134–135, *see also*
 - haemolytic transfusion reactions
 - antibodies not found, 443–448
 - differential agglutination, 490
 - hypergammaglobulinaemia, 467
 - plasma, 448–450, 464
 - red cells *see* red cells, incompatible transfusions
- incomplete antibodies, 75, *see also* IgG,
 - anti-D antibody
 - antiglobulin test, 315–323
 - anti-IgM as, 319
 - anti-S antibody, 226
 - febrile reactions, 476
 - normal cold, 134, 260t, 261
 - red cell test transfusion, 413
 - warm autoantibodies, 271, 272
- incubation of red cells
 - at 37°C, 360–361, 368, 375
 - at high temperatures, viability, 378
- incubation periods
 - agglutination tests, 311
 - antiglobulin test, 320
 - babesiosis, 742
 - infectious mononucleosis, 724
 - malaria, 738
 - post-transfusion hepatitis, 703
 - syphilis, 731
- index of therapeutic effectiveness (ITE),
 - stored red cells, 383
- Indian system, 237–238
- indicator rosette test, 884
- indirect antiglobulin test, 315, 317–319
 - crossmatching, 332
 - immunoglobulin treatment and, 861
 - polyethylene glycol, 322, 324, 328, 330
 - recipient serum screening, 330
 - sensitivity, 327
 - testing for IgG, 533
 - transplacental haemorrhage, 502
- indirect differential agglutination, 356–357, 877
- indirect differential haemolysis, 877
- ¹¹¹In
 - granulocyte labelling, 627
 - platelets labelled with, 613, 878–879
 - red cell labelling, 364, 413
 - red cell volume estimation, 873
- ¹¹³In, platelets labelled with, 613
- infants
 - ABO agglutinins, 130
 - exchange transfusion, 764
 - febrile reactions, 662
 - graft-versus-host disease, 521, 667
 - granulocyte transfusions, 631–632
 - HIV infection, 714
 - indications for transfusion, 392
 - Lewis system, 140
 - Rh D immunization, 509
 - vaccinated mothers, 137
- infected blood, 471, 730–737
- infections, *see also specific pathogens*
 - anti-I antibodies, 263–264
 - anti-i antibodies, 263–264
 - anti-Pr antibodies, 263
 - apheresis, 778
 - autoimmune responses, 259
 - autologous blood, 802
 - biphasic haemolysins, 266–267
 - cancer chemotherapy, 808
 - cold haemagglutinin disease, 261–262
 - exclusion of donors, 4
 - neonatal alloimmune neutropenia, 570
 - parental iron and, 806
 - postoperative, blood transfusions on, 564–565
 - prevention, *see also* vaccines
 - immunoglobulin, 858–860
 - protection by ABH and Le substances, 142–143
 - red-cell loading of reticuloendothelial system, 477
 - transmission by transfusion, 696–762
 - fresh-frozen plasma, 639
 - granulocyte transfusions, 628–630
 - investigations, 736–737
- infectious mononucleosis
 - cold autoagglutinins, 264
 - HLA-B7 and, 242
 - post-transfusion, 724
- INFI antigen, 237
- inflammation, role of Fy glycoprotein, 219
- inflammatory bowel disease, frequency of red cell antibodies, 78–79
- influenza vaccine, anti-A antibody and, 136
- information, for donors, 1
- inheritance, red cell antigens, 58–59
- inherited defects, platelets, 624
- INJA antigen, 237
- Injectafer, 804
- In (Lu) gene, 228, 237
- inosine, red cell rejuvenation, 375
- integrin-associated protein *see* CD47
- integrins
 - CD151 and, 238
 - LW antigen and, 183
- intensive care
 - blood loss from sampling, 391
 - transfusion and mortality, 390
 - vitamin K deficiency, 822
- intensive plasma exchange, anti-D antibodies, 198, 519
- intercellular adhesion molecule, LW antigen as, 183
- interchange of samples, haemolytic transfusion reactions, 342
- interferon-alpha *see* α -interferon
- interleukin-8
 - Fy antigen as receptor, 219
 - transfusion reactions, 466
- interleukin-10, on regulatory T cells, 278
- interleukin-11, thrombopoiesis stimulation, 809
- intermittent blood loss, 390–391
- intermittent-flow cell separators, 770
- International Committee on Standardization in Haematology (ICSH), use of ⁵¹Cr, 439
- International Normalized Ratio (INR),
 - vitamin K on, 822
- International Standard Unit, HBsAg, 702
- interstitial fluid, shock, 31
- interviews, donors, 2
- intestinal mucosa
 - Inab phenotype, 236
 - Sd^a antigen, 241
- intracranial haemorrhage
 - haemophilia, 851
 - leukaemia, 787–788
 - neonatal thrombocytopenia, 583, 584
 - recombinant factor VIIa, 814, 815
 - subarachnoid haemorrhage, lysine analogues, 819
- intramuscular injections
 - anti-D antibody, transplacental haemorrhage, 438
 - IgG, 857
 - IgG anti-D, 199–200, 203, 432–433
 - incompatible blood, 135
 - iron, 804
 - of red cells, 397
 - vitamin K, 822
- intra-operative haemodilution *see* acute normovolaemic haemodilution
- intra-operative red cell salvage, 802–803
- intra-peritoneal transfusion, 396, 397f
 - to fetus, 520

- intrauterine transfusions *see* transfusions, to fetus
- intravascular destruction of red cells, 414–415, 459–474, *see also* haemolysis
- extravascular red cell destruction *vs.*, 458–459
- symptoms and signs, 466–467
- intravenous immunoglobulin, 857, 858, 859–860
- ABO haemolytic disease, 536
- adverse reactions, 861–862
- antenatal, 519–520, 585
- anti-A and anti-B antibodies in, 464
- anti-D, 450–451, 522–526, *see also* anti-D antibodies, therapeutic
- antenatal treatment, 524–526, 527
- IgG, 200–201, 203
- platelet transfusion, 625
- reactions, 525–526
- autoimmune haemolytic anaemia with warm autoantibodies, 277
- fetal IgG (maternal injection), 500
- to fetus, 520
- haemophilia, 854
- immune thrombocytopenic purpura, 860–861
- indications, 780
- neonates, 585
- for haemolytic disease of the newborn, 522
- novel preparations, 862
- platelet transfusion and, 583
- for post-transfusion purpura, 672
- reactions to IgA in, 674
- red cell destruction inhibition, 442
- intravenous iron, 804, 805–806
- intravenous vitamin K, 822, 823
- hypersensitivity, 824
- intrinsic binding constants, 89–90
- introns, 58
- inverted microscopes, 321, 323
- ¹²⁵I
- albumin, plasma volume estimation, 875
- antiglobulin, blood grouping, 326
- anti-K, 217–218
- IgM anti-Le^a antibody, 145
- red cell survival estimation, 376
- iodoacetamide, 70, 341
- ionic strength, 90, 310, 313, 320–321, 324
- IPEX (syndrome), 259
- ⁵⁹Fe, red cell labelling, 364
- iron balance, 7–9
- haemochromatosis patients, 17
- haemosiderosis, 684–686, 766
- thalassaemia, 393
- iron chloride, erythrocyte-magnetized technology, 324
- iron dextran, 804, 805
- iron hypothesis, 13–14
- iron sucrose, 805t
- iron supplements, 8
- parenteral, 804–806, 807
- irradiation (ionising)
- blood components, for premature infants, 392
- granulocyte concentrates, 628
- mixed lymphocyte culture, 566–567
- on red cells, 379
- before freezing, 379
- potassium leak, 372, 379
- T lymphocytes, prevention of TA-GvHD, 668–669
- irradiation (ultraviolet B), platelet concentrates, 578, 580
- ISBT 128 (identification code), 2
- ISBT/ICSH Working Party, one-stage *vs* two-stage agglutination tests, 313
- isoallotypes, 591
- isoallotypic markers, immunoglobulins, 68
- isotype switching, immunoglobulins, 63
- isotypic markers, immunoglobulins, 68
- isovolaemic haemodilution, polycythaemia, 766
- I^T antigen, 151
- Jamaica, sickle cell disease, haemolytic transfusion reactions, 331
- Japan
- K antigen, 214
- RHCE allele, 179
- jaundice, *see also* bilirubinaemia
- delayed haemolytic transfusion reactions, 478–479
- ischaemia, 26
- Rh D haemolytic disease, 509
- Jehovah's Witnesses, 43–44
- cardiopulmonary bypass, 42
- haemoglobin-based oxygen carriers, 830
- mortality *vs* haemoglobin levels, 389
- Jk^a antigen, 221, 428
- immunogenicity, 82
- loss on immune responses, 76
- Jk(a–b–) phenotype, 221
- Jk^b antigen, 221, 428
- JMH antigen, 239
- Jo^a antigen, 233
- 'joint products', RHCE allele, 180
- Jr^a antigen, 239
- antibody, haemolytic disease of the newborn, 531
- Js^a allele, 214
- Js^b allele, 214
- k (fractional rate of red cell clearance), 415
- K₀ phenotype, 214, 215
- K:6 antigen, delayed haemolytic transfusion reactions, 478
- kala azar, direct antiglobulin test, 270
- kallikrein inactivator units, aprotinin, 820
- kallikrein system, transfusion reactions, 466
- Kamhuber antigen, 227
- K antigen, 214
- complement activation, 187
- immunogenicity, 82
- k antigen *vs.*, 215, 529
- potency, 216–217
- single nucleotide polymorphism, 343
- suppression of anti-D response, 85
- k antigen
- K antigen *vs.*, 215, 529
- red cells, 214
- single nucleotide polymorphism, 343
- Kaposi's sarcoma-herpes virus (HHV-8), 725
- κ light chains, cold haemagglutinins, 266
- KAU antibody, 265
- Kawasaki syndrome, intravenous immunoglobulin, 860
- Kell antigens, 214–216
- weakening, immune responses, 76
- Kell protein, 57
- Kell system
- antibodies, 216–218
- autoimmune haemolytic anaemia, 275–276
- pregnancy, 528–530
- clinical importance, 55
- kernicterus, 509
- ABO haemolytic disease, 535
- Kidd glycoprotein, 221
- Kidd system, 221–222
- antibodies, 221, 421
- on enzyme-treated red cells, 307
- as haemolysins, 459
- persistence, 74
- delayed haemolytic transfusion reactions, 81
- kidney, *see also* renal failure; renal transplantation
- 2,8-dioxyadenine deposition, 373
- factor H defect, 102
- haemoglobin clearance, 473
- haemoglobin on, 831
- Klebsiella pneumoniae*, egg drop soup platelets, 734, 735f
- Kleihauer–Betke method, fetal red cells, 503
- Kleihauer immunogold-silver staining, 506
- Km antigen, 217
- K_{mod} phenotype, 215
- Kn antigens, 237
- Knops system, 237
- antibody identification, 341
- antibody inhibitors, 338–339
- Koate-DVI, 854
- Kontron Groupamatic, 324
- testing for D antigens, 174
- Korea, D-negative phenotype, 173–174
- Ko system, 575
- Kp^b allele, 214
- KU812 cell line, warm autoantibodies and Rh antigens, 274
- Kx antigen, 216

- L1 (deferiprone), 686
 labels (for identification), 337
 errors, 461
Laburnum alpinum lectin, A subgroups, 120
 lactate
 platelet storage, 616, 619
 Ringer's, 31
 lactate dehydrogenase, transfusion reactions, 489
 lactose-treated red cells, antibodies, 281
 'lag' before red cell destruction, 443–444
 extravascular, 416–417
 λ light chains, cold haemagglutinins, 266
 Lambert–Eaton myasthenic syndrome, treatment, 782
 laminin 511/521, Lutheran glycoprotein binding, 230
 Lan antigen, 239
 Landois, L., blood incompatibilities, 53
 Landsteiner, K., 53, 54
 LAN (granulocyte-specific antigen), 570
 latent (occult) HBV infection, 700, 702, 703
 law of mass action, 89
 L chains, immunoglobulins, 62, 63
 Leach phenotype, 235
 Le^a epitope, 138, *see also* anti-Le^a antibody
 Le(a+) phenotype, infants, 140
 Le(a+ b+) phenotype, 140
 Le(a+ b-) phenotype, 138, 140
 Le(a- b+) phenotype, 139
 Le(a- b+) phenotype
 anti-Le^a antibody, 143
 carcinoma, 142
 Le(a- b-) phenotype, 140
 Le(a- b+) phenotype, ethnicity, 140
 Le(a- b-) phenotype, ethnicity, 140
 Le^a substance, red cell destruction inhibition, 440–442
 Le^b antigen, *see also* anti-Le^b antibody
 Helicobacter pylori and, 60, 142
 weak expression, 139t
 Le^b epitope, 138
 Le^b substance, red cell destruction inhibition, 440–442
 Le^c, 138
 lectin pathway, complement, 101
 lectins, 87–88, 272–273, *see also specific plants and organisms*
 anti-A, anti-A₁, anti-B, anti-H, 134
 anti-N, 226
 red cell polyagglutinability, 283, 284t, 285
 Tn red cells, 286
 SIGN-R1, complement binding, 99
 A subgroups, 120–121
 Le^d, 138
 left atrial pressure, haemorrhage on, 25–26
 Le gene, 138
 secretions, 139t
Leishmania donovani, exclusion of donors, 4
 Lek^a antigen, 575
lele genotype, 140
Leonurus cardiaca lectin, red cell polyagglutinability, 284t
 leucapheresis, 773–774, 777–778, 787–789
 leucocyte-reduced blood, 661, *see also* universal leucoreduction
 leucocyte-reduced red cells, 663–664
 cytomegalovirus and, 723
 sickle cell disease, pregnancy, 396
 transfusions
 on colorectal carcinoma, 564
 on postoperative infections and mortality, 565
 Yersinia enterocolitica, 736
 leucocyte reduction criteria, platelets, 772
 leucocyte reduction filter, blood forced through, 470
 leucocytes, *see also* granulocytes; HLA antigens; paternal leucocyte therapy
 adhesion, leukaemia, 788
 bacterial clearance, 735
 A, B and H antigens, 128
 blood storage and, 305
 counting, 578
 febrile reactions, 660–662, 663
 I and i antigens, 151
 immunization, habitual abortion, 565
 Lewis antigens, 142
 platelet concentrates, 619
 removal, 577–580, 613, 619, 663–664
 reduction, 663–664, *see also* leucocyte-reduced red cells; universal leucoreduction
 T activation, 284
 leucopenia
 platelet transfusions, 672
 transfusion reactions, 460
 leucoreduced red cells *see* leucocyte-reduced red cells
 leucostasis, 788
 leukaemia, *see also specific types*
 A, B and H antigens, 125–126
 cord blood progenitor cell transplantation, 633–634
 directed donations, 14
 donor lymphocyte infusion, 637–638
 febrile reactions, 660
 graft-versus-tumour effect, 559
 I and i antigens, 152
 leucapheresis, 787–789
 platelet transfusion, 621–623
 on red cell antigens, 60
 Levine, P., and Stetson, R., 54
 Lewis system, 138–146, *see also* Le^b antigen antibodies, 143–146, *see also entries beginning* anti-Le...
 antiglobulin test, 323
 delayed haemolytic transfusion reactions, 484
 on enzyme-treated red cells, 307
 as haemolysins, 459
 haemolytic transfusion reactions and, 81
 pregnancy, 76
 red cell destruction, 415, 417, 419, 474
 tests for lysis by, 315
 antigens, 428, *see also* Le^a substance; Le^b substance
 biosynthetic relationships with other systems, 153
 red cells, 153
 soluble antigens, 55
 Le^x antigen, 140
 Le^x epitope, 138
 Le^y epitope, 138
 L-fucose, red cell membranes, 88
 'light' platelets, 614
 Lima beans, agglutinins, 87
 limited specificity, anti-IgA of, 592
 reactions, 674
 linkage disequilibrium, 554
 linkages, genetic, 59
 lipid rafts, 56
 lipids
 plasma exchange, 783, 784f
 plasticizer content, 683
 red cell membranes, 55, 371
 lipopolysaccharides, 677–678
 lipoproteins, *see also* low-density lipoprotein
 ApoB-containing, 786
 liposomal haemoglobin, 829
 liquid nitrogen, red cell storage, 305, 381
 LISS solutions, 305
 antiglobulin test, 320–321
 crossmatching, missed incompatibilities, 334
 recipient serum screening with, 330
Listeria monocytogenes, anti-I cold autoagglutinins, 264
 liver
 biopsy, thrombocytopenia, 624
 iron, 393, 684
 platelets, 614
 red cell destruction, 415, 417, 477
 transplantation
 cytomegalovirus infection, 723
 hepatitis B immunoglobulin, 704
 HLA matching, 561–562
 lysine analogues, 818
 passenger lymphocyte syndrome, 194–195, 487–488
 Rh system mismatches, 181
 liver disease
 citrate toxicity, 680
 fresh-frozen plasma, 639–640
 HBeAg absence, 705
 HBsAg carriers, 701
 recombinant factor VIIa, 814
 liver flukes, bovine, P₁ antigen, 148
 Liverpool, work on Rh suppression, 199
 LKE antigen, 146, 147–148
 LMP2 gene, 556
 LMP7 gene, 556

- lobenzarit, 280
- logarithmic kinetics, exchange transfusion, 764–765
- London, donor screening, haemoglobin, 9
- losses of red cells
frozen storage, 383
outdated, 3
- Lotus tetragonolobus* extract, 134
- low birthweight *see* very-low-birthweight infants
- low-density lipoprotein
hypercholesterolaemia, 786
removal, 783
thrombotic thrombocytopenic purpura, 784
- Lower, Richard, 1666 experiment, 763
- low-frequency antigens, 241–242
antibody classes, 72
- low-molecular-weight heparin, protamine on, 824
- low-molecular-weight iron dextran, 805
- LOX antigen, 281
- Loxosceles* spider venom, 227
- LTB₄, α_1 -antitrypsin on, 863
- Lu^a antigen, immunogenicity, 82, *see also* anti-Lu^a antibody
- Lu(a+) phenotype, 228
- Lu(a– b+) phenotype, 228
- Lu(a– b–) phenotype, 228
- Lu^a/Lu^b antigen, 229
- Lu antigen
autoimmune haemolytic anaemia, 230
autoimmune thrombocytopenic purpura, 218
- Lu(a+) phenotype, 228
- Lu^b antigen, 229
- Luke antigen (LKE antigen), 146, 147–148
- lumbar puncture, thrombocytopenia, 623–624
- Luminex bead system, 344
- lung injury
acute, Fy(a– b–) phenotype, 220
transfusion reactions, 467, *see also* transfusion-associated acute lung injury
- lung transplantation
passenger lymphocyte syndrome, 195, 487
transfusion-associated acute lung injury and, 665
- Lu_{null} cells
for anti-AnWj patients, 238
In^b antigen, 237
- Lutheran protein, sickle cell disease, 394
- Lutheran system, 228–230
mixed field agglutination, 314
- LW antigen, 57t, 168, 182–183, *see also* anti-LW antibodies
deficiency, 181
sickle cell disease, 394
transient depression, 276
weakening, immune responses, 76
- ly antigen, 575–576
- Lyme disease, 732
- lymphocytes, *see also* B lymphocytes; donor lymphocyte infusion; T lymphocytes
antibody-dependent cell-mediated cytotoxicity assays, 97
apheresis donors, 776–777
A, B and H antigens, 128
after blood transfusion, 562–563
from bone marrow transplantation, 487
chimeras, 667
from donors, 562–564
I and i antigens, 151
immune responses to (passenger lymphocyte syndrome), 194–195, 486–488
mixed culture, 551, 557, 566–567
removal by leucapheresis, 788–789
retroviruses and, 710–711
Rh system, 69
Staphylococcus aureus and, 735
transformation by EBV, 77
transplanted to mice, mouse anti-D, 196
- lymphocytotoxic antibodies
HLA, pregnancy, 558
refractoriness to platelet transfusions, 578
- lymphocytotoxicity test
haematopoietic progenitor cell transfusion, 630
HLA typing, 566
- lymphoma
Burkitt's, anti-pk antibody on, 150
Epstein–Barr virus, 724
T, Tn and Tk antigens, 286–287
warm with cold autoantibodies, 273
- lymphoproliferative disorders
Epstein–Barr virus, 638
on immune responses, 75–76
- lyonization, 232
- lyophilized red cells, 306
- lysed red cells, 458
immunogenicity, 84
- lysine analogues, 813, 817–820
- lysins, anti-A antibody
ethnicity on frequency, 131
tests for, 315
- lysis, red cells *see* haemolysis
- M₁ antigen, 225
- macroaggregates, 682
- macrophages
antibodies bound to, 448
cellular bioassays, 95–96
HLA antigens, 554
IgM and complement on, 423
immunosuppression and, 86
interactions with red cells, 93
- magnetic plates, 324
- magnetic resonance imaging, liver iron, 393, 684
- MAIGA test, 341
- MAIPA test, 341, 587, 588, 589
- major crossreactive idiotypes, 67
- major histocompatibility complex, 549, 551–557
- major surface proteins, red cells, 56–58
- malaria, 737–740, *see also* *Plasmodium falciparum*
blood groups and, 60, 142
deferrals of donations, 4, 739
direct antiglobulin test, 270
Duffy groups, 219
exchange transfusion, 738, 766
Gerbich system, 235
- malignancy *see* cancer; neoplastic change
- M allele, 222
- MAM antigen, 241
- manganese, weak B phenotype, 122
- mannan-binding lectin (MBL), 101
- mannitol, 469
- M antigen, 222, 224
- manual plateletpheresis, 612
- manual polybrene test (MPT), 313, 322, 328
- manual removal of placenta, 505
- MAR antigen, 180
- margination, granulocytes, 627
- MASP (MBL-associated serine proteases), 101
- massive transfusion, 38–41, *see also* hypertransfusion; rapid transfusion
hypothermia, 39, 678
pulmonary microembolism, 682–683
- massive transplacental haemorrhage, 505–506
- mass spectrometry, fetal D grouping, 513
- matching *see* crossmatching
- maternal antibodies, 499–501
- maternal–fetal transport, IgG, 514–515, 524, 570
- maternal plasma
anti-D antibody concentrations, 513
fetal DNA, 511
- maternal red cells, in fetus, 506
- matrix metalloproteinase, CD147 on production, 238
- Matuhasi–Ogata phenomenon, 342
- Max^a antigen, 575
- maximum blood order schedules, 333, 801
- McC antigens, 237
- McLeod syndrome, 216, 217
- mean cell volume
donors, 8
hereditary haemochromatosis, 16
red cell age *vs*, 358–359
- measles, immunoglobulin, 858
- mediastinal drains, blood from, 43
- medications
exclusion of donors, 4, 5–6
glucose-6-phosphate dehydrogenase deficiency, 6
stopping before surgery, 804

- Melanesians, South-East Asian ovalocytosis, 243
- melanoma growth stimulatory activity, Fy antigen as receptor, 219
- membrane attack complex (MAC), 98, 100–101
- membrane inhibitor of reactive lysis (MIRL), 101
deficiency, 471
- membranes
erythroblasts, dyserythropoiesis, 61
red cells, 55–58
storage, 371
sugars, 88
- memory cells, 72, 87
- meningitis
aseptic, intravenous immunoglobulin, 862
Haemophilus influenzae, AnWj as receptor, 238
- meniscectomy, blood loss, 24
- menorrhagia, lysine analogues, 818
- menstruation, iron loss, 7
- meperidine, 664
- MER2 antigen, 238
- 2-mercaptoethanol (2-ME), 70–71, 130
- metabolic diseases, plasma exchange, 783
- metabolism
platelets, 616
acetate media, 619
stored red cells, 370
temperature on, 378–379
- metabolites, antibodies against, 280
- methaemalbumin, 473
detection, 489
- methaemoglobin, spectroscopy, 489
- 8-methoxy-psoralen (8-MOP), 789
- methylolpa
direct antiglobulin test, 269, 270, 274, 280
haemolytic anaemia, 270–271, 280, 281
- methylene blue, heparin reversal, 825
- methylene blue-treated plasma, 641
- Mi.III phenotype, 223, 227
- MIC genes, 551
- microaggregates, 682–683
- microchimerism, lymphocytes, 562–563
- microfibrillar collagen, 826
- microparticles, 372
- microplates
agglutination tests, 312
antiglobulin test, 322–323, 324
- microscopes, inverted, 321, 323
- microscopy
contaminated blood, 734–735
malaria, 739
- microwave radiation
blood warmers, 678
removal of IgG from red cells, 341
- migraine, intravenous immunoglobulin, 862
- milk, I and i antigens, 151
- Miltenberger antigens, 223, 342
- mimicking anti-Rh, autoimmune haemolytic anaemia, 188
- mineral zeolite bandage, 826t
- minimum number of molecules, antibodies, 91–92
- minor surface proteins, red cells, 56–58
- miscollected wrong blood in tube errors, 329, 461
- miscollection errors, 461
- mismatches, platelet transfusion, ‘acceptable’, 582
- mites, Tn antigen, 282
- mitomycin C, mixed lymphocyte culture, 566–567
- mixed field agglutination, 314
antibodies producing, 338
- mixed lymphocyte culture, 551, 557, 566–567
- mixed red cell adherence assay, 582, 586–587
- mixed venous O₂ saturation, 26
- mixing, red cell storage, 373
- mixing (*in vivo*), red cell test transfusion, 413
- mix-ups (interchange of samples),
haemolytic transfusion reactions, 342
- M^k allele, 223
- MNSs system, 222–228
antigens, classification by trypsin sensitivity, 307–310
Miltenberger antigens, 342
rare variants, 222
- MN system
antigens, 222, 223, 224
discovery, 53
- Mo antigen, 575
- modified fluid gelatin, 36
- molecular biology, *see also* DNA-based blood grouping; DNA-based genotyping
group O, 123
HLAMatchmaker, 582
red cell grouping, 304, 343–345
- molecular weights
dextrans, 35
gelatin, 36
plasma alternatives, 34
- Moluccella laevis* lectin, 226
- monitoring, blood transfusion, 29
- monoclonal antibodies, 77–78, *see also*
mouse monoclonal antibodies
anti-D antibodies, 172t, 526
blood grouping, 329
D^{VI} antigen and, 178
suppression of primary immune responses, 201
blood grouping, 310–311, 329
HLA, 558
for Kell glycoprotein, 217
Kidd antibodies, 221
Lewis antibodies, 144–145
microplates, 312
- partial D antigens, classification, 175
quantitative binding studies, Rh antigens, 170
radioimmunoassay, platelet-bound Ig, 589
T, Tn and sialylated Tn antigens, 287
- monoclonal antibody-specific immobilization
of erythrocyte antigens (MAIEA), 215, 341
of platelet antigens (MAIPA), 341, 587, 588, 589
- monoclonal proteins, 783, *see also* multiple myeloma
- monocyte–monolayer assays (MMA), 96, 427
anti-Ytⁿ antibody and, 232
haemolytic disease of the newborn, 514
- monocyte phagocytosis test, 427
- monocytes
ADCC (ADCC(M)) assays, 96, 533
antigens, 570, 573
attachment to red cells, 94
cellular bioassays, 96
monoethylhexylphthalate (MEHP), 683–684
monogamous bivalency, 89
- mononuclear cells
cryopreservation, 885–887
paternal, for habitual abortion, 565
thawing, 887–889
- mononuclear phagocyte system (MPS) *see* reticuloendothelial system
- monovalent binding, 89
ABO agglutinins, 132
- morphology *see* shape
- mortality, *see also* fatalities
apheresis, 778
delayed haemolytic transfusion reactions, 485–486
effects of transfusion, 389–390
haemolytic disease of the newborn, 500, 526–527
Kell system, 529
incompatible transfusions, ABO system, 461–462
plasma exchange, 787
postoperative, blood transfusions on, 565
transfusion-associated acute lung injury and, 665
- mosaicism, 84
- mother–infant ABO incompatibility, 531–532
- mother–infant transmission
cytomegalovirus infection, 722
hepatitis C virus, 708
HIV infection, 714
human T-cell leukaemia viruses, 719
- mothers, *see also* entries beginning maternal...
parental blood transfusion, 14
- Mourant’s notation, Rh phenotypes, 169

- mouse
- anti-D antibody from human lymphocyte transplantation, 196
 - autoimmune haemolytic anaemia, CD47 and, 276
 - Fc receptors, 272
 - FcRn* defect, 499
 - transfusion reactions, 466
 - UMRh antibody, 182
- mouse monoclonal antibodies, 77
- ABO agglutinins, 130
 - antiglobulin reagents, 316
 - blood grouping and, 311
 - to M, N and s, 225
- mouthwash, AMCA, 819
- Moyamoya disease, 388
- MPS (mononuclear phagocyte system) *see* reticuloendothelial system
- multicomponent curves, red cell survival, 428–429, 439
- multi-organ dysfunction syndrome, 640
- multiple cord blood collections, 635–636
- multiple myeloma, *see also* monoclonal proteins
- immunoglobulin therapy, 860
- multiple pregnancies, anti-D antibodies, 508, 510
- multiple sclerosis
- FCGR3B genes, 569
 - plasmapheresis, 785
- multiple transfusions, *see also* repeated transfusions
- antibodies detected, 76, 336
 - anti-D after, 178, 192
 - anti-Gm antibodies, 591
 - anti-N after, 225
 - blood grouping of patients after, 344–345
 - crossmatching, 334–335
 - sickle cell disease, 766
 - fever, 661
 - haemosiderosis, 684
 - HLA immunization, 558
 - non-D immunization, 331
 - sickle cell disease, 766
 - transfusion reactions, 463
- multivalency, antibodies, 89–90
- multivitamins, 8
- murine monoclonal antibodies *see* mouse monoclonal antibodies
- mutant recombinant anti-D, 526
- mutations
- group O, 123
 - weak A and B antigens, 122
- myasthenia gravis
- autoantibody removal, 782
 - FCGR3B genes, 569
- Mycobacterium leprae*, 732
- Mycobacterium tuberculosis*, CD44 binding, 238
- mycoplasma infection, anti-I antibody, 260
- Mycoplasma pneumoniae*, anti-I cold autoagglutinins, 263–264, 266
- mycosis fungoides, 718
- myelodysplasia
- ABO system, 126
 - granulocyte colony stimulating factor, 809
- myeloid cytokines *see* granulocyte colony stimulating factor
- myeloma proteins, IgG, 66
- myeloproliferative disease, on red cell antigens, 61
- myocardial infarction, ABO system, 126
- N*-acetyl-DL-tryptophan, 850
- N*-acetylgalactosamine, 88, 240–241, 286
- Nageotte chamber, leucodepleted platelet concentrates, 578
- Nak^a antigen, 576
- N* allele, 222
- NANBH (non-A, non-B hepatitis), 705–706
- N* antigen, 222, 224
- narrow orifices, blood forced through, 470
- NASBA technique, nucleic acid testing, 699
- naturally occurring antibodies, 55, 71–72, 129
- anti-A and anti-B antibodies, temperature, 132
 - anti-K antibody, 216–217
 - anti-N antibody, 225
 - Rh system, 183–184, 425–426
- NC1 (granulocyte-specific antigen), 570
- ND1 (granulocyte-specific antigen), 570
- NE1 (granulocyte-specific antigen), 570
- necrotizing enterocolitis, neonates, red cell polyagglutinability, 284
- needle exposure, deferrals of donations, 4, 5
- needles
- blood forced through, 470
 - nickel, 676
- neocytes, 358, 394
- neomycin, 305
- neonatal alloimmune neutropenia, 569, 570
- neonatal alloimmune thrombocytopenia, 584–586
- antibody detection, 588
 - post-transfusion purpura and, 671
- neonatal Fc receptor (FcRn), 66
- neonatal isoimmune neutropenia, 570
- neonatal thrombocytopenia, 583–586
- neonates, *see also* haemolytic disease of the newborn; premature infants; walking donors
- ABO agglutinins, 130
 - adenine, 373
 - B antigen, 428
 - compatibility testing, 335
 - complement, 103
 - glucose-6-phosphate dehydrogenase deficiency and, 6
 - granulocyte transfusions, 631–632
 - hepatitis B virus, 700
- hypoglycaemia, 681
- immune responses, 76
- immunoglobulins, 68–69
- Lewis system, 140
- maternal IgG allotypes, 591
- necrotizing enterocolitis, red cell polyagglutinability, 284
- neutropenia, 809
- numbers of A and B sites, 125
- potassium fatalities, 392
- red cell antigens, 61–62, 153
- A, B and H, 125
- red cell survival, 362
- red cell transfusion, blood volume, 386
- sepsis
- GM-CSF, 809
 - IVIG, 859–860
- A subgroups, 120
- Th activation, 285
- transfusion-associated GvHD, 667
- transplacental haemorrhage on, 506
- universal leucoreduction policy, 579
- neoplastic change, on red cell antigens, 60–61
- nerve injury, donors, 12–13
- Netherlands, frequency of donations, 7
- neuraminidase, on red cell agglutination, 92
- neutropenia
- ABO incompatibility, 415
 - autoantibodies, 570–571
 - granulocyte colony stimulating factor for, 808–809
 - granulocyte transfusions, 628–630, 632
 - infants, 631–632
 - neonatal alloimmune, 569, 570
- neutrophil elastase, 863
- neutrophils
- antigens *see* human neutrophil antigens
 - red cell phagocytosis, 95, 415
- Nf antigen, haemodialysis, 226
- N*-glycans, 56
- nickel, 676
- Nigeria
- fetal ABO agglutinins, 130
 - frequency of anti-A antibody lysins, 131
- nitric oxide, 371–372
- haemoglobin-based oxygen carrier binding, 831
 - renal failure, 468
 - transfusion reactions, 465
- ¹⁵N-labelled glycine, red cell labelling, 364
- nitroglycerine patches, venous spasm, 28
- Nitrosomonas europaea*, RHAG homologue, 171, 182
- N*-methylthiotetrazole side chain, antibiotics, 824
- nomenclatures, *see also* numerical nomenclatures
- blood groups, 54–55
 - complement, 99

- HLA system, 554–555
 human neutrophil antigens, 567
 human platelet antigens, 573–574
 IgG subclasses, 591
 P blood group system, 146
 Rh system, 167–168
 phenotypes, 169
 nomifensine, 280
 non-A, non-B hepatitis, 705–706
 non-complement-binding antibodies
 IgG, differences between, 433–434
 red cell destruction, 417, 424–427
 extravascular, 475–476
 red cell sensitization *in vitro*, 429–430
 non-destructive IgG, 426–427
 non-disclosure of risks, 2
 non-immunological hydrops fetalis, 510
 non-obese diabetic mice, 276
 non-radioactive chromium, red cell survival, 362–363
 non-responders, D antigen, 73, 83–84, 189–191
 non-secretors, ABH antigens, 127–128
 ABO haemolytic disease, 535
 disease associations, 59–60
 noroviruses, 60, 142
 non-specific attachment, IgG, 91
 non-steroidal anti-inflammatory drugs, autoimmune haemolytic anaemia, 279
 non-transferrin-bound iron, 684
 non-viable red cells, destruction, 477
 normal cold autoagglutinins, 260–261
 Normal Hematocrit Study, 807
 normal incomplete cold antibody, 134, 260t, 261
 normal ranges, haemoglobin, 9
 normovolaemic haemodilution, 41–42, 802
 haemoglobin-based oxygen carriers, 830–831
 perfluorochemicals, 828
 noroviruses, non-secretors of ABH and, 60, 142
 NOR red cells, 287
 Nplate (AMG 531), 812–813
 NT-BNP (B-natriuretic pro-peptide), 29
 nucleic acid testing (NAT), 696, 698–699, 717, 718
 null phenotypes, 341
 number averages (m_n), molecular weights, plasma alternatives, 34
 numbers of molecules, antibody per red cell, 91–92, 429–434
 numbers of sites, antigens, 124–125, 170
 numerical nomenclatures
 blood groups, 54–55
 Kell system, 214
 Lutheran system, 228
 red cell proteins, 56
 Rh system, 167–168, 169
 Nutricell, 882
 O_{HM}^B phenotype, red cell destruction by anti-H antibody, 419
 occult blood loss, 8, 365–366
 occult HBV infection, 700, 702, 703
 occupation, donors, 10
 OD450 (optical density), amniotic fluid, 515
 Oe^a antigen, 576
 oedema, hydrops fetalis, 509–510
 oesophageal varices, rebleeding, 390
 oestrogens, haemostasis, 825
 off-pump heart surgery, 42, 43
 O-glycans, 56
 Oh phenotype
 mothers of group O infants, 537
 red cell destruction by anti-H antibody, 419–420
 OI^a antigen, 180
 Ok^a antigen, 238
 OI^a antigen, 182
 oligaemia, 22–52
 assessment of amount, 24–26
 effects of, 23–26
 oligonucleotide primers, nucleic acid testing, 699
 oligonucleotide probes, fetal D grouping, 512
 oligosaccharides, 153, *see also* glycosyltransferases
 antibody removal with, 341
 glycans, 56, 142
 MNSs system, 224
 oliguria, 476–477
 Olympus, blood grouping machines, 324
 oncogenic viruses, 686
 one-stage agglutination tests, 312, 313
 on-site systems, cell separators, 771
 open reading frames, hepatitis B virus genome, 700
 optical density, amniotic fluid, 515
 Optipress, platelet concentrates, 612
 o-raffinose-modified haemoglobin, dissociation curve, 829f
 oral antigens
 D antigen, 204
 immunological tolerance, 87
 oral surgery, lysine analogues, 818, 819
 oral vitamin K, 822
 organ damage, oligaemia, 26
 orthopaedic surgery
 effects of transfusion, 390
 tourniquets, lysine analogues, 818
 osmotic damage, red cells, 458, 469–470
 osmotic fragility
 incompatible plasma transfusion, 450
 stored red cells, 372
 osmotic pressure
 colloids, 30
 on red cells, 92
 osmotic reversal reaction, platelets, 619
 Ostene, 826
 osteoarthritis, hereditary haemochromatosis, 16
 outdated red cells, losses, 3
 ovalocytosis, South-East Asian, 243
 ovarian cysts, pseudomucinous, 128
 overheating of blood, 470
 overload of circulation (TACO), 29, 387–388
 oxidized cellulose, 826
 oximetry, pulmonary artery catheters, 26
 oxine
 ¹¹¹In platelet labelling, 613
 ¹¹¹In red cell labelling, 873
 oxygen, platelet storage and, 617
 oxygen carriers, haemoglobin-based, 828–831
 oxygen consumption, 27
 platelet screening, 737
 oxygen delivery, 27
 anaemia and, 27, 384
 oxygen dissociation curve
 anaemia and, 384
 stored red cells, 370
 oxygen extraction, 27
 massive transfusion, 38
 oxygen saturation, mixed venous, 26
 oxyhaemoglobin, spectroscopy, 489
 oxytetracycline, stored blood, 735
 P₁ antigen, 146, 147t, 148, 428, *see also* anti-P₁ antibody
 embryo, 62
 non-human, 148
 P₁ substance, 338
 p24 (protein), retroviruses, 711, 717
 p85 (protein of HIV-1), 711
 packed cell volume
 acute normovolaemic haemodilution, 41
 blood volume from, 875–876
 burns, 45
 estimation, 874
 exchange transfusion, 764
 fetus, 516
 haemorrhage on, 23–24
 mortality and, 390
 red cell concentrates, 397
 on red cell survival, 360
 red cell survival estimation from, 388–389
 sickle cell disease, 395
 target for erythropoietin therapy, 807
 packed red cells, *see also* concentrates *under* red cells
 storage, 374–375
 paedipacks, 391, 802
 PAGE *see* SDS-PAGE
 paid donors, 700–701
 pallor, anaemia, 385
 palmitic acid, attached to Rh proteins, 173
 pancreatic carcinoma, ABO system, 126
 panel reactive antibody reactivity, 567
 panels, red cells, 337–338

- P antigen, 146–147, 725, 726
 biosynthetic relationships with other systems, 153
 parvovirus B19 and, 148
 papain, *see also* ZZAP
 agglutination tests, 312
 IgG splitting, 64
 instability on storage, 310
 on red cell agglutination, 92, 307
 Papua New Guinea
 Gerbich system, 235
 Melanesians, South-East Asian ovalocytosis, 243
 para-Bombay phenotype, 125
 paracetamol, 664
 paraformaldehyde (PFA)
 cryptantigen exposure, 589
 platelet immunofluorescence test, 586
 paramagnetic polymer beads, 324
 paraproteins
 IgM, 261
 myeloma proteins, IgG, 66
 parental blood transfusion, 14
 paroxysmal cold haemoglobinuria, 266
 paroxysmal nocturnal haemoglobinuria (PNH), 57–58, 286, 471–472
 complement, 103
 Fc γ RIIB deficiency, 568
 I and i antigens, 151
 red cells, 236, 366, 398, 471–472
 partial D antigens, 174–179, 527
 auto-anti-D antibody and, 198
 immunogenicity of red cells, 191–192
 partial gastrectomy, blood loss, 24–25
 particle agglutination assay, 697
 particle gel immunoassays, IgA deficiency, 592
 particulate matter, 682–683
 parvovirus B19 (HPV B19), 725–726
 biphasic haemolysins and, 267
 P antigen and, 148
 solvent/detergent-treated plasma, 641
 passenger lymphocyte syndrome, 194–195, 486–488
 passive antibody
 adverse reactions, 861–862
 augmentation of immune responses, 86–87
 Rh D, 202–203
 immunosuppression by, 85–86
 passive haemagglutination assay, 697
 patent blue V, 306, 318
 paternal genotype, *RHD*, 513
 paternal leucocyte therapy, 526, 565
 pathological cold autoagglutinins, 260t
 P blood group system, 146–150
 peanut allergy, 676
 peanut lectin, 285
 PEG *see* polyethylene glycol
 pegylated recombinant human megakaryocyte growth and development factor, 809–811
 Pen^a antigen, 575
 penicillamine, 536
 penicillin, 279–280
 penicillins, 676
 pentastarch, 774
 pepsin
 hog pepsin, vaccines, 136–137
 IgG splitting, 65
 pepsin-digested horse serum, anti-A after, 5
 peptibodies, AMG 531, 812
 peptic ulcers
 non-secretors of ABH, 59–60
 rebleeding, 390
 peptides, autoimmune haemolytic anaemia, 278
 percentage platelet recovery, 625
 percutaneous umbilical vein sampling, 516
 perfluorochemical emulsions, 828
 perforins, 97
 perinatal transmission *see* mother–infant transmission
 peripheral blood-derived progenitor cells, 632–633
 collection, 774–776
 cryopreservation, 633, 885–887
 thawing, 887–889
 peripheral monocytes, cellular bioassays, 96
 peritoneum, *see also* intraperitoneal transfusion
 fetal red cells via, 505
 persistence, antibodies, 74, 138, 196
 persistence of fetal Hb, hereditary, 501
 pertussis, toxoid, 859
 pH
 antibody elution, 340
 anti-M antibody, 225
 monoclonal, 225
 B antigen acquired in A₁ subgroup, 126
 blood grouping, 323
 solid-phase systems, 325
 using enzymes, 312
 on equilibrium constants, 90
 granulocyte storage, 628
 IgG release from FcRn, 500
 intracellular
 on DPG, 370
 haemorrhage, 26
 intravenous immunoglobulin, 858
 on monoclonal antibodies, 77
 platelet storage, 613, 617, 619
 red cell labelling, 874
 red cell phagocytosis, 94
 red cell storage, 372–373
 phagocytosis of red cells, 93, 94–95, 415
 assays, 96, 97, 427
 CD47 on, 86
 phenotypes
 genotypes *vs.*, 58
 inference of specificity of undetectable antibody, 446
 investigation of DHTR, 488
 phenotyping
 extended, sickle cell disease, 766
 neutrophil antigens, 572
 phlebitis, donors, 12
 phlebotomy *see* venesection
 phosphate buffer, platelet storage, 619
 phosphate-buffered saline (PBS), red cell thawing, 305
 phosphatidylinositol glycan complementation class A gene (*PIGA* gene), 471
 phospholipid
 Rh proteins, 173
 stored red cells, 371
³²P
 di-isopropyl phosphofluoridate, red cell labelling, 363, 364
 red cell survival estimation, 376
 photometry, haemoglobin levels, 9
 photopheresis, 789
 phototherapy, 522, 536
 phthalates, *see also* DEHP
 toxicity, 683–684
 phycoerythrin-conjugated murine monoclonal anti-glycophorin A, flow cytometry, 503
 physical examination, donors, 2
 phytanic acid, removal by plasma exchange, 783
 pytonadione, 822
 PIE system (obsolete), 576
 pigeons, P₁-like antigen, 148
 piperacillin, 279
 piroplasms, 741
 PI^I antigen, 576
 PIVKA (proteins induced by vitamin K absence), 821
 PK7200 (Olympus), 324
 P^k antigen, 146–147
 p^k antigen, 148
 p^k gene *see* *A4GALT* gene
 PI^{A1} antigen, 669
 placenta, *see also* transplacental haemorrhage
 collection of blood, 889
 decay accelerating factor, 236–237
 haemorrhage, assessment of blood loss, 24
 manual removal, transplacental haemorrhage, 505
 placental alkaline phosphatases, 515
 placental cord blood transfusion, 634
 PLADO trial, 624
 plants, lectins, 87, 88, 134
 plaque-forming cells, mice, 86–87
 plasma, *see also* soluble antigens
 ABO system antigens, 153
 albumin *vs.* red cell agglutination, 92
 alternatives, 34–38
 burns, 44
 colour of haemoglobin, 489
 cord blood, 635

- donors
normally disqualified, 6
screening, 331–332, 333
- fetal DNA, 511
- fractionation *see* fractionation of plasma
- fresh-frozen *see* fresh-frozen plasma
- haemoglobin in *see* haemoglobin, in plasma
- human T-cell leukaemia viruses, 719
- I and i antigens, 151
- immediate-type hypersensitivity reactions, 672–675
- Lewis system antigens, 153
- potassium, 372, 374
for premature infants, 392
- P system antigens, 147
- red cell agglutination, albumin *vs*, 92
- red cell contamination, D immunization, 194
- red cell ratios, trauma-associated
coagulopathy, 39–40
- removal from red cells, 311
- serum *vs*, blood grouping, 306
- solvent/detergent-treated *see* solvent/detergent-treated plasma
- substitutes *see* plasma, alternatives
- transfusions
on extrusion, 385
incompatible, 448–450, 464
- Trypanosoma cruzi*, 740
- plasma components
HIV infection, 715
paid donors, 701
transfusion, 639–642
- plasma exchange, 778–787
adverse effects, 786–787
citrate solutions, 882–883
intensive, anti-D antibodies, 198, 519
plasmapheresis *vs*, 767
for post-transfusion purpura, 671
- plasmagel, 774
- Plasma-Lyte A, 885
- plasmapheresis, 766–769
biphasic haemolysin removal, 268
donors, 768–769, 847
frequency of donations, 7
multiple sclerosis, 785
- plasma protein fraction (PPF), 849–850
reactions, 677, 850
- plasma proteins
on copper sulphate test, 9
haemorrhage on, 24
plasma exchange on, 787
plasmapheresis donors, 768–769
preparations from, 846
shock, 31
- plasma proteins (plasma alternatives),
allergies, 37
- plasma volume
blood volume from, 875–876
estimation, 875
- Plasmodium* (spp.)
blood group phenotypes, 60, 142
Duffy groups and, 219
frequencies of transmission, 738
- Plasmodium falciparum*
Cad-positive red cells, 241
CD147 as receptor, 238
direct antiglobulin test, 270
enzyme-linked immunosorbent assay, 739
Gerbich system, 235
glycophorin B binding, 228
SI⁺ phenotype and, 237
- plastic bags
bacterial contamination, 736
blood storage, 368
damage, 888
frozen red cell storage, 382
paedipacks, 391, 802
platelets, 617, 772
- plasticizers
platelet storage, 617
on stored red cells, 371, 379
toxicity, 683–684
- platelet additive solution, 872
- platelet-bound Ig, radioimmunoassay, 589
- platelet factor 4, 590
- platelet immunofluorescence test (PIFT),
582, 586, 588, 589
- plateletpheresis, 789
donors, 7, 470, 582–583, 772–773,
777–778
manual, 612
PEG-rHuMGDF, 809–811
on platelet counts, 772, 776
single-donor platelets from, 464–465, 578,
580
- platelet-rich plasma (PRP), 612, 615, 770,
872, 878
- platelets
antibodies, *see also* platelet-specific
antibodies
reactions, 669–672
tests for, 586–588
transfusion, 672
antigens, 573–590
aspirin on, 626
A, B and H antigens, 128
cardiopulmonary bypass, 43, 624
CD147 on, 238
collection, 770, 772–773
autologous, 802
from normally disqualified donors, 6
concentrates, 615–616
anti-A and anti-B antibodies in,
464–465
bacterial contamination, 733–734, 736,
737
leucocyte removal, 577–580, 613, 619,
663–664
preparation, 872–873
from whole blood, 612–613
- counts, plateletpheresis on, 772, 776
defective, 624
DDAVP for, 817
frequency of donations, 7
gelatins on, 36
hypothermia, 39
I and i antigens, 151
immune thrombocytopenia, 588
increments after transfusion, 625
Klebsiella pneumoniae on, 734, 735f
Lewis antigens, 142
metabolism, 616
acetate media, 619
neonates, counts, 583
plasmapheresis donors, 769
red cell contamination, D immunization,
193–194
storage, 369, 613, 615–621
cytokines, 663
T activation, 284
transfusion, 611–626
allergies, 673
dosage, 624
febrile reactions, 660, 663
after haematopoietic stem cell
transplantation, 637
indications, 621–625
intrauterine, 585
neonates, 585
recovery and survival, 613–615,
878–882
refractoriness, 576–584
trauma, 40
Trypanosoma cruzi, 740
- platelet sealant, 826f
- platelet-specific antibodies, 577
febrile reactions, 669
HLA antibodies *vs*, 587
neonatal alloimmune thrombocytopenia,
584
post-transfusion purpura, 588, 669, 670
- platelet-specific antigens, 573–576
genotyping, 587–588
- plerixafor, 775, 776
- plethora, on red cell survival, 360
- pneumococcal vaccine, anti-A antibody and,
136
- Polge, C., red cell freezing, 380
- pol* gene, 710
HIV-1, 711
human T-cell leukaemia viruses, 718
- poliomyelitis epidemic, intramuscular blood,
135
- polyacrylamide gel electrophoresis *see*
SDS-PAGE
- polyagglutinability, red cells, 282–287
- polybrene
blood grouping tests, 310
missed incompatibilities, 334
manual test (MPT), 313, 322, 328
on red cell agglutination, 92, 283, 284t

- polycations *see* polybrene; protamine
 polycythaemia, isovolaemic haemodilution, 766
 polycythaemia vera, 15, 61
 Lutheran glycoprotein, 230
 polyester filters, platelet concentrates, 579
 polyethylene glycol
 ABH antigen masking, 127
 autoantibody tests, 274
 haemoglobin coupled to, 829
 indirect antiglobulin test, 322, 324, 328, 330
 red cell IgG assay, 326
 polymerase chain reaction, 529
 anti-CMV, 724
 fetal D grouping, 511–512
 for genotypes, 59
 HCV RNA, 707
 HLA typing, 566
 HPA system genotyping, 587–588
 K antigen *vs* k antigen, 215, 529
 malaria, 739–740
 nucleic acid testing, 698–699
 red cell grouping, 343–344
 ‘polymerized albumin’, 306
 polymerized haemoglobin solution, 830, 831
 polymers, on red cell agglutination, 92
 polymyxin B, stored blood, 735
 polyvinyl chloride
 platelet storage, 617
 toxicity, 683
 polyvinyl pyrrolidone (PVP), 305
 frozen red cell storage, 383
 pooled plasma, transfusion reactions, 464
 poor responders, D antigen, 190–191
 porcine factor VIII, 853
 portal circulation, 416
 positive end-expiratory pressure, on blood loss, 43
 positive pressure, rapid transfusion, 28
 post-diarrhoeal haemolytic uraemic syndrome, 148
 postmenopausal women, D-positive transfusion, 331
 postoperative erythroderma syndrome, 667
 postoperative infections, blood transfusions on, 564–565
 postoperative mortality, blood transfusions on, 565
 postoperative red cell salvage, 803
 postpartum period
 ABO agglutinins, 136
 anti-D administration, 199, 522–524
 anti-D antibodies found, 508
 neonatal alloimmune thrombocytopenia, treatment, 585
 neonatal haemoglobin levels, 518
 postponed surgery, due to blood shortages, 3
 post-storage leucoreduction, 580
 post-transfusion blood sampling, 488, 489
 post-transfusion hepatitis
 epidemiological trends, 708–710
 hepatitis B virus, 703
 post-transfusion purpura, 669–672
 antibody detection, 588
 universal leucoreduction policy, 580
 post-transfusion syndrome
 cytomegalovirus, 721–722
 Epstein–Barr virus, 724
 posture, fainting, 11
 potassium
 citrate and, 680–681
 red cells, radiation on, 372, 379
 stored plasma, 372, 374
 for premature infants, 392
 potency (immunogenicity)
 D antigen variants, 175–177
 K antigen, 216–217
 red cell antigens, 82–84
 potentiators, blood grouping, 306–307, 314
 pp65 antigen, cytomegalovirus, 721, 724
 p phenotype, 149
 Pr antigens
 cold autoagglutinins specific to, 263
 on enzyme-treated red cells, 310
 pre-core mutants, hepatitis B virus, 704–705
 pre-deposit donations, 800–803
 prednisone
 leucapheresis, 773
 post-transfusion purpura, 671
 pre-eclampsia, ABO system, 126
 pregnancy
 alloimmunization by A and B antigens, 136
 anti-Gm antibodies, 591
 anti-K antibody, 79, 217, 528–530
 anti-PP₁P^k antibody, 149, 150
 autologous blood donation, 801
 deferrals of donations, 6
 frequency of anti-D, 79
 frequency of red cell antibodies, 78, 79, 80
 HLA antibodies, 558
 HNA-2 system, 569
 on immune responses, 76
 transfusion *vs*, 82–83
 immunization to platelets, 577
 Lewis system, 140, 145
 platelet refractoriness, 578
 recipient serum screening, 330
 red cell alloantibodies, 501
 Rh system, 167, 198
 anti-D antibody subclasses, 186
 immunization frequency, 506–508, 510
 suppression of immune response, 199–204
 sickle cell disease, exchange transfusion, 395–396, 765
 trimesters for transplacental haemorrhage, 503–504, 588
 prekallikrein activator, 677
 premature delivery, for haemolytic disease of the newborn, 521
 premature infants, *see also* very-low-birthweight infants
 ABO haemolytic disease and, 535
 blood sampling, 391
 cytomegalovirus infection, 722, 723
 danger of adult A or B red cells, 536–537
 directed donations for, 14
 hypoglycaemia, 681
 intravenous immunoglobulin, 859–860
 red cell survival, 362
 red cell transfusion, 391–392
 transfusion effects, 390
 transfusions for, 335
 premedication, 676–677
 preoperative assessment
 transfusion avoidance, 804
 transfusion triggers, 41
 preoperative autologous blood collections, 800–803
 preoperative haemodilution *see* acute normovolaemic haemodilution
pre-S1 region, hepatitis B virus genome, 700
pre-S2 antigen, hepatitis B virus, 700
 pre-storage leucoreduction, 580, 663, 664
 pretransfusion samples, 488
 pretransfusion tests, frequency of red cell antibodies, 79
 primary immune responses, 73
 delayed haemolytic transfusion reactions, 478
 D-positive transfusion, 188–195
 antibodies not found, 443
 suppression by anti-D antibodies, 199–204, 438
 priming, pump-oxygenators, 43
 prion proteins, 728–730
 prisons, exclusion of donors, 4
 private antigens, 557
 private idiotypes, 67
 probiotics, high-titre anti-B induced by, 465
 Promacta (eltrombopag), 813
 pronormoblasts, D antigen, 62
 properdin, 102
 propylene oxide, 281
 prostatectomy
 retropubic, recombinant factor VIIa, 815
 transurethral, 469
 protamine, 824–825
 blood grouping tests, 310, 313
 proteases, on red cell agglutination, 92
 protein, *see also* plasma proteins
 serum levels, adult respiratory distress syndrome, 45
 protein 4.2, 182
 Protein A (bacterial), 69
 protein C, 856
 disseminated intravascular coagulation, 40
 Protein G (bacterial), 69

- proteins induced by vitamin K absence (PIVKA), 821
- Proteus mirabilis* infection, auto-anti-Jk^b antibody, 222
- prothrombin complex concentrates, 823, 853, 854–855
- prothrombin time
fresh-frozen plasma on, 640
vitamin K on, 821
- prozone phenomenon, 317–318
anti-C3d reagents, 319
immediate-spin methods, 334
microplates, 323
- pruritus, hydroxyethyl starch, 37
- pseudoautosomal region, X chromosome, 232
- pseudogenes, *RHD*, 173–174, 511, 513
variants, 174, 179
- Pseudomonas cepacia*, 733, 736
- pseudomucinous ovarian cysts, 128
- pseudo-specificity, monoclonal antibodies, 78
- pseudothrombocytopenia, 589
- P system, discovery, 53
- public antigens, HLA system, 557
- public idiotypes, 67
- Puerto Rico, ABO haemolytic disease, 532
- pulmonary artery catheters, 25–26
- pulmonary capillary wedge pressure, 25–26
- pulmonary microembolism, 682–683
- pulmonary oedema
crystalloids vs colloids, 31
haemorrhage and, 25
overload of circulation, 388
- pulse of donors, 2, 9–10
fainting, 10
- pump-oxygenators, priming, 43
- pure red cell aplasia
erythropoietin-related, 807
haematopoietic stem cell transplantation, 636
- purity, factor VIII concentrates, 852
- pyramidon-induced granulocytopenia, 571
- pyrogens, bacteria, 677–678
- pyruvate
platelet storage, 619
on red cell DPG, 375
- pyruvate kinase, red cell ageing, 359
- qualifications, donors, 1–2, *see also* disqualification of donors
- quality assurance
molecular blood grouping, 345
red cell storage, 368
- quantitative studies
red cell destruction, 429–443
Rh antigen binding, 170
transplacental haemorrhage, 884–885
- quantitative tests, blood grouping, 303–304, 325–328
- quasispecies, hepatitis C virus, 708
- quencher dye, fetal D grouping, 512
- Quikclot (mineral zeolite bandage), 826t
- quinidine, drug-induced thrombocytopenia, 590
- quinine
drug-induced neutropenia, 571
drug-induced thrombocytopenia, 590
- RIIM reagent, 316
- R3P reagent, 316
- rabbit complement, 103, 104
- rabies, deferrals of donations, 5
- radiation *see* irradiation
- Radin* antigen, 233
- radioimmunoassay
IgA deficiency, 591–592
infectious agents, 698
platelet-bound Ig, 589
- radionuclide scanning, spleen, 366
- rags (rheumatoid agglutinators), 591
- RANTES (chemokine), on HIV binding, 219, 238
- Raph system, 238
- rapid transfusion, 28, *see also* massive transfusion
- rate nephelometry, IgA deficiency, 673
- rate of transfusion, 27–28, 387, 663
- Rd* antigen, 233
- reabsorption, haemoglobin, 473, 474
- reactive lysis, by complement, 101
- reagent red cells, storage, 305
- real-time PCR
fetal D grouping, 512–513
red cell grouping, 343–344
- recipients
bacteraemia, 734
characteristics, on red cell survival, 377
D antigen variant phenotypes, 177
as donors, 5
red cells of
anti-D antibodies on, 450–451
delayed haemolytic transfusion reactions, 483–484
vs donors', 342–343, 357, 490
factors affecting clearance, 431
incompatible ABO transfusions on, 462–465
serum, screening, 329–330
- recombinant albumin, 850
- recombinant antithrombin, 862–863
- recombinant blood group antigens, 342
- recombinant enzymes, converting A and B cells to O, 127
- recombinant erythropoietin, 806–808
ABO haemolytic disease, 536
preoperative, 801
- recombinant factor VIIa, 813, 814–815, 823–824, 853, 855
- recombinant factor VIII, 852–853
- recombinant factor IX, 855
- recombinant granulocyte colony stimulating factor, 808
- recombinant human megakaryocyte growth and development factor, 809–811
- recombinant immunoblot assay
anti-HCV, 707
infectious agents, 698
- recombinant monoclonal anti-D antibodies, 526
- recombinant plasma proteins, 849
- recombinant protein C, 856
- recombinant technologies, antibodies for blood grouping, 311
- recombinant thrombin, 864
- record-keeping, blood donation, 2
- recovered blood, 803
air embolism, 681
- recovered plasma, 847
- recovery
platelets, 613–615, 625, 878–882
red cells, after donation, 9
- recruitment of donors, after disasters, 18
- recurrent haemorrhage, anaemia, 390
- recurrent infection, cytomegalovirus, 720–721
- red cell additive solution, 882
- red cell autoantibodies, 259–278
- red cells, *see also* blood groups; enzymes; membranes
A₁ vs A₂, 120–121
ABO haemolytic disease, 534–535
agglutination *see* agglutination of red cells
antibodies, 62–87, *see also* antibodies, effects on red cells
binding *see* antigens, reactions with antibodies
antigens, 55–62, *see also specific antigens*
also on platelets, 573
content on destruction, 427–428
development, 61–62
inheritance, 58–59
neonates, 61–62, 125, 153
relative potency, 82–84
weakening, 76
- antiglobulin test, ratio to serum, 320, 332
- aplasia *see* aplastic anaemia; pure red cell aplasia
- bacterial contamination, 736
colour change, 737
- cell separators, 768, 769–772
- collection by apheresis, 774
- concentrates, 397–398, *see also* packed red cells
- as contaminants, 460, 625
on D immunization, 193–195
- cryopreservation *see* cryopreservation, red cells
- defective, 471
- donors *see* donors, red cells from
donors' vs recipient's, 342–343, 357, 490

- drug binding, 279
 D sites, numbers of, 170
 elimination with no signs of destruction, 436
 exchange transfusion, 203–204, 764, 765–766
ex vivo generation, 831
 fetus *see* fetus, red cells
 fixation in antibody tests, 325
 Fy sites, 218–219
 gel test, 322
 glucose-treated
 antibodies, 281
 anti-M antibody and, 225
 anti-N antibody and, 226
 granulocyte concentrates, 630–631
 group O
 A and B substance uptake, 128
 converting to A or B cells, 127
 HLA antigens on, 242–243, 426
 I and i antigens, 151
 incompatible transfusions
 attempts to inhibit destruction, 440–443
 destruction without demonstrable antibodies, 443–448
 larger amounts, 429–443
 small amounts, 411–457, 466–467
 survival estimation, 877–878
 therapeutic amounts, 436, 437–438, 444–448
 Jk antigens, 221
 K antigen, 214
 lactose-treated, 281
 leucocyte removal, 663–664
 Lewis substance uptake, 141–143
 lysis *see* haemolysis
 number of molecules of antibody, 91–92, 429–434
 numbers of D sites, 170
 panels, 337–338
 paroxysmal nocturnal haemoglobinuria, 236, 366, 398, 471–472
 PBSC collections, 775
 phagocytosis *see* phagocytosis of red cells
 polyagglutinability, 282–287
 preoperative regeneration, 801
 recipient serum screening with, 330
 recovery after donation, 9
 reference preparations, 328
 removal from marrow, 636
 removal of antibodies with, 519
 salvage, 802–803, *see also* recovered blood
 sensitization *in vitro*, 429–431
 separation by age, 358–359
 separation by volume, 358–359
 S, s and U antigens, 223
 storage *see* storage of blood and components, red cells
 substitutes, 827–831
 survival *see* survival, red cells
 transfusion, 356–410
 anaemia, 384–398
 biphasic haemolysins and, 268
 cytomegalovirus and, 723
 after haematopoietic stem cell transplantation, 637
 incidence trends, 3
 platelet refractoriness after, 578
 potassium and citrate, 680, 681
 trauma-associated coagulopathy, plasma ratios, 39–40
 trypsin-treated, 287, 288
 red cell volume (RCV)
 blood volume from, 875–876
 estimation, 873–875
 incompatible red cells, on survival, 439–440
 red cell survival estimation, 376
 for red cell test transfusion, 413–414
 reductases, vitamin K, 821
 reduction (chemical)
 immunoglobulins, 69–71, 311
 thiol proteases, 307
 reference solutions
 blood grouping, 328
 enzymes, 307
 reflectance spectroscopy, 9
 refrigerated storage, 735, *see also* cold blood
 blood, 28, 38, 378
 peripheral blood-derived progenitor cells, 633
 platelets, 619–620
 red cells, 383, 663
 Refsum disease, 783
 refusal of transfusion *see* Jehovah's Witnesses
 regression analysis, platelet increments, 625
 regulator Rh_{null}, 181
 regulatory T cells, 259
 interleukin-10 on, 278
 rejection, solid organs, 562
 rejuvenation of stored red cells, 371, 375
 freezing after, 383
 related donor transplants, cord blood
 progenitor cells, 633–634, 636
 religion *see* Jehovah's Witnesses
 remote blood issue
 electronic, 334
 transport (land and air), platelets, 618
 renal failure
 chronic, anaemia, 804, 805–807
 delayed haemolytic transfusion reactions, 479–480
 dextran 40, 35
 intravenous immunoglobulin, 862
 oligaemia, 26
 red cell transfusion on blood volume, 386–387
 transfusion reactions, 463–464, 468, 476–477
 treatment of anaemia, 393–394
 TURP, 469
 renal transplantation
 antibody-mediated rejection, 562
 anti-Nf antibody, 226
 cytomegalovirus infection, 722
 D immunization, 194
 directed donations, 14
 Duffy antigens, 220
 HLA system, 561
 immunoaffinity apheresis before, 786
 Kidd antigens, 222
 Lewis system and, 145
 malaria, 738
 passenger lymphocyte syndrome, 486–487
 previous transfusions, 563–564
 removal of antibodies, 781
 repeated transfusions, *see also* multiple transfusions
 cold autoagglutinins, 266
 repeat tests
 after haemolytic transfusion reactions, 342
 infectious agents, 698
 repertoire shift, genes, 187
 replacement donations, 15
 replacement fluids, 26–34, 764–765, 779
 plasma exchange, 779–780
 reporter dye, fetal D grouping, 512
 reporting
 mortality (FDA), 461–462
 transfusion errors, 460–461
 resistance of red cells to complement-mediated lysis, 262–263, 422–423
 respiratory burst, 101
 responders *vs* non-responders, D antigen, 189–191
 restriction fragment length polymorphism, 343
 resuspended red cells, storage, 375
 reticulocytes
 ABO haemolytic disease, 535
 donors, 9
 donors' *vs* recipient's red cells, 343
 HLA antigens on, 242
 iron labelling, 364
 mother–infant ABO incompatibility, 531t
 red cell antigens, 62
 reticuloendothelial system (RES)
 immunosuppression, 442–443
 loading with non-viable red cells, 477
 red cell destruction, 416, 458
 saturability, 429, 434–436
 retinal detachment, sickle cell disease, surgery, 395
 retroviruses, 710–711, *see also* HIV infection; *specific viruses*
 p24 (protein), 711, 717
 simian foamy virus, 728
 reversal of anticoagulants, 640, 814, 821–825, 855
 reverse passive haemagglutination, 697
 reversibility of changes, red cell storage, 373–374

- 'reversor' factor, 287
 r^G phenotype, 179, *see also* anti-C^G antibody
 rhabdomyolysis, lysine analogues, 819
 Rh-associated proteins, 182–183
 RHCE gene, 173–174, 179, 511–512, *see also*
 RHD/RHCE gene
 'joint products', 180
 RHD–CE–D' hybrid gene, 173–174
 RHD gene, 511, 517
 RHD pseudogene, 173–174, 511, 513
 variants, 174, 179
 RHD/RHCE gene, 175
 rhesus boxes, 173–174, 514
 rhesus immunoglobulin (RhIg), *see also*
 anti-D antibodies
 for immune thrombocytopenic purpura,
 451, 583
 immunosuppression by, 443
 platelet transfusion and, 583
 rhesus system *see* Rh system
 rheumatoid agglutinators, 591
 Rh membrane complex, 182
 Rh_{null} blood, 181, 182
 glycophorin B deficiency, 223
 Rho(D) immune globulin, immune
 thrombocytopenic purpura, 475
 Rho-GAM (anti-D), safety, 675
 Rh-related glycoprotein (RHAG), 171
 Rh system, 167–213, *see also* D antigens;
 D-positive transfusion
 agglutination tests, capillary tubes, 312
 antibodies, 183–188, *see also* anti-D
 antibodies
 on enzyme-treated red cells, 307
 to low-frequency antigens, 241
 naturally occurring, 183–184, 425–426
 non-anti-D, 184, 528
 quantification, 187–188
 red cell destruction, 424
 relative frequencies, 80
 renal transplantation, 486
 blood grouping, 329
 error rates, 330
 serology *vs* molecular biology, 345
 D gene, 58, 168–169, 171, 173–174
 discovery, 53–54
 haemolytic disease *see* haemolytic disease
 of the newborn
 haemolytic transfusion reactions, 81–82
 hybrid genes, 173–175, 511–512
 idiotopes, 67
 immunization *see* immunization, D
 antigens
 immunoglobulin *see* rhesus
 immunoglobulin
 incompatible red cell labelling, 412–413
 indirect antiglobulin test, 317–319
 lymphocytes, 69
 mixed field agglutination, 314
 neonates, crossmatching, 335
 phenotypes, 169–170
 polycythaemia vera, 61
 red cell contamination of platelet
 concentrates, 625
 terminology, 54
 warm autoantibodies, 273–275, 341
 ricin, 87
 rickettsial disease, 732–733
 right atrial pressure (central venous
 pressure), haemorrhage on, 23, 25
 rigidity, stored red cells, 371, 378
 Ringer's lactate, 31
 'Ripley' serum, anti-D antibody, 131,
 186–187
 rituximab
 cold haemagglutinin disease, 265
 immune cytopenias, 277
 rodenticide poisoning, 824
 Rodgers gene, 234
 Romiplostim (AMG 531), 812–813
 rosetting, 94
 assays, 96
 Rh immunization, 69
 tests for transplacental haemorrhage, 502,
 523, 884
 rotation of inventory, frozen red cell storage,
 384
 rotation thromboelastometry, trauma, 40
 rouleaux, 288–289
 apparent donor incompatibility, 335
 dextrans causing, 35, 36, 314
 leucapheresis, 773, 774
 Rous–Turner solution, 367
 Sa antigens, cold autoagglutinins specific to,
 263
 SAFE study, albumin *vs* saline, 32
 saline, *see also* crystalloids
 agglutination tests in, 311–312
 frozen platelet storage, 621
 hypertonic, 32–34
 burns, 45
 phosphate-buffered (PBS), red cell
 thawing, 305
 plasma exchange, 780
 removal of glycerol from red cells, 382
 saline–adenine–glucose–mannitol solution
 (SAGM), 375, 882
 saline agglutinins, anti-D, 196
 saliva
 ABH antigens, 127–128
 ABO agglutinins, 132
 B-transferase, 127
 I and i antigens, 151
 immunoglobulins, 68
 Lewis antigens, 139
 salvage, red cells, 802–803, *see also* recovered
 blood
Salvia sclarea lectin, 284t, 286
 sandwich assays, infectious agents, 698
 S antigen, 222, 223, 224
 enzymes on, 310
 s antigen, 222, 223, 224
 satellite packs, 802
 Sc antigens, 233
 schistocytes, thrombotic thrombocytopenic
 purpura, 784
 Scianna system, 233
 scleroderma, cold haemagglutinin disease,
 265
 scores, titres *vs*, 326
 SCR 20, factor H, 102
 scrapie isoforms, 728
 screen filtration pressure, 682
 screening
 antenatal, 510–511, 523, 527
 anti-HCV, 706
 anti-K antibody, 217
 bacterial contamination, 737
 donors, 2
 anaemia, 8–9
 false-positive tests, 4
 single nucleotide polymorphisms, 345
 hepatitis B surface antigen, 702
 HIV infection, 716–718
 human T-cell leukaemia virus antibodies,
 719–720
 infectious agents, 696–699
 plasma, 331–332, 333
 recipient serum, 329–330
 stored red cells, 384
 syphilis, 731
 West Nile virus, 727
 Sd^a antigen (Sid antigen), 240, 241
 SDS-PAGE, 56
 Rh system antigens, 170–171
 se³⁸⁵ allele, 140
 seasonal allergy, 5
 SEC23B mutations, 243
 secondary immune responses, 73
 D antigen, 84, 195–196, 197–198
 platelet refractoriness, 578
 secretors, ABH antigens, 127–128, 535
 secretory piece, IgA, 67
 sedimentation
 granulocyte concentrates, 630–631
 red cells
 agents, 774
 rates, 288
 sedormid-induced thrombocytopenia, 590
 Se gene, 138, 153
 secretions, 139t
 seizures, donors, 13
 selective removal of plasma components,
 785–786
 self-exclusion of donors, 716
 semaphorin 7A (CDw108), 239
 senescence *see* ageing
 'sensibilization', 189
 sensitization of red cells
 by antibodies, 429–431, 458, 625
 to bacteria, 286
 SEN virus, 709

- sepharose-bound staphylococcal protein A, 786
- sepsis
 from contaminated transfusions, 734, 736
 neonates
 GM-CSF, 809
 IVIG, 859–860
 systemic inflammatory response syndrome, 26
- September 11, 2001, World Trade Center disaster, 17
- septic shock, C1 esterase inhibitor, 857
- sequence-based nomenclature, HLA system, 554–555
- sequence-specific oligonucleotides, HLA typing, 566
- sequence-specific primers, HLA typing, 566
- sequestration of red cells, 366, 423
- 'Serious Hazards of Transfusion' initiative, 665
- Serodia HTLV-1 (agglutination test), 720
- serology
 ABO haemolytic disease, 533–535
 anti-B antibody, 75
 anti-D antibody, 75
 blood grouping, 345
 delayed haemolytic transfusion reactions, 482–484
 IgA, 75
 IgG, 75
 IgM, 74–75
 Kell antigens, 217
 Lewis antibodies, 145
 transplacental haemorrhage, 502–503
- SERPINC1 mutations, 862
- serum, *see also* horse serum
 albumin *vs.* red cell agglutination, 92
 antiglobulin test, ratio to red cells, 320, 332
 A, B and H antigens, 128
 blood grouping, 306
 complement from, 315
 cord blood, ABO system, 130
 haemolysis *in vitro*, 131
 recipients, screening, 329–330
 'Ripley' serum, anti-D antibody, 131, 186–187
 storage *see* storage of blood and components, serum
- serum normal agglutinators, 591
- serum proteins, antigens and antibodies, 590–592
- serum sickness-like syndromes, anti-IgG, 675–676
- sexual transmission
 hepatitis C virus, 708
 HIV infection, 713
- S gene, hepatitis B virus, 700
- shape
 stored platelets, 617, 619, 620
 stored red cells, 371, 378
- sheep, transfusions from, 411
- sheep antibodies, 136
- sheep red blood cells (SRBC), immune responses, 86–87
- shigatoxin, p⁺ binding, 148
- Shigella shigae*, A and B antigens, 129
- shock, 24, 25
 C1 esterase inhibitor, 857
 from contaminated transfusions, 736
 interstitial fluid, 31
 lung injury, 45
 transfusion reactions, 462
 vitamin K, 824
- shortages of blood, 3
- sialic acid deficiency, 222–223, 283
- sialic acid residues, MNSs system and, 224
- sialidase-susceptible antigens, 263
- sialosylparagloboside, P system antibodies and, 150
- sickle cell disease
 alloimmunization, 79, 80–81
 autoimmune haemolysis, 482
 delayed haemolytic transfusion reactions, 479, 485
 exchange transfusion, 394–395, 765–766
 Fy(a– b– 3–) phenotype, 220
 Fy(a– b–) phenotype, 219
 haemoglobin-based oxygen carriers, 830
 hypertensive encephalopathy, 388
 Lutheran glycoprotein, 230
 pregnancy, 395–396, 765
 red cells
 deglycerolized, 382–383, 470
 survival, 366, 412
 selecting donor blood, 331
 thrombospondin, 182
- sickle cell haemolytic transfusion reaction syndrome, 472
- Sid antigen, 240, 241
- siderophilic microorganisms, 806
- SIGN-R1 (lectin), complement binding, 99
- silent infarcts (SCI), sickle cell disease, 765–766
- silent (occult) HBV infection, 700, 702, 703
- silica, colloidal, 289
- simian foamy virus, 728
- single-donor platelets, 578, 580
 transfusion reactions, 464–465
- single-label method, red cell survival estimation, 376
- single nucleotide polymorphisms, 343, 345
- Sit^a antigen, 576
- skeletons, red cells, 55, 93
- skin
 flora, 733
 GCSF side effects, 776
 hypersensitivity, plasma transfusions, 672–673
 TA-GvHD, 667
- skin fragments, embolism by, 683
- skin grafts, tolerance, 85
- SL3 antigen, 237
- Sl^a antigen, 237
- Sl^a– phenotype, 237
- SLC4A1 gene, Diego system, hereditary spherocytosis, 230–231
- slide tests, agglutination tests, 312
- SMIM1* gene, 239
- SNaggs (serum normal agglutinators), 591
- snails, lectins, 134
- SNO hypothesis, 371–372
- sodium, stored red cells, 372, 374
- sodium azide, 134, 261, 306
- sodium bicarbonate, red cell storage, 373
- sodium chromate, red cell labelling, 360–361, 362, 874
- sodium dodecyl sulphate *see* SDS-PAGE
- sodium ferric gluconate, 805t
- soft tissues, haemorrhage into, 472
- solid organ transplantation
 ABO incompatibility, 135
 alloimmunization, 81
 deferral of blood donors, 5
 fetal D grouping and, 513
 frequency of anti-D, 79, 194–195
 HLA system, 561–564
 immune response to lymphocytes (passenger lymphocyte syndrome), 194–195, 486–488
 removal of antibodies, 781–782
- solid-phase techniques
 blood grouping, 303, 324–325
 platelet antibodies, 586–587
- Solidscreen II, 325
- soluble antigens, 55
- soluble HLA class I antigens, 557
- solvent/detergent-treated antithrombin concentrates, 862
- solvent/detergent-treated plasma, 641
 transfusion-associated acute lung injury and, 665
 viruses, 641, 846
- South-East Asia, haemolytic transfusion reactions, Lewis system, 145
- South-East Asian ovalocytosis, 243
- species differences, complement, 103
- specific gravity
 haemoglobin testing, 9
 red cell suspensions, 874
- specific inhibition, antibodies, 338–339
- Spectra cell separators, 770, 771
- spectrin, 56
- spectrophotometers, blood grouping, 325
- spectroscopy
 methaemalbumin, 489
 urine, 489
- spherocytosis, *see also* hereditary spherocytosis
 delayed haemolytic transfusion reactions, 481
- spiculation, red cells, 92
- spin-tube antiglobulin tests, 321, 330

- splanchnic vasoconstriction, 26
- spleen
- granulocyte colony stimulating factor side effects, 776
 - immune responses, 76
 - platelet pool, 614
 - red cell destruction, 86, 415, 425
- splenectomy
- autoimmune haemolytic anaemia with warm autoantibodies, 277
 - cytomegalovirus infection, 722
 - delayed haemolytic transfusion reactions, 480
 - platelet transfusion and, 583, 613–614
 - for post-transfusion purpura, 672
 - on red cells, 359–360, 425
 - scintigraphy for, 366
- splenomegaly
- blood volume estimation, 876
 - granulocyte colony stimulating factor, 809
 - haemoglobin levels after transfusion, 387
 - red cell survival, 366
- splenunculi, 425
- splits, HLA antigens, 557
- spontaneous naturally occurring antibodies, 72
- spontaneous red cell agglutination, 314, 450, 534
- spring balances, rate of transfusion, 387
- squamous cell carcinoma, ABO system, 142
- Sr^a antigen, 575
- Src-family kinases, on red cells, 93
- Sri Lanka, tsunami (2004), 17
- Ss glycoprotein *see* glycophorin B
- S–s– phenotype, 223
- staff, blood grouping errors and, 329
- stannous chloride, red cell volume estimation, 873
- staphylococcal protein A, immunoaffinity apheresis, 785, 786
- staphylococci, IgA resistance, 67
- Staphylococcus aureus*, lymphocytes and, 735
- Starling's equation, 30
- sterilization, LISS solution, 320
- stomach
- carcinoma
 - anti-Tj^a and, 60
 - group A and, 59
 - mucosa, A, B and H antigens, 129
- stomatocytosis, hereditary, 231
- stools, blood loss, 8, 365–366
- StoP trial, 624
- 'storage lesion'
- platelets, 617, 619–620
 - red cells, 369–374, 377–378
- storage of blood and components, *see also* additive solutions; cryopreservation; refrigerated storage
- autologous blood, 802
 - bacterial contamination, 733–737
 - enzymes, 310
 - granulocytes, 627–628
 - immunoglobulins, 858
 - leucoreduction, 580, 663, 664
 - peripheral blood-derived progenitor cells, 633
 - plasma, citrate, 847
 - platelets, 369, 613, 615–621
 - cytokines, 663
 - red cells, 366–384, *see also* glycerol
 - antigens, 288, 304–306
 - changes, 29
 - colour change, 737
 - enquiries after haemolytic transfusion reactions, 490
 - before freezing, 383
 - after freezing, 383
 - lysis, 131
 - metabolism, 370, 378–379
 - reversibility of changes, 373–374
 - serum
 - on A antigen, 128
 - for blood grouping, 306
 - on complement, 104
 - whole blood, 374
 - aggregates of formed elements, 682–683
 - ammonia, 681
 - citrate solutions, 882
 - potassium, 680
- strategic red cell reserves, 384
- Streptococcus faecium* infection, K-like antigens, 216
- streptomycin, 281
- stroke risk, sickle cell disease, 395, 765, 766
- stroma from red cells, infusion, renal failure, 468
- subarachnoid haemorrhage, lysine analogues, 819
- subclass-specific anti-IgA, 592
- subcutaneous DDAVP, 816
- subcutaneous erythropoietin, 807
- subcutaneous IgG, 858
- subnormal survival of transfused red cells, 444–448
 - without demonstrable antibodies, 446–448
- succinylated gelatin, 36
- sucrose nephropathy, 862
- sugars
 - inhibition of anti-M antibody, 225
 - red cell membranes, 88
- sulphydryl compounds, on IgM, 69–70, 340–341
- supercooling, acid–citrate–dextrose solution, 378
- supertransfusion, thalassaemia, 393
- suppressor T cells, drugs on, 280
- supratypic antigens, HLA system, 557
- suprofen, 280
- surface proteins, *see also* CD47
 - glycosylphosphatidylinositol-anchored, 57–58, 471
 - red cells, 56–58
- surface tension, 92–93
- surgery, *see also* recovered blood
 - assessment of blood loss, 24–25
 - bloodless, 800–844
 - blood transfusion, effects, 389–390
 - delayed due to blood shortages, 3
 - on donors, 5
 - elective
 - blood transfusion, 41–44
 - 'type and screen' procedure, 333
 - heart *see* heart, surgery
 - lysine analogues, 818
 - platelet transfusion, 623
 - recombinant factor VIIa, 815
 - red cell salvage, 802–803
 - sickle cell disease, exchange transfusion, 395, 765
 - universal leucoreduction policy, 579
- surrogate markers, non-A, non-B hepatitis, 705–706
- survival, *see also* half-lives ($T_{1/2}$); viability
- platelets, 613–615, 878–882
 - glycoproteins on, 617, 619
 - red cells, 356–366, *see also* subnormal survival of transfused red cells
 - anticoagulants on, 374
 - donor differences, 446
 - estimation, 375–378, 388–389, 876–878
 - ⁵¹Cr, 360–362, 375–376, 413–414, 438–440, 490, 876–877
 - incompatible, 412–414, 436, 439–440, 489–490
 - multicomponent curves, 428–429, 439
 - variation in population, 359
 - survival times, platelets, 614
 - suxamethonium apnoea, plasma exchange, 780
- Swan–Ganz catheter, 25–26
- swirling phenomenon, platelet quality, 619
- Switzerland, frequency of donations, 3
- syncope, vasovagal, 10–12, 773, 777
- synthetic media
 - granulocyte storage, 628
 - platelet storage, 619
- syphilis, 731
 - biphasic haemolysins and, 267
- syringes, D immunization, 195
- systemic inflammatory response syndrome, 26
- systemic lupus erythematosus
 - FCGR3B genes, 569
 - HLA antigens on red cells, 242
 - IgG and complement, 271
 - on immune responses, 75
 - plasma exchange, 782–783
 - warm with cold autoantibodies, 273
- systemic vascular resistance, 26

- table form, IgM, 65f, 67, 98
tachyphylaxis, DDAVP, 816, 854
TACO (overload of circulation), 29, 387–388
TAC (trauma-associated coagulopathy), 39–40
Taiwan
 anti-Mi^a antibody, 223, 227
 D-negative phenotype, 173–174
Tamm–Horsfall glycoprotein, 241
tannic acid, 289
T antigen
 activation, 126, 284
 enzymes on, 310
 red cell polyagglutination, 282–285
TAPI and TAP2 genes, 556
Taq polymerase, nucleic acid testing, 699
tattooing, deferrals of donations, 5
Tc^b antigen, 236
Tc^c antigen, 236
^{99m}Tc red cell labelling, 363–364
 survival estimation, 376, 413
 volume estimation, 873
Technicon Autogrouper, 324
temperature, *see also* cold antibodies; warm antibodies
 agglutination tests, false-positive, 314
 anti-A₁ antibody, 133
 antibody isolation, 339
 antiglobulin test, 320, 321
 anti-Le^a antibody, 145
 anti-M antibody, red cell destruction, 421
 bacterial contamination and, 733–734
 biphasic haemolysins and, 267
 blood storage, 368–369, 370
 cold autoagglutinins, identification, 340
 crossmatching, 332–333, 335–336
 on equilibrium constants, 90
 massive transfusion, 38
 naturally occurring antibodies, anti-A and anti-B, 132
 platelet storage, 616–617
 recipient serum screening, 330
 red cell agglutination, 74–75, 91
 red cell polyagglutinability, 283
 red cell storage
 frozen, 381–383
 viability, 378–379
 red cell transfusion, 264, 265, 420
 venous spasm, 28
 temperature (body)
 cold blood transfusions, 678
 haemolytic transfusion reactions, 488
teratogenicity of drugs, exclusion of donors, 4
terminations *see* abortions
terminology *see* nomenclatures
TerumoTrima cell separator, 771
test tubes, agglutination tests, 311–312
tetanus immunoglobulin, deferrals of donations, 5
tetanus toxoid, anti-A after, 5, 136
tetany, donors, 13
tetrameric band 3, 55
tetraspanins, 238
thalassaemia, 393
 anti-Sc3 antibody, 233
 autoimmune haemolysis, 483
 donor blood selection, 331
 glucose-6-phosphate dehydrogenase deficiency, 6
 haemosiderosis, 684, 685–686
 hypertensive encephalopathy, 388
 I and i antigens, 151–152
 immunological tolerance, 85
 red cell antibodies, frequency, 80
 trait, 6
 transfused red cells, survival, 366
Th antigen, red cell polyagglutination, 282, 285
thawing
 bacterial contamination, 733
 human cells and tissue-based products, 887–889
 red cells, 883
 phosphate-buffered saline, 305
Th cells *see* helper T cells
therapeutic effectiveness, index of (ITE), stored red cells, 383
thermal ranges
 antibodies, red cell destruction, 419
 cold autoagglutinins, 262
Thermus aquaticus polymerase, nucleic acid testing, 699
thioester bonds, complement molecules, 99, 100, 102
thiol proteases, 307
thiol reagents, on red cells, 339
thrombin, 826–827, 863–864
thrombocytapheresis *see* plateletpheresis
thrombocytopenia, *see also* Glanzmann's thrombocytopenia type I; neonatal alloimmune thrombocytopenia
 bleeding time, 614–615
 DDAVP and, 817
 dilutional, 38, 39
 granulocyte colony stimulating factor, 809
 historical aspects, 611
 hypoproliferative, 621–624
 invasive procedures, 623–624
 lysine analogues, 818
 neonatal, 583–586
 plasma exchange, 787
 platelet lifespan, 614
 plateletpheresis donors, 776
 thrombopoietin for, 811–813
thrombocytopenic purpura *see* autoimmune thrombocytopenic purpura; immune thrombocytopenic purpura; thrombotic thrombocytopenic purpura
thromboelastography, trauma, 40
thromboembolism *see* venous thromboembolism
thrombomodulin, transfusion reactions, 466
thrombopoietin, 621, 809–813
thrombosis
 aprotinin, 820
 DDAVP, 817
 heparin-induced thrombocytopenia, 590
 hereditary antithrombin deficiency, 862
 lysine analogues, 819–820
 recombinant factor VIIa, 815
 thrombocytosis, 789
thrombospondin, sickle cell disease, 182
thrombotic thrombocytopenic purpura, 640–641
 plasma exchange, 779, 783–785
tick bites, exclusion of donors, 4
tick-borne rickettsial disease, 732–733
TIC (trauma-induced coagulopathy), 39–40
tin chloride, red cell volume estimation, 873
tissue adhesives, 827
tissue factor, recombinant factor VIIa binding, 814
tissue necrosis factor (TNF), transfusion reactions, 466, 476
tissues, A, B and H antigens, 128–129
titres
 antibodies
 anti-A and anti-B, 129
 blood grouping, 325–326
 anti-complement reagents, 319
 serum volume *vs.* antiglobulin test, 320
Tj^a antigen, stomach carcinoma and, 60
Tk antigens, 282, 284t
 malignant disease, 286–287
 red cell polyagglutination, 126, 285
T lymphocytes, *see also specific types*
 Ia–IIa glycoprotein complex, 576
 apheresis donors, 776–777
 autoimmune haemolytic anaemia, 278
 depletion, donor lymphocyte infusion, 638
 engineering, for donor lymphocyte infusions, 638–639
 irradiation, prevention of TA-GvHD, 668–669
 peripheral blood-derived progenitor cells and, 632–633, 775
 solid organ rejection, 562
Tn red cells
 enzymes on, 310
 polyagglutination, 61, 282, 286–287, *see also* anti-Tn antibody
toe temperature, 25
tolerance *see* immunological tolerance
tolmetin, 280
topical haemostatic agents, 825–827
topical lysine analogues, 818, 819, 820
total-dose infusion, intravenous iron, 805
total nucleated cell counts, cord blood progenitor cell transplantation, 634
tourniquets, orthopaedic surgery, lysine analogues, 818

- toxocariasis, ABO agglutinins, 137
 toxoplasmosis, 741
 Rhesus negative conscripts, 181
 tranexamic acid (AMCA), 43, 817–818
 transferrin saturation, 16, 684
 transfusion-associated acute lung injury, 29, 45, 664–667
 fresh-frozen plasma, 639
 HNA-3 system, 569
 transfusion-associated graft-versus-host disease, 487, 667–669
 universal leucoreduction policy, 580
 transfusions
 to fetus, 520–521
 platelets, 585
 immunomodulation by, 562–565
 indications for, 389–390
 quantities, 28–29
 rates, 27–28, 387, 663
 reactions *see* haemolytic transfusion reactions
 transfusion-transmitted viruses *see* blood-borne viruses
 transfusion trigger, 389–390
 transient Kell antigen depression, 218, 276
 transient LW negativity, anti-LW antibodies and, 198, 276
 transmembrane domains, Rh system antigens, 171
 transmembrane proteins, 56–57, 711
 transmissible diseases *see* infections
 transmissible spongiform encephalopathy, 730
 transplacental haemorrhage, 501–509
 anti-D antibody injections, 438, 523
 detection, 501–502, 884–885
 enzyme-linked antiglobulin test, 327
 after fetal transfusions, 521
 frequency, 503–506
 haemolytic reaction in mother, 460
 massive, 505–506
 mixed field agglutination, 314
 transplacental transfer, IgG, 66
 transplantation *see* bone marrow, transplantation; solid organ transplantation
 transport (land and air), platelets, 618
 transurethral prostatectomy, 469
 trauma, 38, *see also* battle casualties
 coagulopathy, 39–40
 from fainting, 12
 lysine analogues, 819
 recombinant factor VIIa, 814–815
 wet lung, 45
 TREAT study, 807
 Tregs *see* regulatory T cells
 trehalose, 306
 Trendelenburg position, 11
Trypanosoma pallidum, 730–731
 Trima Accel cell separator, 771
 trimolecular complex mechanism, 280
 triosephosphate antibodies, malaria, 270
 trisaccharides, ABO haemolytic disease, 536
 tropical spastic paraparesis, 718
 tropolone
 ¹¹¹In platelet labelling, 613
 ¹¹¹In red cell labelling, 873
 Tr polyagglutination, 285
Trypanosoma cruzi, 740–741
 trypsin, 307
 on Kell antigens, 215
 on red cell IgG, 91
 red cells treated with, 287, 288
 tsunami (2004), Sri Lanka, 17
 TT virus, 709
 Tu/Ca antigen, 575
 tumour necrosis factor (tissue necrosis factor), transfusion reactions, 466, 476
 twins, chimeras
 groups O and A, 128
 groups O and B, 460
 Lewis substance red cell uptake, 142
 two-colour fluorescence tests, HLA typing, 566
 two-component curves, red cell survival, 428–429, 439
 two-stage agglutination tests, 312, 313, 323
 sensitivity, 328
 two-way MLC test, 567
 Tx polyagglutination, 282, 285
 ‘type and screen’ procedure, 333
 typhoid-paratyphoid vaccine, anti-A after, 5

 U antigen, 223
 ulcerative colitis, immune complexes, 281
Ulex europaeus extract, 134
 ultrapure factor VIII concentrates, 852
 ultrasonography, fetus, 516
 ultraviolet B irradiation, platelet concentrates, 578, 580
 umbilical cord blood *see* cord blood
 umbilical vein sampling, 516
 UMRh antibody, mouse, 182
 United Kingdom, transplacental haemorrhage measurement, laboratories, 503
 United States Pharmacopoeia, whole blood units, 368
 units of stored blood, 368
 haemoglobin content, 386
 universal donors, 448–449
 dangerous, 462–463
 universal leucoreduction (ULR), 578, 579–580, 671
 unrelated donor transplants
 cord blood progenitor cells, 634, 636
 peripheral blood-derived progenitor cells, 776
 Upshaw–Shulman syndrome, 783
 uraemia, conjugated oestrogens, 825
 urea, Kidd antigens and, 221
 urea-linked gelatin, 36
 ureteral obstruction, lysine analogues, 820
 urine
 anti-Sd^a antibody, 240
 transfusion reactions, 459
 alkalinization, 469
 investigations, 489
 urine output, resuscitation, 26
 urticaria, 673, 676
 USA
 frequency of donations, 3, 6
 haemochromatosis blood, 16–17
 haemoglobin levels for donation, 9
 Pharmacopoeia, whole blood units, 368
 uterine surgery, lysine analogues, 818
 utilization of blood, rates, 3
 U wells, agglutination tests, 312

 Va^a antigen, 576
 vaccines/vaccinations, 5
 anti-A and anti-B antibodies, 136–137
 deferrals of donations, 5
 hepatitis B virus, 704
 vancomycin, 289
 V antigen, 180
 VA polyagglutination, 285
 variable domains, immunoglobulins, 62, 78
 variant Creutzfeldt–Jakob disease, 4, 729–730
 varices
 rebleeding, 390
 recombinant factor VIIa, 814
 vascular maintenance, platelets for, 614
 vascular permeability, dengue, 727
 vascular smooth muscle, HPA-1 system antigens, 576
 vasculitides, autoimmune, treatment, 782
 vasoconstriction
 from blood loss, 25, 26
 renal failure, 468
 vaso-occlusion, sickle cell disease, 394, 395, 765
 vasovagal syncope, 10–12, 773, 777
 vein-to-vein principle, 461
 VEL system, 239
 venesection, *see also* collection of blood
 bacterial contamination from, 733
 ill effects, 9–13, 804
 for platelets, 878
 therapeutic, 15–17
 Venezuela, ABO haemolytic disease, 532
 venoms, effect on complement, 227–228
 venous haematocrit, 764
 venous pressure, transfusion on, 385–386
 venous spasm, 28
 venous thromboembolism
 ABO system, 126
 intravenous immunoglobulin, 862
 Verotoxin, p^h binding, 148

- vertical transmission *see* mother–infant transmission
- very fresh whole blood, 396
- very-low-birthweight infants, *see also* premature infants
erythropoietin, 392
- veterans, exclusion as donors, 4
- V genes, anti-D antibody, 187, 188
- viability, *see also* survival
platelets, 614, 619
stored red cells, 369–370, 371, *see also* non-viable red cells
estimation, 375–378
irradiation, 379
temperature on, 378–379
- Vicia cracca* agglutinins, 87
- Vicia cretica* lectin, red cell polyagglutinability, 284t
- Vicia graminea*, anti-N lectin, 226
- vimentin, crossreactivity of monoclonal anti-D, 78
- viruses, *see also* blood-borne viruses; *specific viruses*
ABH-active, 138
autologous blood, 802
biphasic haemolysins and, 266–267
donor lymphocyte infusion, 638
fibrin sealants, 827
fresh-frozen plasma, 639
HLA class I molecules and, 552
leucoreduction and, 579
methylene blue-treated plasma, 641
oncogenic, 686
screening, 696
solvent/detergent-treated plasma, 641, 846
vaccinations, 5
- viscoelastic whole blood assays, trauma, 40
- viscosity of blood
haemorrhage on, 27
rapid transfusion, 28
- vital capacity, transfusion on, 385–386
- vitamin K, 813, 821–824
- vitamin K₁, 640, 821–822
- vitamin K₂, 821–822
- vitamin K epoxide reductase, 821
- Vivaglobin®, 858
- volume of donation, 2
fainting, 11
- volume replacement, 26–34, 764–765, 779
- Voluven, 34
- von Willebrand disease, 854
- von Willebrand factor, 854
ABO system and, 60, 126
DDAVP on, 815–816, 852
deficiency, oestrogens on, 825
hydroxyethyl starch on, 37
receptors, platelets, 620
- VS antigen, 180
- V wells, agglutination tests, 312
- walking donors, 392, 396
- warfarin
heparin-induced thrombocytopenia and, 590
reversal, 640, 821–825, 855
- warm antibodies, 90
autoantibodies, 260, 268–278
delayed haemolytic transfusion reactions, 482–483
donor incompatibility, 336
drug-induced, 280
Rh system, 273–275, 341
specificity, 273–278
incomplete, 319
- warm-antibody type autoimmune haemolytic anaemia, 75, 188, 270, 277–278
- warm autohaemolysins, 273
- warming of blood, 378, 678
- washed red cells, 397–398, *see also* freshly-washed red cells
anaphylaxis, 673
glycerol removal, 883
hepatitis B virus, 703
paroxysmal nocturnal haemoglobinuria, 398, 471–472
salvaged, 803
- washes
antiglobulin test, 318–319, 320–321
microplates, 323
- WASP (gene product), 129
- waterbaths, bacterial contamination, 733
- water ingestion, pre-donation, 12
- water injection, 469
- weak A and B variants, 122, 124
- weak alleles, A group, 123–124
- weak antibodies
elution, 340
identification, 338
- weak D antigens, 174, 175–179, 527, *see also* D phenotypes
auto-anti-D antibody and, 198
blood grouping, 329
immunogenicity of red cells, 191–192
- weak Fy^b expression, 218–219
- weak HLA antibodies, 558–559
- weak reactions, leukaemia, ABO system, 126
- weighing of swabs, blood loss, 25
- weight averages (m_w), molecular weights, plasma alternatives, 34
- weight (body)
blood volume estimation, 876
of donors, 2
fainting, 11
- wells, blood grouping, 312, 324
- WES⁺ antigen, 236
- West African ethnicity, gene frequencies, 59
- Western blotting
antibody identification, 341–342
HIV screening, 716, 717–718
infectious agents, 698
- West Nile virus, 726–727
- Wharton's jelly, 289
- 'white ball disease', 788
- whole blood
donation, 6–21
fresh, 396, 611, 612
Treponema pallidum, 731
Yersinia enterocolitica, 735
storage *see* storage of blood and components, whole blood transfusion, 29–30
- Wiener, A., work on Rh system, 54
- Wiener's nomenclature, 168
- window period
cytomegalovirus infection, 723
after hepatitis B, 701
HIV infection, 712, 718
- Wiskott–Aldrich syndrome, 129, 624, 667
- women
anti-HI antibody, 134
D immunization, 196
D-positive transfusion, 331
fainting, 11
frequency of donations, 6–7
haemoglobin levels for donation, 9
husband's blood, 217
non-D immunization, 331
transfusion-associated acute lung injury and, 666
- World Trade Center disaster, 17
- wounds
assessment of blood loss, 24
blood transfusions on postoperative infections, 564–565
- Wr antigens, 231
autoantibody specificity, 275
- Wren, Christopher (1632–1723), 22
- wristbands, 337
- X chromosome
blood group genes, 58
pseudoautosomal region, 232
- xenodiagnosis, *Trypanosoma cruzi*, 740
- Xg system, 232–233
- X-inactivation, 232
- Xk gene, 216
- XS2 gene, 228
- Yersinia enterocolitica*
in fresh blood, 735
in red cell concentrates, 736
colour change, 737
- Yk^a antigen, 237
- young platelets, 614

young red cells *see* neocytes

Yt antigens, 231–232, *see also* anti-Yt antibodies

Yuk system (HPA-4 system), 575

Yus phenotype, 235

Zav system, 575

zeolite (mineral zeolite bandage), 826t

zidovudine, anaemia, recombinant erythropoetin, 807

Zw antigens *see* HPA-1 system

zygosity, *RHD*, 513

ZZAP (papain and DTT), removal of autoantibodies, 336, 341