Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Leukocytes express distinct assortments of molecules on their cell surfaces, many of which reflect either different stages of their lineage-specific differentiation or different states of activation or inactivation. These cell surface molecules of leukocytes are routinely detected with anti-leukocyte monoclonal antibodies. Clusters of antigens on the surface of leukocytes can be designated by their reactions with monoclonal antibodies. This designation of the antigens is called clusters of differentiation (CDs). Using different combinations of mAbs, it is possible to chart the cell surface immunophenotypes of different leukocyte subpopulations, including the functionally distinct mature cell subpopulations of B cells, helper T cells (TH), cytotoxic T cells (TC), and natural killer (NK) cells. Some CD antigens have a well-known function, but other CD antigens have no known function.

MOUSE CD ANTIGENS

Mouse CD antigens are listed in Table 3.1. Their gene, molecular weight, ligands, distribution, and functions are shown in the table. For reference, alternate names of mouse leukocyte antigens are listed in Table 3.2. Non-CD antigens are listed in alphanumeric order in Table 3.3. Table 3.4 is a detailed summary of mouse leukocyte antigen distribution depicting the presence of surface antigens on different subsets. Antigen distribution on hematopoietic stem cells, erythrocytes, epithelial cells, endothelial cells, NK cells, monocytes/macrophages, T cells, B cells, granulocytes, megakaryocytes/platelets, and dendritic cells is illustrated graphically in Figures 3.1–3.11.

HUMAN CD ANTIGENS

CD antigens established in the 7th International Workshop of Human Leukocyte Differentiation Antigens are listed in Table 3.5. This table provides information regarding their molecular weight, gene locus, ligands/receptors, functions, and distribution. An addendum describing HLDA family and main antigen expression is provided as Table 3.6. A list of abbreviations can be found inside the back cover of this book.
Table 3.1 Mouse CD antigen chart

Key

The distribution of activation-dependent and developmental cluster of differentiation (CD) markers on various cell types is presented in the following pages.
### Table 3.1 Mouse CD antigen chart (continued)

| Antigen | Gene | Component of | Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|------|--------------|------------------|-------------------|----------------------|-----------------------|
| CD1d    | Cd1d | T-cell receptor | 43-49 kDa | Lipid/glycolipid Ag | CD1/MHC | Antigen presentation |
| CD2     | Cd2  | T-cell receptor | 45-58 kDa | CD48              |                      | Activation/costimulation; adhesion |
| CD3     | Cd3  | T-cell receptor | 20 kDa | CD2 Ig |                      | Signal transduction |
| CD3δ    | Cd3δ | T-cell receptor | 10 kDa | CD3 Ig |                      | Signal transduction |
| CD3ε    | Cd3ε | T-cell receptor | 20 kDa | CD3 Ig |                      | Signal transduction |
| CD3γ    | Cd3γ | T-cell receptor | 25 kDa | CD3 Ig |                      | Signal transduction *For CD3γ, see CD247 |
| CD4     | Cd4  | T-cell receptor complex | 55 kDa | CD4 |                      | Signal transduction; receptor/coreceptor |
| CD5     | Cd5  | CD72          | 67 kDa | CD5 Ig |                      | Adhesion; immunoregulation |
| CD5.1   | Cd5.1| CD72          | 67 kDa | CD5 Ig |                      | Immunoregulation |
| CD6     | Cd6  | CD166         | 100–128 and 130 kDa | CD6 |                      | Activation/costimulation; adhesion; differentiation/development |
| CD7     | Cd7  | CD166         | 40 kDa | CD7 Ig |                      | Immunoregulation |
| CD8a    | Cd8a | T-cell receptor complex | 38 kDa | CD8a |                      | Signal transduction; receptor/coreceptor |
| CD8b    | Cd8b | T-cell receptor complex | 30 kDa | CD8b |                      | Signal transduction; receptor/coreceptor |
| CD8b.2  | Cd8b.2| T-cell receptor complex | 30 kDa | CD8b.2 |                      | Signal transduction; receptor/coreceptor |
| CD9     | Cd9  | CD44          | 21, 24 kDa | CD9 |                      | Activation/costimulation |
Table 3.1  Mouse CD antigen chart (continued)

| Antigen | Gene | Component of Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|------|-------------------------------|--------------------|----------------------|-----------------------|
| CD10    | Mme | 100 kDa                        | Peptides           | CD54; CD102          | Enzymatic activity;   |
|         |      |                               |                    |                      | differentiation/development |
| CD11a   | LFA-1 | 180 kDa                        | Integrin           | CD54; iC3b;          | Adhesion; differentiation/development |
|         |      |                               |                    | fibronectin          |                       |
| CD11b   | Mac-1 (aka CR3) | 170 kDa | Integrin | CD54; iC3b;          | Adhesion              |
|         |      |                               |                    | fibronectin          |                       |
| CD11c   | p150, 95 (aka CR4) | 150 kDa | Integrin | CD54; iC3b;          | Adhesion              |
|         |      |                               |                    | fibronectin          |                       |
| CD13    | Anpep | 140-150 kDa                    | Leucyl-L-naphthylamine | CD62E?              | Enzymatic activity    |
| CD14    | CD14 | 53-55 kDa                      | LP5/LPβ complex    |                      | Receptor/coreceptor   |
| CD15    | Fut4 | Leucine-rich repeat            |                     |                      | Adhesion               |
| CD16    | Fcgr3 | 40-60 kDa                      | mouse IgG           |                      | Ig Fc Receptor        |
| CD18    | LFA-1, Mac-1, & p150, 95      | 95 kDa             | varies, see         |                      | Signal transduction; adhesion |
|         |      |                               | CD11a, b, c        |                      |                       |
| CD19    | C19/CD21/CD81 complex | 95 kDa | Integrin |                      | Signal transduction; receptor/coreceptor |
|         |      |                               |                     |                      |                       |
| CD20    | Ms4a2 | 33-37 kDa                      | RCA                |                      | Activation/costimulation; differentiation/development |
|         |      |                               |                     |                      |                       |
| CD21    | C3d | CD19/CD21/CD81 complex |                |                      | C′ regulation         |
|         |      | 150 kDa                        |                     |                      |                       |
| CD22.2  | Cy34.1 | 140-160 kDa                    | N-glycolyl neuraminic acid |                      | Adhesion; immunoregulation; receptor/coreceptor |
|         |      |                               | Siglec             |                      |                       |
| CD23    | FcE2a | 45-49 kDa                      | CD62P              |                      | Ig Fc Receptor        |
|         |      |                               |                    |                      |                       |
| CD24    | C24a | 35-52 kDa                      | CD62P              |                      | Activation/costimulation; adhesion |
|         |      |                               |                    |                      |                       |
Table 3.1  Mouse CD antigen chart (continued)

| Antigen | Component of | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|--------------|--------------------|----------------------|-----------------------|
|         | Gene         | Molecular Weight   |                      |                       |
| CD25    | il2ra        | IL-2 receptor      | IL-2                 | Activation/costimulation; receptor/coreceptor |
|         |              | 50-60 kDa          |                      |                       |
|         |              | CCP-like           |                      |                       |
| CD26    | Dpp4         | 220 kDa            | Polypeptides         | Activation/costimulation; adhesion; enzymatic activity |
|         |              | Dipeptidyl-peptidase |                      |                       |
| CD27    | Tnfrsf7      | 45 kDa             | CD70                 | Activation/costimulation; receptor/coreceptor |
|         |              | TNFR               |                      |                       |
| CD28    | Cd28         | Homodimer          | CD80, CD86           | Activation/costimulation; receptor/coreceptor |
|         |              | 65-80 kDa          |                      |                       |
|         |              | Ig                 |                      |                       |
| CD29    | Itgb7        | Varies, see CD49e-f and CD51 | Signal transduction; adhesion/differentiation/development |
|         |              | Integrin 130 kDa   |                      |                       |
| CD30    | Tnfrsf8      | 105-120 kDa        | CD153                | Immunoregulation; receptor/coreceptor; cytotoxicity? |
|         |              | TNFR               |                      |                       |
| CD31    | Pecam        | 130-140 kDa        | CD38; vitronectin receptor | Adhesion; angiogenesis |
|         |              | Ig                 |                      |                       |
| CD32    | Fcgr2b       | 40-60 kDa          | mouse IgG            | Ig Fc Receptor; phagocytosis |
|         |              | Ig                 |                      |                       |
| CD33    | Cd33         | 67 kDa             | Sialylated glycoproteins? | Adhesion |
|         |              | Siglec             |                      |                       |
| CD34    | Cd34         | 90, 105-120 kDa    | CD62L                | C3 regulation; phagocytosis |
|         |              | Sialomucin         |                      |                       |
| CD35    | C2           | 190 kDa            | C3b                  | Adhesion; receptor/coreceptor; phagocytosis |
|         |              | RCA                |                      |                       |
| CD36    | Cd36         | 88 kDa             | oxidized LDL         | Activation/costimulation; enzymatic activity |
|         |              | Class B scavenger receptor |                      |                       |
| CD37    | Cd37         | 42 kDa             | CD31                 | Enzymatic activity |
|         |              | TM4                |                      |                       |
| CD38    | Cd38         | 42 kDa             |                      |                       |
|         |              | T10                |                      |                       |
| CD39    | Entpd1       | ATP, ADP           |                      |                       |
|         |              |                     |                      |                       |
Table 3.1  Mouse CD antigen chart (continued)

| Antigen | Gene      | Component of Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens                      |
|---------|-----------|-------------------------------|--------------------|----------------------|--------------------------------------------|
| CD40    | Tnfrsf5   | 45-50 kDa                     | CD154              | Activation/costimulation; immunoregulation |
|         |           | TNFR                          |                    |                      |                                            |
| CD41    | Itga2bGPa | 105 kDa                       | Integrin           | Adhesion; hemostasis  |                                            |
|         |           |                               |                    |                      |                                            |
| CD42a   | Gp9       | GPib/IX/V Complex             | Leucine-rich repeat| Adhesion; hemostasis  |                                            |
|         |           |                               |                    |                      |                                            |
| CD42b   | Gp1ba     | GPib/IX/V Complex             | Leucine-rich repeat| Adhesion; hemostasis  |                                            |
|         |           |                               |                    |                      |                                            |
| CD42c   | Gp1bb     | GPib/IX/V Complex             | Leucine-rich repeat| Adhesion; hemostasis  |                                            |
|         |           |                               |                    |                      |                                            |
| CD42d   | Gp5       | GPib/IX/V Complex             | Leucine-rich repeat| Adhesion; hemostasis  |                                            |
|         |           |                               |                    |                      |                                            |
| CD43    | Spn       | 115 and 130 kDa               | CD54               | Signal transduction; adhesion |                                            |
|         |           | Sialomucin                    |                    |                      |                                            |
| CD44    | Cd44      | 85-95 kDa                     | Hya-LR; collagens; fibrinogen | Activation/costimulation; adhesion |                                            |
|         |           | Core/link proteoglycan        |                    |                      |                                            |
| CD45.1  | Ptprc     | 180-240 kDa                   | RPTP               | Signal transduction  |                                            |
|         |           |                               |                    |                      |                                            |
| CD45.2  | Ptprc     | 180-240 kDa                   | RPTP               | Signal transduction  |                                            |
|         |           |                               |                    |                      |                                            |
| CD45R   | Ptprc     | 220 kDa                       | RPTP               | Signal transduction  |                                            |
|         |           |                               |                    |                      |                                            |
| CD45RA  | Ptprc     | 220, 235 kDa                  | RPTP               | Signal transduction  |                                            |
|         |           |                               |                    |                      |                                            |
| CD45RB  | Ptprc     | 200-240 kDa                   | RPTP               | Signal transduction  |                                            |
|         |           |                               |                    |                      |                                            |
| CD45RC  | Ptprc     | 200-240 kDa                   | RPTP               | Signal transduction  |                                            |
|         |           |                               |                    |                      |                                            |
### Table 3.1  Mouse CD antigen chart (continued)

| Antigen | Gene | Component of Molecular Weight Family/Superfamily | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|------|-----------------------------------------------|-------------------|---------------------|----------------------|
| CD45RO | Ptpc | 180 kDa, RPTP |  |  | Signal transduction |
| CD46   | Mcp  | 41 kDa, RCA |  |  | C' regulation |
| CD47   | Itgα3 | β integrins | 50 kDa, Ig |  | Signal transduction; activation/costimulation; adhesion |
| CD48   | Cd48 | 45 kDa, CD2 Ig | VLA-1, 200 kDa, Integrin |  | Activation/costimulation; adhesion |
| CD49a  | Itgα1 | VLA-1 | laminin, collagen |  | Adhesion; differentiation/development |
| CD49b  | Itgα2 | VLA-2, 165 kDa, Integrin | laminin, collagen; fibronectin |  | Adhesion; differentiation/development |
| CD49c  | Itgα3 | VLA-3, Integrin | fibronectin; laminin, collagen |  | Adhesion; differentiation/development |
| CD49d  | Itgα4 | VLA-4 (LPAM-2, LPAM-1), Integrin | VCAM-1; fibronectin; MadCAM-1; invasin |  | Adhesion; differentiation/development |
| CD49e  | Itgα5 | VLA-5, 135 kDa, Integrin | fibronectin |  | Adhesion; differentiation/development |
| CD49f  | Itgα6 | VLA-6, αα integrin (TSF-180), Integrin | laminin |  | Adhesion; differentiation/development |
| CD50   | Itgam3 | Integrin | Unknown in mouse |  |  |
| CD51   | Itgαv | Vitronecin receptor; αα, αα, αα, αα, αα β integrins | Vitronecin; fibronectin; fibrinogen; thrombospondin; von Willebrand factor; CD31 |  | Activation/costimulation; adhesion; differentiation/development |
| CD52   | Cd92 | 12 kDa, Integrin |  |  |  |
| CD53   | Cd53 | 35-45 kDa, TM4 |  |  | Signal transduction; differentiation/development |
### Table 3.1 Mouse CD antigen chart (continued)

| Antigen       | Gene          | Component of Molecular Weight | Ligands/Substrates               | Antigen Distribution | Functions of Antigens                  |
|---------------|---------------|-------------------------------|----------------------------------|----------------------|----------------------------------------|
| CD54          | ICAM-1, Ly-47, MALA-2 | Icam1                         | LFA-1; Mac-1; CD43               |                      | Adhesion                               |
| CD55          | Decay accelerating factor (DAF) | Dafl                          | C3b; CD97                        |                      | C" regulation                          |
| CD56          | N-CAM13, 12F8, 12F11 N-CAM | Ncam                         | 120, 140, 180 kDa                |                      | Adhesion; differentiation/development |
| CD59          | Complement inhibitor | Cd59a                        | CSb-8                            |                      | C" regulation                          |
| CD61          | 2CBG23 Integrin β3 chain | Itgb3                        | varies, see CD51 and CD41        |                      | Signal transduction; adhesion          |
| CD62E         | 106.9 E-selectin, ELAM | Sele                          | E-selectin Ligand-1 (ESL-1)      |                      | Adhesion                               |
| CD62L         | MEL-14 L-selectin, LECAM-1, Ly-22 | Self                        | PNA and CD34, GlyCAM-1, MAdCAM-1 |                      | Adhesion                               |
| CD62P         | Polyclonal, B44.34 P-selectin, GMP-140, PADGEM | Selp                          | CD162; CD24                      |                      | Adhesion                               |
| CD63          | ME491         | Cdx3                          | CD66E?                            |                      | Differentiation/development?           |
| CD64          | Fcγ Receptor  | Fcgr1                         | mouse IgG                        |                      | Ig Fc Receptor                         |
| CD66a         | BGP, CEA-1    | Ceacam1                        | CD62E?                            |                      | Signal transduction; adhesion; angiogenesis |
| CD66b         | CGM6, CEA-3   | Pgp18                         | Phagocytosis                      |                      |                                        |
| CD68          | Macr2a, lysosomal glycoprotein | Cdx68                        | Activation/costimulation; differentiation/development |                      |                                        |
| CD69          | H1.2F3 Very Early Activation Antigen | Cdx69                        | 85 kDa                            |                      |                                        |
| Antigen | Gene | Component of | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|------|--------------|--------------------|----------------------|----------------------|
| CD70    | Tnfsf7 | 30-33 kDa | CD27               | Activation/costimulation |
| CD71    | Trfr  | 180-190 kDa | transferrin         | Activation/costimulation; metabolism |
| CD72    | Cd72  | 90 kDa       | CD5; CD100          | Activation/costimulation; differentiation/development |
| CD73    | Nts5  | 69 kDa       | NMP                | Enzymatic activity |
| CD74    | Il    | 31, 41 kDa   | CD44; MHC class II | Antigen presentation; differentiation/development |
| CD79a   | Igα   | 30-35 kDa    | B-cell receptor complex | Signal transduction |
| CD79b   | Igβ   | 35-40 kDa    | B-cell receptor complex | Signal transduction; differentiation/development |
| CD80    | Cd80  | 55 kDa       | CD28; CD152         | Activation/costimulation; immunoregulation |
| CD81    | Cd81  | 26 kDa       | CD19/CD21/CD81 complex | Activation/costimulation; adhesion; differentiation/development |
| CD82    | Kai   | TM4          |                     | Activation/costimulation |
| CD83    | Cd83  | TM4          |                     | Activation/costimulation |
| CD84    | Cd84  | CD2 Ig       |                     |                     |
| CD86    | Cd86  | 80 kDa       | CD28; CD152         | Activation/costimulation; immunoregulation |
| CD87    | Plaur | uPA          |                     | Adhesion; receptor/coreceptor |

Table 3.1 Mouse CD antigen chart (continued)
Table 3.1  Mouse CD antigen chart (continued)

| Antigen  | Gene       | Component of Molecular Weight Family/Superfamily | Ligands/Substrates | Antigen Distribution | Functions of Antigens                      |
|----------|------------|--------------------------------------------------|--------------------|----------------------|--------------------------------------------|
| CD88     | CSr1       |                                                  | CSa                |                      | Activation/costimulation; C" regulation   |
| CD90     | Thy1       | 25-30 kDa                                        | Ig                 |                      | Signal transduction; activation/costimulation; adhesion; differentiation/development |
| CD90.1   | Thy1       | 25-30 kDa                                        | Ig                 |                      | Signal transduction; activation/costimulation; adhesion; differentiation/development |
| CD90.2   | Thy1       | 25-30 kDa                                        | Ig                 |                      | Signal transduction; activation/costimulation; adhesion; differentiation/development |
| CD91     | Lrp1       | 600 kDa                                          | LDLR               |                      | Antigen presentation; hemostasis; metabolism |
| CD94     | Klr1       | CD94/NKG2 heterodimers                            | Qa-1/Qdm           |                      | Antigen recognition; immunoregulation       |
| CD95     | Tnfrsf6    | 45 kDa                                           | CD178              |                      | Apoptosis                                   |
| CD97     | Cd97       | EGF-TM7                                          | CD55               |                      | Activation/costimulation; immunoregulation? |
| CD98     | N202-141   | 120 kDa                                          |                     |                      | Immunoregulation                            |
| CD100    | Sema4d     | 150 kDa                                          | CD72; Plexin-B1    |                      | Activation/costimulation; adhesion          |
| CD102    | Icam2      | 55-68 kDa                                        | LFA-1              |                      | Activation/costimulation; adhesion          |
| CD103    | Itgæ       | 150 kDa (and 20 kDa?)                            | E-cadherin         |                      | Activation/costimulation; adhesion; differentiation/development |
| CD104    | Itgβ4      | 205 kDa                                          | Laminin            |                      | Adhesion                                    |
| CD105    | Eng        | 180 kDa                                          | TGFr               |                      | Adhesion; receptor/coreceptor               |
### Table 3.1 Mouse CD Antigen Chart (continued)

| Antigen     | Gene       | Component of Molecular Weight Family/Superfamily | Ligands/Substrates | Antigen Distribution | Functions of Antigens                      |
|-------------|------------|-------------------------------------------------|--------------------|----------------------|--------------------------------------------|
| CD106       | VCam1      | 100-110 kDa, 47 kDa GP-linked                   | VLA-4              |                      | Adhesion; differentiation/development      |
| CD107a      | Lamp1      | 110-140 kDa, Lampl                             | collagen?, laminin?, fibronectin? |                      | Adhesion?                                  |
| CD107b      | Lamp2      | 100-110 kDa, Lampl                             |                    |                      | Adhesion?                                  |
| CD110       | Mpl        |                                                 | CKR                |                      | Differentiation/development                |
| CD111       | Purt1      |                                                 | α-herpesviruses    |                      | Adhesion                                   |
| CD112       | Pus        |                                                 | ig                 |                      | Adhesion                                   |
| CD114       | Csf3r      | 95-125 kDa, CRK                               | G-CSF              |                      | Signal transduction; differentiation/development; receptor/coreceptor |
| CD115       | Csf1r      | 165 kDa, RTK                                   | M-CSF              |                      | Signal transduction; differentiation/development; receptor/coreceptor |
| CD116       | Csf2ra     |                                                 | GM-CSF             |                      | Signal transduction; differentiation/development; receptor/coreceptor |
| CD117       | Kit        | 145-150 kDa, Ig, RTK                           | c-Kit Ligand (aka Steel, stem cell, or mast cell growth factor) |                      | Signal transduction; adhesion; differentiation/development; receptor/coreceptor |
| CD118       | Ifnar      |                                                 | IFN-α; IFN-β       |                      | Immunoregulation? receptor/coreceptor      |
| CD119       | Ifngr      | 85-95 kDa, CRK                                 | IFN-γ              |                      | Immunoregulation; receptor/coreceptor      |
| CD120a      | Tnfrs1a    | 55-60 kDa, TNFR                               | TNF, LT-α3 (aka TNF-β) |                      | Signal transduction; apoptosis; receptor/coreceptor |
| CD120b      | Tnfrs1b    | 75-80 kDa, TNFR                               | TNF, LT-α3 (aka TNF-β) |                      | Signal transduction; apoptosis; necrosis; receptor/coreceptor |
Table 3.1 Mouse CD antigen chart (continued)

| Antigen     | Component Family/Superfamily | Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens                                      |
|-------------|------------------------------|------------------|--------------------|----------------------|-----------------------------------------------------------|
| CD121a      | IIF1                          | 80 kDa           | IL-1α; IL-1β       |                      | Signal transduction; activation/costimulation; receptor/coreceptor |
| CD121b      | IIF1                          | 60 kDa           | IL-1α; IL-1β       |                      | Immunoregulation; receptor/coreceptor                     |
| CD122       | II-2 and IL-15 receptors      | 85-100 kDa       | IL-2; IL-15        |                      | Signal transduction; receptor/coreceptor                  |
| CD123       | IL-3 receptor                 | 60-70 kDa        | IL-3               |                      | Differentiation/development; receptor/coreceptor          |
| CD124       | IL-4 and IL-13 receptors      | 138-145 kDa      | IL-4; IL-13        |                      | Signal transduction; receptor/coreceptor                  |
| CD125       | IL-5 receptor                 | 80 kDa           | IL-5               |                      | Activation/costimulation; immunoregulation; receptor/coreceptor |
| CD126       | IL-6 receptor                 | 80 kDa           | IL-6               |                      | Differentiation/development; receptor/coreceptor          |
| CD127       | IL-7 receptor                 | 65-75 kDa        | IL-7               |                      | Signal transduction; differentiation/development; receptor/coreceptor |
| CD128       | α-chemokine receptor          |                  | MIP2; KC (human IL-8) |                      | Activation/costimulation; receptor/coreceptor             |
| CD130       | IL-11, OSM, CNTF & LIF receptors | 130 kDa    |                    |                      | Signal transduction                                     |
| CD131       | IL-3, IL-5, & GM-CSF receptors | 110-120 kDa & 120-140 kDa (for AIC28) | IL-3 (for AIC28) |                      | Signal transduction; receptor/coreceptor                  |
| CD132       | IL-2, IL-4, IL-7, IL-9 and IL-15 receptors | 9 kDa       |                    |                      | Signal transduction                                     |
| CD133       | S-TM                          |                  |                    |                      | Activation/costimulation                                 |
| CD134       | OX-40 Ligand                  | 50 kDa           |                    |                      | OX-40 Ligand                                           |
### Table 3.1  Mouse CD antigen chart (continued)

| Antigen | Component of Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|-------------------------------|--------------------|----------------------|-----------------------|
| CD135   | FIt3 Ligand                    | 135-150 kDa, Ig, RTK|                      | Differentiation/development; receptor/coreceptor |
| CD137   | Tnfrsf9                        | 30 kDa (monomer), 55 kDa (dimer), or 110 kDa (tetramer) | 4-18BL, fibronectin, laminin, vitronectin, collagen IV | Antigen presentation; signal transduction; activation/costimulation; adhesion |
| CD138   | Sdc1                           | 31-kDa core protein, Glycosaminoglycan | Interstitial matrix proteins | Adhesion |
| CD140a  | PDGfra                         | PDGF receptor homodimer and heterodimer, 180 kDa | PDGF A chain; PDGF B chain | Signal transduction; differentiation/development; receptor/coreceptor |
| CD140b  | PDGfrb                         | PDGF receptor homodimer and heterodimer, 180 kDa | PDGF B chain | Signal transduction; differentiation/development; receptor/coreceptor; chemotaxis |
| CD141   | Thbd                           |                          |                      | Hemostasis |
| CD142   | F3                             |                          | Plasma Factor VIII/IX | Differentiation/development; hemostasis; angiogenesis |
| CD143   | Ace                            | Serine protease cofactor | angiotensin I | Enzymatic activity |
| CD144   | Cdhs                           | 125 kDa | Cadherin | Adhesion; angiogenesis |
| CD146   | Mtam                           |                          |                      | Adhesion |
| CD147   | Bsg                            |                          |                      | Adhesion |
| CD148   | Ptpj2, Byp                     |                          | FNIII, PTP | Signal transduction |
| CD150   | Slam                           |                          |                      | Signal transduction |
| CD151   | Cd151                          |                          | TM4                  | Hemostasis? |
| Antigen | Component of Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|-------------------------------|-------------------|---------------------|---------------------|
| CD152   | Cdf152                        | 33-37 kDa         | Ig                  | CD80, CD86          | Immunoregulation     |
| CD153   | Tnfsf8                        | 40 kDa            | TNF                 | CD30                | Activation/costimulation; immunoregulation |
| CD154   | Tnfsf5                        | 39 kDa            | TNF                 | CD40                | Activation/costimulation |
| CD156a  | Adam8                         | 89 kDa            | Metalloproteinase   |                     | Adhesion; enzymatic activity |
| CD156q  | Adam17                        | 130 kDa           | Metalloproteinase   | TNF-α; APP; CD62L   | Adhesion; enzymatic activity; receptor/receptor |
| CD157   | Bst1                          | 38-48 kDa         | ADP-ribosylcyclase  |                     | Adhesion? |
| CD159a  | Kirc1                         | CD94/NKG2 heterodimers | 38 kDa | Qa-1/Qdm | Antigen recognition; signal transduction |
| CD160   | Bys55                         | Cdf160            | Ig                  |                     |                      |
| CD161a  | Ly5Sα                         |                  |                     |                     |                      |
| CD161b  | Ly5Sβ                         | 81 kDa            | C-type lectin       |                     |                      |
| CD161c  | Ly5Sc                         | 76-80 kDa         | C-type lectin       |                     | Activation/costimulation |
| CD162   | Selpf                         | 160 kDa           | Sialomucin          | CD62P               | Adhesion             |
| CD163   | Cdf163                        |                  | SRCR                |                     |                      |
| CD164   | Cdf164                        |                  |                     |                     | Adhesion             |
| CD166   | Alcam                         | 120 kDa           | Ig                  | CD6                 | Activation/costimulation; adhesion; differentiation/development? |
### Table 3.1 Mouse CD antigen chart (continued)

| Antigen | Gene | Component of Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|------|--------------------------------|--------------------|----------------------|-----------------------|
| CD167a  | Ddr1 | RTK                            |                    |                      | Adhesion              |
| CD168   | Hmmr |                                 |                    |                      | Adhesion              |
| CD169   | Sn   |                                 | CD43; CD162        |                      | Adhesion              |
| CD170   | Siglec5 |                              | Siglec            |                      | Adhesion              |
| CD171   | L1cam|                                 |                    |                      | Adhesion              |
| CD172a  | Ptpns1 | 77, 86 kDa                  | CD47               |                      | Signal transduction; adhesion |
| CD178   | Tnfsf6 |                              | CD95               |                      | Signal transduction; activation/inhibition; differentiation/development; apoptosis; cytotoxicity? |
| CD178.1 | Tnfsf6 |                              | CD95               |                      | Signal transduction; activation/inhibition; differentiation/development; apoptosis; cytotoxicity? |
| CD179a  | VpreB | Pre-B cell receptor, 16 kDa |                    |                      | Differentiation/development |
| CD179b  | VpreB2 | Pre-B cell receptor, 22 kDa |                    |                      | Differentiation/development |
| CD180   | Ly78 |                                 | RP105/MF-1 complex | Leucine-rich repeat | Signal transduction |
| CD183   | Cmkar3 | Chemokine receptor            |                    |                      | Receptor/coreceptor; chemotaxis |
| CD184   | Cmkar4 | Chemokine receptor            | SDF-1              |                      | Receptor/coreceptor; chemotaxis |
| CD195   | Cmkbbr5 | Chemokine receptor            | MIP-1β; MIP-1α; RANTES; MCP-1 |                      | Receptor/coreceptor; chemotaxis |
| CD197   | Cmkbbr7 | Chemokine receptor            | SLC                |                      | Receptor/coreceptor; chemotaxis |
Table 3.1  Mouse CD antigen chart (continued)

| Antigen         | Gene   | Component of Molecular Weight | Ligands/ Substrates | Antigen Distribution | Functions of Antigens            |
|-----------------|--------|-------------------------------|---------------------|----------------------|----------------------------------|
| CD200           | Mox2   | Ig                            | CD200 receptor      | Immunoregulation      |
| CD201           | Procr  |                               | Protein C           | Receptor/coreceptor; hemostasis |
| CD202           | Tek    | RTK                           | CD1/MHC             | Differentiation/ development |
| CD203c          | Enpp1  |                               | Extracellular nucleotides | Enzymatic activity |
| CD204           | Scvr   | Class A scavenger receptor    | LPS; collagen; LDL? | Adhesion             |
| CD205           | Ly75   | 205 kDa                       | C-type lectin       | Antigen presentation |
| CD206           | Mrc1   | 175 kDa                       | High-mannose carbohydrates | Antigen presentation |
| CD210           | If10a, If10b |                            | IL-10               | Immunoregulation; receptor/coreceptor |
| CD212           | If12rβ1 | IL-12 receptor                | IL-12               | Immunoregulation; receptor/coreceptor |
| CD213a1         | If13rα1 | IL-13 and IL-4 receptors      | IL-13               | Immunoregulation; receptor/coreceptor |
| CD213a2         | If13rα2 | IL-13 receptor                | IL-13               | Immunoregulation; receptor/coreceptor |
| CD217           | I17r   |                               | IL-17; vIL-17       | Immunoregulation; receptor/coreceptor |
| CD220           | Insr   | 130 kDa, 95 kDa               | Insulin             | Receptor/coreceptor; metabolism |
| CD221           | Igt1r  | RTK                           | IGF-I; Insulin      | Receptor/coreceptor; metabolism |
| CD222           | Igt2r  | 220-250 kDa                   | IGF-II; mannose-6-phosphate residues; retinoic acid; TGF-β LAP | Receptor/coreceptor; metabolism |
Table 3.1  Mouse CD antigen chart (continued)

| Antigen | Gene | Component of Molecular Weight | Ligands/Substrates | Antigen Distribution | Functions of Antigens |
|---------|------|-------------------------------|-------------------|---------------------|----------------------|
| CD223   | Lag3 | MHC class II                  |                   |                     | Immunoregulation      |
| CD224   | Ggtp | glutathione                   |                   |                     | Enzymatic activity    |
| CD227   | Muc1 |                               |                   |                     |                      |
| CD228   | Mfti |                               |                   |                     |                      |
| CD229   | Ly9  | 100 kDa, 150 kDa             | CD2 Ig             |                     |                      |
| CD229.1 | Ly9a | 100 kDa                       | CD2 Ig             |                     |                      |
| CD230   | prnp |                               |                   |                     | Differentiation/ development |
| CD231   | Tm4sf2 |                             |                   |                     |                      |
| CD232   | plxnc1 |                           | Plexin             |                     | Metabolism            |
| CD233   | slc4a1 |                             | SLC                |                     |                      |
| CD234   | Dfy  |                               |                   |                     | Chemokines            |
| CD235a  | Gypa |                               |                   |                     | Receptor/coreceptor; chemotaxis |
| CD236R  | Gypc |                               |                   |                     |                      |
| CD238   | Kell | Kell/Kx antigen complex       | 110 kDa            |                     | Enzymatic activity    |
| CD239   | Lu   | Laminin 10/11                 |                   |                     | Adhesion              |
Table 3.1  Mouse CD antigen chart (continued)

| Antigen                  | Gene             | Component of Molecular Weight Family/Superfamily | Ligands/ Substrates | Antigen Distribution | Functions of Antigens |
|--------------------------|------------------|--------------------------------------------------|---------------------|----------------------|-----------------------|
| CD240 Rh30, Rh antigen   | Rhced            | Rh blood group                                   | Rh                  |                      | Metabolism            |
| CD241 Rh50, Rh-associated glycoprotein | Rhag             | Rh blood group                                   | 50 kDa              | Rh                   | Metabolism            |
| CD243 P- glycoprotein1, Mdr1 | Abcb1            | ABC transporter, MDR/TAP                          | Drugs, dyes         |                      | Enzymatic activity; metabolism |
| CD244.2 284 284 Antigen  | Nmrkb            | 66 kDa                                           | CD48                |                      | Signal transduction   |
| CD246 Anaplastic lymphoma kinase | alk              | RTK                                              | Unknown             |                      | Enzymatic activity    |
| CD247 1C3A1, 114F2, 8d3 CD3z, CD3 ζ chain | Cd3z             | T-cell receptor                                  | 16, 21, 32, 42 kDa  |                      | Signal transduction   |
### Table 3.2  Alternate names of mouse leukocyte antigens

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|-----------------------------------------------|
| 2B4 antigen                              | CD244                                         |
| 4-1BB                                    | CD137                                         |
| 4F2                                      | CD98                                          |
| 5E6                                      | Ly-49C and Ly-49I                             |
| 6C1 antigen                              | Ly-51                                         |
| A1                                       | Ly-49A                                        |
| ACT35 antigen                            | CD134                                         |
| AIC2A and AIC2B                          | CD131                                         |
| Aminopeptidase N                         | CD13                                          |
| APO-1                                    | CD95                                          |
| APO-2 ligand                             | TRAIL                                         |
| B220                                     | CD45R/B220                                    |
| B29                                      | CD79b                                         |
| B7-1, B7/BB1                             | CD80                                          |
| B7-2, B70                                | CD86                                          |
| BCM1                                     | CD48                                          |
| β_{IL-2} and β_{c}                       | CD131                                         |
| BIT                                      | CD172a                                        |
| BP-1 antigen                             | Ly-51                                         |
| BP-3                                     | CD157                                         |
| BST-1                                    | CD157                                         |
| c-Kit                                    | CD117                                         |
| ClqRp                                    | Early B lineage                               |
| C3b receptor                             | CD35                                          |
| CALLA                                    | CD10                                          |
| CCR5                                     | CD195                                         |
| CD1.1                                    | CD1d                                          |
| CD3 ε chain                              | CD3ε                                          |
| CD3 ζ chain                              | CD247                                         |
| CD21b                                    | CD35                                          |
| CD27 ligand                              | CD70                                          |
### Table 3.2 Alternate names of mouse leukocyte antigens (continued)

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|-----------------------------------------|-----------------------------------------------|
| CD30 ligand                             | CD153                                         |
| CD40 ligand                             | CD154                                         |
| CD62L ligand                            | PNAd                                          |
| CD95 ligand                             | CD178                                         |
| CD161                                   | NK-1.1                                        |
| coll-4                                  | CD100                                         |
| Common γ chain                          | CD132                                         |
| CR1                                     | CD35                                          |
| CR2/CR1                                 | CD21/CD35                                     |
| CRF2-4                                  | CD210                                         |
| CTLA-4                                  | CD152                                         |
| CXCR4                                   | CD184                                         |
| DDP IV                                  | CD26                                          |
| DX5                                     | CD49b                                         |
| E-selectin                              | CD62E                                         |
| Ecto-5′-nucleotidase                    | CD73                                          |
| ELAM-1                                  | CD62E                                         |
| endoCAM                                 | CD31                                          |
| Endoglin                                | CD105                                         |
| Erythroid cells                         | TER-119                                       |
| Fas                                     | CD95                                          |
| Fas ligand                              | CD178                                         |
| Fce RII                                 | CD23                                          |
| Fceγ III/II receptor                    | CD16/CD32                                     |
| Fibronectin receptor α chain            | CD49e                                         |
| Fibronectin receptor β chain            | CD29                                          |
| Flk-2                                   | CD135                                         |
| Flt3                                    | CD135                                         |
| γc                                      | CD132                                         |
| GL7                                     | T- and B cell activation antigen              |
| GMP-140                                 | CD62P                                         |
| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|-------------------------------------------|-----------------------------------------------|
| gp150                                     | CD13                                          |
| gp39                                      | CD154                                         |
| gp39 receptor                             | CD40                                          |
| gplla                                     | CD29                                          |
| gpllb                                     | CD41                                          |
| gpllla                                    | CD61                                          |
| Gr-1                                      | Ly-6G and Ly-6C                               |
| H2-DM                                     | HZ-M                                          |
| H4                                        | ICOS                                          |
| Heat stable antigen                       | CD24                                          |
| HsAg, HSA                                 | CD24                                          |
| la-associated invariant chain             | CD74                                          |
| IAP                                       | CD47                                          |
| ICAM-1                                    | CD54                                          |
| ICAM-2                                    | CD102                                         |
| IFN-γ receptor α chain                    | CD119                                         |
| Igα                                       | CD79a                                         |
| Igβ                                       | CD79b                                         |
| IgE, Fc receptor                          | CD23                                          |
| II                                        | CD74                                          |
| IL-1 receptor type 1/p80                  | CD121a                                        |
| IL-1 receptor type II/p60                 | CD121b                                        |
| IL-2 receptor α chain                     | CD25                                          |
| IL-2 and IL-15 receptor β chain           | CD122                                         |
| IL-3 receptor α chain                     | CD123                                         |
| IL-4 receptor α chain                     | CD124                                         |
| IL-6 receptor α chain                     | CD126                                         |
| IL-7 receptor α chain                     | CD127                                         |
| IL-10 receptor                            | CD210                                         |
| IL-12 receptor β chain                    | CD212                                         |
| Insulin receptor                          | CD220                                         |
| Integrin α1 chain                         | CD49a                                         |
Table 3.2  Alternate names of mouse leukocyte antigens *(continued)*

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|-----------------------------------------------|
| Integrin α₂ chain                        | CD49b                                        |
| Integrin α₁ chain                        | CD49c                                        |
| Integrin α₄ β₇ complex                    | LPAM-1                                       |
| Integrin α₄ chain                        | CD49d                                        |
| Integrin α₅ chain                        | CD49e                                        |
| Integrin α₆ chain                        | CD49f                                        |
| Integrin α₁EL chain                      | CD103                                        |
| Integrin α₁lb chain                      | CD41                                         |
| Integrin α₅l chain                       | CD11a                                        |
| Integrin α₉M chain                       | CD11b                                        |
| Integrin α₉ chain                        | CD51                                         |
| Integrin α₉S chain                       | CD11c                                        |
| Integrin β₁ chain                        | CD29                                         |
| Integrin β₂ chain                        | CD18                                         |
| Integrin β₁ chain                        | CD61                                         |
| Integrin β₄ chain                        | CD104                                        |
| Integrin-associated protein              | CD47                                         |
| Ki-1                                     | CD30                                         |
| L-selectin                              | CD62L                                        |
| L1                                       | CD171                                        |
| L3T4                                     | CD4                                          |
| LAG3                                     | CD223                                        |
| λ 5                                     | CD179b                                        |
| Laminin receptor α chain                | CD49f                                        |
| Laminin receptor β chain                | CD29                                         |
| LAMP-1                                  | CD107a                                        |
| LAMP-2                                  | CD107b                                        |
| LCA                                     | CD45                                         |
| LECAM-1                                 | CD62L                                        |
| Leukocyte common antigen                | CD45                                         |
| Leukosialin                             | CD43                                         |
Table 3.2 Alternate names of mouse leukocyte antigens (continued)

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|---------------------------------------------|
| LFA-1 α chain                            | CD11a                                       |
| LFA-1 β chain                            | CD18                                        |
| LFA-2                                    | CD2                                         |
| LGL-1                                    | Ly-49G2                                     |
| Lgp-100                                   | CD299.1                                     |
| LPAM-1 α chain                           | CD49d                                       |
| LPAM-1 β chain                           | Integrin β7 chain                           |
| LPAM-2 α chain                           | CD49d                                       |
| LPAM-2 β chain                           | CD29                                        |
| Ly-1                                     | CD5                                         |
| Ly-2                                     | CD8a                                        |
| Ly-3                                     | CD8b                                        |
| Ly-4                                     | CD4                                         |
| Ly-5                                     | CD45                                        |
| Ly-6E                                    | TSA-1                                       |
| Ly-9.1                                   | CD229.1                                     |
| Ly-10                                    | CD98                                        |
| Ly-12                                    | CD5                                         |
| Ly-15                                    | CD11a                                       |
| Ly-17                                    | CD16/CD32                                   |
| Ly-19                                    | CD72                                        |
| Ly-21                                    | CD11a                                       |
| Ly-22                                    | CD62L                                       |
| Ly-24                                    | CD44                                        |
| Ly-32                                    | CD72                                        |
| Ly-35                                    | CD8a                                        |
| Ly-37                                    | CD2                                         |
| Ly-38                                    | CD1d                                        |
| Ly-40                                    | CD11b                                       |
| Ly-42                                    | CD23                                        |
| Ly-43                                    | CD25                                        |
| Ly-44                                    | CD20                                        |
Table 3.2  Alternate names of mouse leukocyte antigens (continued)

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|-----------------------------------------------|
| Ly-47                                    | CD54                                          |
| Ly-48                                    | CD43                                          |
| Ly-52                                    | CD24                                          |
| Ly-53                                    | CD80                                          |
| Ly-54                                    | CD79a                                         |
| Ly-55                                    | NK1.1                                         |
| Ly-56                                    | CD152                                         |
| Ly-58                                    | CD86                                          |
| Ly-59                                    | NK1.1                                         |
| Ly-60                                    | CD102                                         |
| Ly-61                                    | Ly-6D                                         |
| Ly-62                                    | CD154                                         |
| Ly-63                                    | CD137                                         |
| Ly-63L                                   | 4-1BB ligand                                  |
| Ly-65                                    | CD157                                         |
| Ly-66                                    | CD223                                         |
| Ly-67                                    | TSA-1                                         |
| Ly-68                                    | Early B lineage                               |
| Ly-69                                    | Integrin β7 chain                             |
| Ly-70                                    | CD134                                         |
| Ly-70L                                   | OX-40 ligand                                  |
| Ly-72                                    | CD135                                         |
| Ly-73                                    | Flk1                                          |
| Ly-74                                    | Ep-CAM                                        |
| Ly-76                                    | TER-119                                       |
| Ly-77                                    | T and B cell activation antigen               |
| Ly-78                                    | CD180                                         |
| Ly-79                                    | Dendritic cells                               |
| Ly-81                                    | TRAIL                                         |
| Ly-89                                    | PIR-A/B                                       |
| Ly-90                                    | CD244                                         |
**Table 3.2** Alternate names of mouse leukocyte antigens (*continued*)

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|-----------------------------------------------|
| Ly-92a                                    | ART2.2                                        |
| Ly-101                                    | PD-1                                          |
| Ly-115                                    | ICOS                                         |
| Ly-A                                      | CD5                                          |
| Ly-B                                      | CD8a                                         |
| Ly-C                                      | CD8b                                         |
| Ly-m10                                    | CD98                                         |
| Ly-m11                                    | β2 microglobulin                             |
| Ly-m19                                    | CD72                                         |
| Ly-m22                                    | CD62L                                        |
| Lyam-1                                    | CD62L                                        |
| Lyb-2                                     | CD72                                         |
| Lyb-8.2                                   | CD22.2                                       |
| LyM-1                                     | CD16/CD32                                    |
| Lym-20                                    | CD16/CD32                                    |
| Lyt-1                                     | CD5                                          |
| Lyt-2                                     | CD8a                                         |
| Lyt-3                                     | CD8b                                         |
| Mac-1 α chain                             | CD11b                                        |
| Mac-1 β chain                             | CD18                                         |
| MAFA                                      | KLRG1                                        |
| MALA-2                                    | CD54                                         |
| Mast cell factor receptor                 | CD117                                        |
| mb-1                                      | CD79a                                        |
| MECA-32 antigen                           | Panendothelial cell antigen                  |
| Mo2                                       | CD14                                         |
| Mucosalin                                 | CD34                                         |
| N-CAM                                     | CD56                                         |
| Nectadrin                                 | CD24                                         |
| NKR-P1B                                   | NK-1.1                                       |
| NKR-P1C                                   | NK-1.1                                       |
| NT                                        | CD73                                         |
Table 3.2  Alternate names of mouse leukocyte antigens (continued)

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|-----------------------------------------------|
| OX-2 antigen                            | CD200                                         |
| OX-40 antigen/receptor                   | CD134                                         |
| P-selectin                              | CD62P                                         |
| P-selectin glycoprotein ligand           | CD162                                         |
| p150, 95 α chain                        | CD11c                                         |
| p150, 95 β chain                        | CD18                                          |
| p24                                      | CD9                                           |
| p55                                      | CD25                                          |
| P84 antigen                             | CD172a                                        |
| PADGEM                                   | CD62P                                         |
| Pan-NK cells                             | CD49b                                         |
| PDGF receptor α chain                   | CD140a                                        |
| PDGF receptor β chain                   | CD140b                                        |
| PECAM-1                                  | CD31                                          |
| pgllα                                    | CD31                                          |
| Pgp-1                                    | CD44                                          |
| Pre-BCR                                  | Pre-B cell receptor                           |
| PSGL-1                                   | CD162                                         |
| pTα                                      | Pre-T cell receptor α chain                   |
| RL-388                                   | CD98                                          |
| RP105                                    | CD180                                         |
| Rtn-2                                    | ART2.2                                        |
| Sca-1                                    | Ly-6A/E                                       |
| Sca-2                                    | TSA-1                                         |
| Scavenger receptor                      | CD36                                          |
| Semaphorin H                            | CD100                                         |
| Siglec-2                                 | CD22                                          |
| sgp-60                                   | CD48                                          |
| SHPS-1                                   | CD172a                                        |
| Sialophorin                              | CD43                                          |
| SIRPα                                    | CD172a                                        |
### Table 3.2 Alternate names of mouse leukocyte antigens (continued)

| Common names for mouse leukocyte antigens | Specificity in mouse leukocyte catalog section |
|------------------------------------------|-----------------------------------------------|
| Steel factor receptor                    | CD117                                         |
| Stem cell factor receptor                | CD117                                         |
| Syndecan-1                               | CD138                                         |
| 0                                        | CD90                                          |
| T3                                       | CD3                                           |
| T10                                      | CD38                                          |
| T200                                     | CD45                                          |
| TAP                                      | Ly-6A/E                                      |
| TAPA-1                                   | CD81                                          |
| THAM                                     | CD26                                          |
| ThB                                      | Ly-6D                                         |
| Thy-1                                    | CD90                                          |
| Thy-1.1                                  | CD90.1                                        |
| Thy-1.2                                  | CD90.2                                        |
| TNFR receptor type I/p55                 | CD120a                                        |
| TNF receptor type II/p75                 | CD120b                                        |
| Transferin receptor                      | CD71                                          |
| TSP-180 α chain                          | CD49f                                         |
| TSP-180 β chain                          | CD104                                         |
| VCAM-1                                   | CD106                                         |
| VE-cadherin                              | CD144                                         |
| VEGF-R2                                  | Flk1                                          |
| Very Early Activation antigen             | CD69                                          |
| Vitronectin receptor α chain              | CD51                                          |
| Vitronectin receptor β chain              | CD61                                          |
| VLA-1 α chain                            | CD49a                                         |
| VLA-2 α chain                            | CD49b                                         |
| VLA-3 α chain                            | CD49c                                         |
| VLA-4 α chain                            | CD49d                                         |
| VLA-5 α chain                            | CD49e                                         |
| VLA-6 α chain                            | CD49f                                         |
| VLAαβ                                    | CD29                                          |
| Antigen   | Other names            | MW       | Structure | Chromosome # | Expression               | Function                                                                 |
|-----------|------------------------|----------|-----------|--------------|--------------------------|--------------------------------------------------------------------------|
| 4-1BBL    | Tnfsf9, TNFSF          | 17       | B act, D, Cact, peritoneal mac act | B act, DC act, peritoneal mac act | DC activation, cytokine production                                       |
| B7-H1     | PD-L1                  |          |           |              | Broad                    | Cell costimulation, receptor for PD-1                                     |
| B7-H2     | GL50, ICOS-Ln, B7h, B7RP-1 |        | B, DC, mono |              | Cell costimulation, receptor for ICOS                                   |
| B7-DC     | PD-L2                  | Mono, mac, DC subset |          |              | Cell costimulation, receptor for PD-1                                   |
| BP-1      | Ly-51, 6C3, Enpep      | 120-160 kD | Type II TM | 3            | Early B progenitors, BM stromal cells, thymic epith | Zinc metalloproteinase, glutamyl aminopeptidase                           |
| DX5       | VLA-2, Integrin α2, Itga 2 | 165 kD    | IntgF     | 13           | NK, T subset              |                                                                           |
| Fk-1      | Kdr, Ly73, VEGFR2      |          | RTK family | 5            | Endoth                   | Receptor for VEGF                                                         |
| Flt-4     | VEGFR3                 | 170 kD   | RTK family | 11           | Lymphatic endoth         | Endoth growth factor receptor, binds VEGF-C                                |
| ICOS      | Ly115                  | 26 kD    | IgSF      | 1            | Thymic medulla, geminal center T cells, T act | Inducible T cell Costimulator, T costimulation, B7-H2 receptor, cytokine production, B help |
| IgE high affinity receptor |          |          |           |              | B, mono                  | High affinity binding to IgE                                              |
| IgM       |                        |          |           |              |                          | Surface expression by mature B cells                                     |
| Jagged-1  |                        |          |           |              |                          | Receptor for Notch-1                                                      |
| Ly-6A/E   | Sca-1                  | 18 kD    | GPI-linked | Gran, mono, B, T subset, endoth | T activation                                                            |
| Ly-6B     |                        |          |           |              |                          |                                                                           |
| Ly-6C     |                        | 14–17 kD | GPI-linked | Endoth, T, NK, mono, mac |                                                                           |
| Ly-6D     | ThB, Ly-61             | 15 kD    | GPI-linked | B, T, thymic epith |                                                                           |
| Ly-6F     |                        |          |           |              |                          |                                                                           |
| Ly-6G     | Gr-1                   | 21–25 kD | GPI-linked | Unknown        | Myeloid cells                                                           |
### Table 3.3 Mouse cell surface antigens: Non-CD antigens (continued)

| Antigen       | Other names | MW       | Structure          | Chromosome # | Expression | Function                                      |
|---------------|-------------|----------|--------------------|--------------|-----------|-----------------------------------------------|
| Ly-49A        | A1, Klra1   | 85 kD    | Type II C-type lectin | 6            | T subset, NK subset | Regulation of cytotoxicity, binds MHC class I |
| Ly-49B        | Klra2       |          |                    | 6            |           |                                               |
| Ly-49C        | Klra3, 5E6  | 110 kD   | Type II C-type lectin | 6            | T subset, NK subset | Regulation of cytotoxicity, binds MHC class I |
| Ly-49D        | Klra4       |          |                    | 6            | NK subset | NK activation                                 |
| Ly-49E        | Klra5       |          |                    | 6            |           |                                               |
| Ly-49F        | Klra6       |          |                    | 6            |           |                                               |
| Ly-49G        | LGL1, Klra7 | 85 kD    | Type II C-type lectin | 6            | T subset, NK subset | Regulation of cytotoxicity |
| Ly-49H        | Klra8       |          |                    | 6            |           |                                               |
| Ly-49I        | Klra9       |          |                    | 6            |           |                                               |
| Mac-3         |             | 93–110 kD|                    |              |           | Mac (surface and intercellular) related to CD107b |
| MAd-CAM-1     |             | 50 kD    | IgSF, Type I TM    | 10           | Endoth subset | Mucosal vascular adhesion molecule, adhesion, cells homing, binds CD49d and CD62L |
| Notch-1       | Lin-12, Tan1|          |                    | 2            |           | Developing embryo, variety of adult tissues, Cell–cell interaction, cell fate determination |
| OX-40 ligand  | Tnfsf4, gp34| 35 kD    | TNFSF              | 1            | B<sup>+</sup>, cardiac myocytes | T-B interaction, T costimulation |
| PD-1          | Programmed death-1 | 55 kD | Thymocyte subset, T<sup>αβ</sup>, B<sup>αβ</sup> | T-B interaction, T costimulation, peripheral tolerance |
| Sca-1         | Sca-1       | 18 kD    | GPI-linked         |              | Gran, mono B, T subset, endoth | T activation |
| Ter-119       | Ly-76       |          |                    |              |           | Early proerythroblast to mature erythrocyte, W/ glycophorin, but not a typical glycophorin |
## Table 3.3  Mouse cell surface antigens: Non-CD antigens (continued)

| Antigen | Other names | MW | Structure | Chromosome # | Expression | Function |
|---------|-------------|----|----------|--------------|------------|----------|
| Tie2    | Tek         | 140 kD RTK family | 4          | Stem cells, endoth from early development | Angiogenesis, Angiopoietin-1 receptor |
| TLR1    |             |             | 5          | Activation of AP-1 not NF-kB |
| TLR2    |             |             | 3 or 8     | Mono, mac, adipocytes, γδ T | Response to bacterial lipoproteins |
| TLR3    |             |             | 3 or 8     |             | Binds double stranded RNA, activation of NK-kB |
| TLR4    | Ly8T, Rasl2-8 | 4          |            | Peritoneal mac | Bacterial lipoproteins response, NF-kB and AP-1 activation |
| TLR5    |             |             | 1          | mRNA: liver, lung, lower level in MOLF/Ei mice | Role in Gram-negative bacterial infection |
| TLR6    |             |             | 5          | mRNA: spleen, thymus, ovary, lung | Activation of NF-kB and JunK |
| TLR7    |             |             | X          |             | |
| TLR8    |             |             | X          |             | |
| TLR9    |             |             | 6          |             | CpG DNA receptor, TLR9KO resist lethal effect of CpG |
| TRAIL   | Ly-81, APO-2L, Tnfsf10 TNFSF | Unknown |            | NK<sup>act</sup>, liver NK | Apoptosis |
| TCR     | αβ          |             | T subset   |             | Antigen recognition |
| TCR     | γδ          |             | T subset   |             | Antigen recognition |
| TCR-Hy  |             |             | Transgenic | H-Y T cells | |

### Abbreviations:
- Act: Activated
- Ag: Antigen
- BM: Bone marrow
- CCRSF: Complement component receptor superfamily
- CHO: Carbohydrate moiety
- CRSF: Cytokine receptor superfamily
- DC: Dendritic cells
- ECM: Extracellular matrix
- Endoth: Endothelial cells
- Epith: Epithelial cells
- FDC: Follicular dendritic cells
- GPI: Glycophosphatidylinositol
- Gran: Granulocytes
- (H): Human CD, not defined in mouse
- IgSF: Immunoglobulin superfamily
- IntgF: Integrin family
- LRRF: Leucine-rich repeat family
- Mac: Macrophages
- MHC: Major histocompatibility complex
- Mono: Monocytes
- NK: Natural killer
- RTK: Receptor tyrosine kinase
- SRCRSF: Scavenger receptor cysteine-rich superfamily
- TM: Transmembrane
- TM12SF: 12-transmembrane spanning protein superfamily
- TM4SF: 4-transmembrane spanning protein superfamily
- TM7SF: 7-transmembrane spanning protein superfamily
- TNFRSF: TNF receptor superfamily
- TLR: Toll-like receptor superfamily
- W/: Associates with
- KO: Knock-out mouse
### Table 3.4  Mouse leukocyte antigen distribution chart

| Antigen | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|---------|--------|--------|----------------|---------|----------|-------------|---------------|-------------|------------------|
| CD1d (CD1.1, Ly-38) | Most | Most | Most | Most | Most | Most | Unkn | Unkn | Unkn |
| CD2 (LFA-2) | Most/Dev | Sub/Dev | Unkn | Most | Sub | Most | Unkn | Most | Unkn |
| CD3 molecular complex | Most/Dev | ND | ND | Sub | ND | ND | ND | ND | ND |
| CD3ε (CD3 ε chain) | Most/Dev | ND | ND | Sub | ND | ND | ND | ND | ND |
| CD4 (L3T4) | Sub/Dev | ND | Sub | Sub | Most/Dev | ND | Unkn | ND | Unkn |
| CD5 (Ly-1) | Most/Dev | Sub | Unkn | ND | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD8a (Ly-2) | Sub/Dev | ND | Sub | ND | ND | ND | ND | ND | ND |
| CD8b (Ly-3) | Sub/Dev | ND | ND | ND | ND | ND | ND | ND | ND |
| CD9 | Sub/Act | Sub | Most | Unkn | Most | Most/Dev | Most/Dev | ND | Unkn |
| CD11a (integrin αL chain, LFA-1 α chain) | Most | Most | Most | Most | Most/Dev | Most | Unkn | ND | Unkn |
| CD11b (integrin αM chain, Mac-1 α chain) | Sub/Act | Sub | Sub/Act | Sub | Most/Dev | Most/Dev | Unkn | ND | Unkn |
| CD11c (integrin αX chain) | Sub/Act | Sub | Most | Most | Most/Dev | Most/Dev | Unkn | ND | Unkn |
| CD13 | ND | ND | Most | Unkn | Sub/Dev | Unkn | Unkn | Unkn | Most |
| CD14 | ND | ND | Unkn | ND | Sub/Act | Most/Act | Unkn | Unkn | Unkn |
| CD16/CD32 (Fcγ III/II receptor) | ND | ND | Unkn | Most | Most/Dev | Sub/Act | Unkn | Unkn | Unkn |
| CD18 (integrin β2 chain) | Most | Most | Most | Most | Most | Unkn | ND | Unkn | Unkn |
| CD19 | ND | Most | Unkn | ND | ND | Sub | ND | ND | Unkn |
| CD21/CD25 (CR2/CR1, CD21a/CD21b) | ND | Most | Unkn | Unkn | Sub | Most/Act | ND | ND | Unkn |
| CD22.2 (Lyb-8.2) | ND | Most/Dev | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
Table 3.4 Mouse leukocyte antigen distribution chart (continued)

| Antigen | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|---------|--------|--------|----------------|---------|-----------|-------------|---------------|-------------|-----------------|
| CD23 (FcεRII) | ND | Sub/Act | Sub/Act | Unkn | Most | Sub | Most | Unkn | Unkn |
| CD24 (heat stable antigen) | Most/Dev | Most/Dev | Sub | ND | Most/Dev | Most | Unkn | Most | Unkn |
| CD25 (IL-2 receptor α chain, p55) | Most/Act+Dev | Most/Act+Dev | Sub/Dev | ND | Most/Dev | Unkn | Unkn | Unkn | Unkn |
| CD26 (THAM, DPP IV) | Most/Act | Most | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD27 | Most | Sub | Unkn | Sub | ND | ND | Unkn | Unkn | Unkn |
| CD28 | Most/Act+Dev | ND | Unkn | Most | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD29 (integrin β1 chain) | Most | Most | Most | Most | Most | Most | ND | Most | |
| CD30 | Most/Act | Most/Act | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD31 (PECAM-1) | Sub | Sub | Most | Most/Act | Sub | Most | Most | Unkn | Most |
| CD34 | ND | ND | ND | ND | ND | ND | ND | ND | Sub |
| CD35 (CR1, CD21b) | ND | Most | Sub | Unkn | Most | Most/Act | ND | ND | Unkn |
| CD36 (scavenger receptor) | Unkn | Most/Dev | Unkn | Unkn | Most/Dev | Unkn | Unkn | Unkn | Sub |
| CD38 | Sub | Sub | Unkn | Most | Sub | Unkn | Unkn | ND | Unkn |
| CD40 | Sub | Most | Sub | Unkn | Most/Act | Unkn | Unkn | Unkn | Unkn |
| CD41 (integrin α1b chain) | ND | ND | Unkn | Unkn | Sub | Sub | Most | ND | Unkn |
| CD43 (Ly-48, leukosialin) | Most | Most/Dev | Unkn | Most | Most | Most | Unkn | Unkn | Unkn |
| CD43 activation-associated glycoform | Most/Act | Most/Dev | Unkn | Unkn | Most | Most | Unkn | Unkn | Unkn |
| CD44 (Pgp-1, Ly-24) | Most/Act+Dev | Most/Act | Most | Most | Most | Most | Most | Unkn | Unkn |
| CD45 (leukocyte common antigen, Ly-5) | Most | Most | Most | Most | Most | Most | Most/Dev | ND | |
| CD45R/B220 | Sub/Act | Most/Dev | Unkn | Sub/Act+Dev | Sub | ND | ND | ND | ND |
**Table 3.4** Mouse leukocyte antigen distribution chart (continued)

| Antigen                        | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|--------------------------------|--------|--------|----------------|---------|----------|-------------|---------------|-------------|------------------|
| CD45RA                         | Sub    | Most   | ND             | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | ND               |
| CD45RB                         | Sub/Dev| Most   | Sub            | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | ND               |
| CD45RC                         | Sub    | Most   | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | ND               |
| CD47 (IAP)                     | Most   | Most   | Most           | Most    | Most     | Most        | Most          | Most        | Most             |
| CD48 (BCM1)                    | Most   | Most   | Unkn           | Most    | Most     | Most        | ND            | ND          | ND               |
| CD49a (integrin α1 chain)      | Most/Act| ND    | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | ND               |
| CD49b (integrin α2 chain)      | Most/Act| ND    | Unkn           | Sub     | Unkn     | Unkn        | Most/Dev      | ND          | Sub              |
| CD49c (integrin α3 chain)      | Unkn   | Unkn   | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn             |
| CD49d (integrin α4 chain)      | Most   | Most   | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | ND               |
| CD49e (integrin α5 chain)      | Sub/Act| ND    | Unkn           | Unkn    | Unkn     | Unkn        | Sub           | Unkn        | ND               |
| CD49f (integrin α6 chain)      | Sub    | Sub    | Unkn           | Unkn    | Unkn     | Unkn        | Sub           | Unkn        | Most             |
| CD51 (integrin α7 chain)       | Sub/Act| ND    | Unkn           | Unkn    | Unkn     | Unkn        | Sub           | Sub         | Most/Dev         |
| CD53                           | Most/Act| Most | Most           | Most    | Most     | Most        | Unkn          | ND          | Unkn             |
| CD54 (ICAM-1)                  | Sub/Act| Most/Act| Most/Act     | Unkn    | Most/Act| Most/Act    | Unkn          | ND          | Most/Act         |
| CD56 (N-CAM)                   | ND     | ND     | Unkn           | ND      | Unkn     | Unkn        | Unkn          | Unkn        | Unkn             |
| CD61 (integrin β1 chain)       | ND     | ND     | Unkn           | ND      | Unkn     | Unkn        | Sub           | Most        | ND               |
| CD62E (E-selectin, ELAM-1)     | ND     | ND     | Unkn           | ND      | ND       | Unkn        | Unkn          | Unkn        | Most/Act         |
| CD62L (L-selectin)             | Most/Act+Dev| Unkn | Sub            | Most    | Most/Act| Unkn        | Unkn          | Unkn        | Unkn             |
| CD62P (P-selectin)             | ND     | ND     | Unkn           | ND      | ND       | ND          | Most/Act      | Unkn        | Most/Act         |
| CD69 (Very Early Activation antigen) | Most/Act+Dev| Unkn | Most/Act      | Unkn    | Most/Act| Unkn        | Unkn          | Unkn        | Unkn             |
| CD70                            | Most/Act| Most | Most           | Most    | Most     | Most        | Most          | Unkn        | Most/Dev         |
| CD71 (transferrin receptor)    | Most/Act| Most | Unkn           | Most    | Most     | Most        | Most          | Unkn        | Most/Dev         |
| Antigen                        | T cell | B cell | Dendritic cell | NK cell | Monoocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|-------------------------------|--------|--------|----------------|---------|-----------|-------------|---------------|-------------|-----------------|
| CD72a alloantigen (Lyb2.1)    | ND     | Most/Dev| Unkn           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD72b alloantigen (Lyb-2.2)   | Sub/Act| Most/Dev| Unkn           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD72c alloantigen (Lyb-2.3)   | ND     | Most   | Unkn           | ND      | ND Unkn   | Unkn        | Unkn          | Unkn        | Unkn            |
| CD73 (Ecto-5’-nucleotidase)   | Sub/Dev| Sub/Dev| ND             | Unkn    | Most/Dev  | Most/Dev    | Unkn          | ND Sub      |                 |
| CD74 (Ii)                     | ND     | Most   | Most           | Unkn    | Most/Act  | ND          | ND            | ND          | ND              |
| CD79a (Igα, mb-1)             | ND     | Most/Dev| Unkn           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD79b (Igβ)                   | ND     | Most/Dev| Unkn           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD80 (B7-1)                   | ND     | Sub/Act| Most           | Unkn    | Most      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD81 (TAPA-1)                 | Most/Dev| Sub/Dev| Most           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD86 (B7-2)                   | Sub/Act| Sub/Act| Most/Act       | Unkn    | Most/Act  | Unkn        | Unkn          | Unkn        | Unkn            |
| CD90 (Thy-1)                  | Most   | ND     | Sub            | Most    | Sub       | ND          | ND            | ND          | Unkn            |
| CD94                          | Sub    | ND     | Unkn           | Most    | ND Unkn   | ND          | ND            | ND          | Unkn            |
| CD95 (Fas)                    | Most/Dev| Sub/Act| Sub/Act        | Unkn    | Sub       | Sub         | Sub           | Sub         | Unkn            |
| CD98 (4F2)                    | Most/Act| Most/Act| Unkn           | Unkn    | Most/Dev  | Most/Dev    | Unkn          | Most/Dev    | Unk             |
| CD100                         | Unkn   | Unkn   | Unkn           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD102 (ICAM-2)                | Most   | Most   | Sub            | Unkn    | Unkn      | Unkn        | Unkn          | Most        | Unkn            |
| CD103 (integrin αIEL chain)   | Sub/Dev| ND     | Unkn           | Unkn    | Unkn      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD104 (integrin β4 chain)     | Sub/Dev| ND     | Unkn           | ND      | ND Unkn   | Unkn        | Unkn          | Sub         |                 |
| CD105 (endoglin)              | ND     | ND     | ND             | ND      | ND        | ND          | ND            | ND          | Most            |
| CD106 (VCAM-1)                | ND     | ND     | Sub            | ND      | ND        | ND          | Unkn          | ND Most/Act  |                 |
| CD107a (LAMP-1)               | Most/Act| Most/Act| Unkn           | Unkn    | Most/Dev  | Most/Dev    | Unkn          | ND Most     |                 |
### Table 3.4 Mouse leukocyte antigen distribution chart (continued)

| Antigen                          | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|----------------------------------|--------|--------|----------------|---------|----------|-------------|---------------|-------------|-----------------|
| CD107b (LAMP-2)                  | ND     | ND     | Unkn           | Unkn    | Most/Dev | Most/Dev    | Unkn          | ND          | Unkn            |
| CD117 (c-Kit)                    | Most/Dev | Most/Dev | Most/Dev     | Most/Dev | Most/Dev | Most/Dev    | Most/Dev      | Most/Dev    | Most/Dev        |
| CD120a (TNFR receptor type I/p55) | Most   | Most   | Most           | Most    | Most     | Most        | Most          | Unkn        | Most            |
| CD120b (TNFR receptor type II/p75) | Most  | Most   | Most           | Most    | Most     | Most        | Most          | Unkn        | Most            |
| CD121a (IL-1 receptor type I/p80) | Most   | ND     | Most/Dev       | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| CD121b (IL-1 receptor, type II/p60) | Sub   | Most   | Sub            | Unkn    | Most/Dev | Most/Dev    | Unkn          | Unkn        | Unkn            |
| CD122 (IL-2 and IL-15 receptor β chain) | Sub/Dev | Sub | Unkn           | Most    | Most/Dev | Unkn        | Unkn          | Unkn        | Unkn            |
| CD123 (IL-3 receptor α chain)    | Unkn   | Most/Dev | Unkn           | Unkn    | Most     | Most        | Most          | Unkn        | Unkn            |
| CD124 (IL-4 receptor α chain)    | Most   | Most   | Sub            | Unkn    | Most     | Most        | Most          | Most        | Most            |
| CD126 (IL-6 receptor α chain)    | Most   | Most   | Sub            | Unkn    | Most     | Most        | Most          | Most        | Most            |
| CD127 (IL-7 receptor α chain)    | Most/Dev | Most/Dev | Unkn           | Unkn    | Sub      | Unkn        | Unkn          | Unkn        | Unkn            |
| CD131 (β<sub>IL-3R/β<sub>)      | Sub    | Sub    | Unkn           | Unkn    | Sub      | Sub         | Sub           | Unkn        | Unkn            |
| CD132 (common γ chain; γ<sub>c) | Sub    | Sub    | Sub            | Sub     | Sub      | Sub         | Sub           | Unkn        | ND              |
| CD134 (OX-40 antigen)            | Most/Act | Sub/Act | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| CD135 (Flk-2/Flt3, Ly-72)        | Most/Dev | Most/Dev | Unkn           | Unkn    | Most/Dev | Most/Dev    | Most/Dev      | Most/Dev    | Unkn            |
| CD137 (4-1BB, Ly-63)             | Most/Act | Unkn    | Unkn           | Most/Act | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| CD138 (Syndecan-1)               | ND     | Most/Dev | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| CD140a (PDGF receptor α chain)   | ND     | ND     | ND             | ND      | ND       | ND          | ND            | ND          | ND              |
| CD140b (PDGF receptor β chain)   | Unkn   | Unkn   | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| CD144 (VE-cadherin)              | ND     | ND     | ND             | ND      | ND       | ND          | ND            | ND          | Most            |
| CD152 (CTLA-4)                   | Most/Act | Unkn    | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| CD153 (CD30 ligand)              | Sub/Act | ND     | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
### Table 3.4 Mouse leukocyte antigen distribution chart (continued)

| Antigen | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|---------|--------|--------|----------------|---------|-----------|-------------|--------------|-------------|-----------------|
| CD154 (CD40 ligand, gp39) | Sub/Act | ND | Unkn | Sub/Act | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD157 (BP-3 alloantigen) | Sub/Dev | Sub/Dev | Unkn | Unkn | Most/Dev | Most/Dev | Unkn | Unkn | Unkn |
| CD162 (PSGL-1) | Sub | Unkn | Unkn | Unkn | Sub | Unkn | Unkn | Unkn | Unkn |
| CD171 (L1) | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD172a (SIRPα, SHPS-1) | Unkn | Unkn | Unkn | Unkn | Sub | Unkn | Unkn | Unkn | Unkn |
| CD178 (Fas ligand, CD95 ligand) | Most/Act | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD179b (λ5) | ND | Most/Dev | ND | ND | ND | ND | ND | ND | ND |
| CD180 (RP105) | ND | Most/Dev | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD184 (CXCR4) | Most | Most/Act | Unkn | Unkn | Most | Most | Most | Unkn | Unkn |
| CD195 (CCR5) | Sub/Act | Unkn | Unkn | Most | Most/Act | Unkn | Unkn | Unkn | Unkn |
| CD200 (OX-2 antigen) | Sub | Most | Sub | ND | ND | ND | Unkn | ND | Sub |
| CD210 (IL-10 receptor) | Sub | Most | Unkn | Unkn | Sub | Unkn | Unkn | Unkn | Unkn |
| CD212 (IL-12 receptor β chain) | Sub | Sub | Sub | Most | Sub | Unkn | Unkn | Unkn | Unkn |
| CD220 (insulin receptor) | Unkn | Sub/Dev | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD223 (LAG3) | Most/Act | Unkn | Unkn | Most/Act | Unkn | Unkn | Unkn | Unkn | Unkn |
| CD229.1 (Ly-9.1) | Most | Most | Unkn | Unkn | Sub | Sub | Sub | Sub | Unkn |
| CD244.1 (2B4 BALB alloantigen) | Sub/Act | Sub | ND | Most | ND | ND | ND | ND | ND |
| CD244.2 (2B4 B6 alloantigen) | Sub/Act | ND | ND | Most | ND | ND | ND | ND | ND |
| CD247 (CD3 ζ chain) | Most | ND | ND | Sub | ND | ND | ND | ND | ND |
| 3G11 (disialoganglioside antigen) | Sub/Act/Dev | ND | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| 4-1BB ligand | ND | Sub/Act | Sub | Unkn | Sub/Act | Unkn | Unkn | Unkn | Unkn |
| ART2.2 (Rt6-2) | Most/Dev+Act | ND | Unkn | Sub | ND | ND | Unkn | Unkn | Unkn |
| Antigen                                    | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|-------------------------------------------|--------|--------|----------------|---------|-----------|-------------|--------------|-------------|------------------|
| β₂ microglobulin                          | Most/Dev | Most  | Unkn           | Unkn    | Most      | Most        | Unkn         | Unkn        | Unkn             |
| CC chemokine receptor 3 (CCR3)            | Sub    | Unkn   | Unkn           | Unkn    | Sub       | Unkn        | Unkn         | Unkn        | Unkn             |
| Crry/p65                                  | Most   | Most   | Unkn           | Unkn    | Sub/Act   | Unkn        | Most         | Unkn        | Sub              |
| Cytokeratins                              | ND     | ND     | ND             | ND      | ND        | ND          | ND           | ND          | ND               |
| Dendritic cells                           | ND     | ND     | Sub            | ND      | ND        | ND          | ND           | ND          | Unkn             |
| Early B lineage                           | ND     | Sub/Dev| Unkn           | Sub     | Sub       | ND          | Most         | Unkn        | Most             |
| Ep-CAM                                    | Sub/Dev| Sub/Act| Sub            | Unkn    | Sub       | Sub         | Unkn         | Unkn        | Unkn             |
| Flk1 (VEGF-R2, Ly-73)                     | ND     | ND     | Unkn           | ND      | Unkn      | Unkn        | Unkn         | Unkn        | Most/Dev         |
| Follicular dendritic cell                 | ND     | ND     | Sub            | ND      | ND        | ND          | ND           | ND          | ND               |
| Forssman antigen                          | ND     | ND     | Unkn           | ND      | Sub       | ND          | Unkn         | Most/Dev    | ND               |
| gp49 receptor                             | ND     | ND     | Unkn           | Most/Act| Most      | Most        | Unkn         | Unkn        | Unkn             |
| H-2D                                      | Most   | Most   | Most           | Most    | Most      | Most        | Most         | Most        | Most             |
| H-2K                                      | Most   | Most   | Most           | Most    | Most      | Most        | Most         | Most        | Most             |
| H-2L                                      | Most   | Most   | Most           | Most    | Most      | Most        | Most         | Most        | Most             |
| H2-M (H2-DM)                              | ND     | Most   | ND             | Most    | ND        | Unkn        | ND           | Unkn        | Unkn             |
| H2-M3                                     | ND     | Most   | Sub            | Unkn    | Sub       | ND          | Unkn         | Unkn        | Unkn             |
| I-A                                       | ND     | Most   | Most           | ND      | Most      | Unkn        | Unkn         | ND          | Most/Act         |
| I-E                                       | ND     | Most   | Most           | ND      | Most      | Unkn        | Unkn         | ND          | Most/Act         |
| ICOS                                      | Sub/Act| ND     | Unkn           | ND      | ND        | ND          | Unkn         | Unkn        | Unkn             |
| Integrin β₁ chain                        | Most/Dev| Most/Dev| Unkn           | Unkn    | Most      | Unkn        | Unkn         | Unkn        | Unkn             |
| Interferon-γ receptor β chain             | Sub    | Sub    | Unkn           | Unkn    | Most      | Unkn        | Unkn         | Unkn        | Unkn             |
| Interleukin-10 receptor                   | Sub    | Sub    | Unkn           | Unkn    | Most      | Most        | Unkn         | Unkn        | Unkn             |
| Ki-67                                     | Most/Act| Most/Act| Most/Act       | Most/Act| Most/Act  | Most/Act    | Most/Act     | Most/Act    | Most/Act         |

Table 3.4 Mouse leukocyte antigen distribution chart (continued)
| Antigen                       | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|------------------------------|--------|--------|----------------|---------|----------|-------------|---------------|-------------|-----------------|
| KLRG1 (MAFA)                 | Sub    | ND     | Unkn           | Sub     | Unkn     | ND          | Unkn          | Unkn        | Unkn            |
| LPAM-1 (integrin α4β7 complex) | Most/Dev | Most/Dev | Unkn           | Unkn    | Most     | Unkn        | Unkn          | Unkn        | Unkn            |
| Ly-6A/E (Sca-1)              | Sub/Dev | Sub    | Unkn           | Unkn    | Most     | Unkn        | Unkn          | Unkn        | Unkn            |
| Ly-6C                        | Sub/Act+Dev | Sub/Act | Unkn           | Sub     | Sub      | Unkn        | Unkn          | Unkn        | Unkn            |
| Ly-6D (ThB)                  | Most/Dev | Most   | Unkn           | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| Ly-6G                        | ND     | ND     | Unkn           | ND      | Most/Dev | ND          | ND            | ND          | Unkn            |
| Ly-49                        | Sub/Act | ND     | Unkn           | Sub     | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| Ly-51 (6C3/BP-1 antigen)     | ND     | Most/Dev | Unkn           | ND      | ND       | ND          | ND            | ND          | Unkn            |
| Mac-3                        | ND     | ND     | Unkn           | Unkn    | Sub/Dev  | Unkn        | Unkn          | Unkn        | Unkn            |
| MAdCAM-1                     | ND     | ND     | Unkn           | Unkn    | ND       | ND          | ND            | ND          | Sub             |
| NKCells/3A4                  | ND     | ND     | Unkn           | ND      | Most     | ND          | ND            | ND          | ND              |
| NK-1:1 (NKR-P1B and NKR-P1C) | Sub    | ND     | ND             | Most    | ND       | ND          | ND            | ND          | ND              |
| NK-T/NK cell antigen         | Sub    | ND     | Unkn           | Sub     | Unkn     | ND          | Unkn          | ND          | Unkn            |
| NKG2A/C/E                    | Sub    | ND     | Unkn           | Sub     | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| Notch 1                      | Sub/Dev | ND     | Unkn           | ND      | ND       | ND          | ND            | Unkn        | Unkn            |
| OX-40 ligand                 | ND     | Most/Act | Sub            | Unkn    | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| Panendothelial cell antigen  | ND     | ND     | Unkn           | ND      | ND       | ND          | ND            | Unkn        | Most            |
| PD-1                         | Sub/Dev+Act | Sub/Dev+Act | Unkn       | Sub/Act | Unkn     | Unkn        | Unkn          | Unkn        | Unkn            |
| PIR-A/B                      | ND     | Most   | Sub            | ND      | Most     | ND          | ND            | Unkn        | Unkn            |
| PNAd carbohydrate epitope (CD62L ligand) | ND | ND | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Sub/Act |
| Pre-B cell receptor (Pre-BCR) | ND     | Sub/Dev | Unkn           | ND      | ND       | ND          | Unkn          | ND          | Unkn            |
| Pre-T cell receptor α chain (pTα) | ND | Sub/Dev | Unkn           | ND      | ND       | ND          | Unkn          | ND          | Unkn            |
| Qa-1b                        | Most/Act | Most/Act | Unkn           | Unkn    | Most     | Unkn        | Unkn          | Unkn        | Unkn            |

Table 3.4 Mouse leukocyte antigen distribution chart (continued)
Table 3.4  Mouse leukocyte antigen distribution chart (continued)

| Antigen | T cell | B cell | Dendritic cell | NK cell | Monocyte | Granulocyte | Megakaryocyte | Erythrocyte | Endothelial cell |
|---------|--------|--------|----------------|---------|----------|-------------|---------------|-------------|------------------|
| Qa-2    | Sub/Act/Dev | Most | Unkn | Sub/Dev | Unkn | Unkn | Unkn | Unkn | Unkn |
| Siglec-F | ND | ND | Unkn | ND | Sub/Dev | Sub/Dev | Unkn | Unkn | Unkn | Unkn |
| Syndecan-4 | Sub | Most/Dev+Act | Unkn | Unkn | Sub/Act | Unkn | Unkn | Unkn | Sub/Act |
| T and B cell activation antigen (GL7, Ly-77) | Most/Act | Most/Act | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn | Unkn |
| TCR α chain | Sub | ND | ND | ND | ND | ND | ND | ND | ND |
| TCR β chain | Sub | ND | ND | ND | ND | ND | ND | ND | ND |
| TCR γ chain | Sub | ND | ND | ND | ND | ND | ND | ND | ND |
| TCR δ chain | Sub | ND | ND | ND | ND | ND | ND | ND | ND |
| TER-119/erythroid cells (Ly-76) | ND | ND | Unkn | ND | ND | ND | ND | Most | ND |
| Thymic medullary epithelium | ND | ND | ND | Most/Act | ND | ND | Unkn | ND | Unkn |
| TRAIL | ND | ND | ND | Most/Act | ND | ND | Unkn | ND | Unkn |
| TSA-1 (Sca-2, Ly-6E) | Most/Dev | Most | Unkn | Unkn | Sub | Sub | Unkn | Unkn | Unkn |

Abbreviations:
ND  Not detected
Dev  Developmental marker
Most  On most cells
Sub  On subset of cells
Act  Activation-dependent
Figure 3.1  Surface antigens of hematopoietic stem cells

Figure 3.2  Surface antigens of erythrocytes

Figure 3.3  Surface antigens of epithelial cells

Figure 3.4  Surface antigens of endothelial cells

Figure 3.5  Surface antigens of natural killer cells

Figure 3.6  Surface antigens of monocytes/macrophages
Figure 3.7  Surface antigens of T cells

Figure 3.8  Surface antigens of B cells

Figure 3.9  Surface antigens of granulocytes

Figure 3.10  Surface antigens of megakaryocytes/platelets
Figure 3.11  Surface antigens of dendritic cells
Table 3.5  Human leukocyte differentiation antigens

| CD    | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell/precuror | Macrophage/macroglobin | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|-------|------------------|--------------|-----------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|----------------|--------|------------------|-------------------------|-------------|----------|-------------|------------------|----------------|-----------|------|
| CD1a  | R4               | T            |                                               | Non-peptide antigen presenting molecules; involved in lymphocyte activation; related to thymic T cell development | 49/-     | ⊗      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | CD1a             |
| CD1b  | R1               | T            |                                               | Non-peptide antigen presenting molecules; involved in lymphocyte activation; related to thymic T cell development | 45/-     | ⊗      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | CD1b             |
| CD1c  | M241, R7         | T            |                                               | Non-peptide antigen presenting molecules; involved in lymphocyte activation; related to thymic T cell development | 43/-     | ⊗      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | CD1c             |
| CD1d  | R3               | T            |                                               | Non-peptide antigen presenting molecules; involved in lymphocyte activation; related to thymic T cell development | ⊗        | ⊗      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | CD1d             |
| CD1e  | R4               | T            |                                               | Non-peptide antigen presenting molecules; involved in lymphocyte activation; related to thymic T cell development | ⊗        | ⊗      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | CD1e             |
| CD2   | E-rosette R T11, LFA-2 | T            | Receptor for CD58, CD48, CD59 and CD15; adhesion and signal-transducing molecule | 50/-     | ⊗      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 1p13             |
| CD3   | T3               | T            | Associated with T cell receptor α/β or γδ dimer; signal transduction; assembly and expression of the T cell receptor complex | 20-26    | +      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 11q23            |
| CD4   | L3T4, W3/25      | T            | MHC Class II, gp120, IL-16; Co-receptor in antigen-induced T cell activation; thymic differentiation; regulation of T–B cell adhesion; primary receptor for HIV; binds to MHC class II. Also expressed in peripheral blood monocytes, tissue macrophages, granulocytes | 55       | +      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 12pter-p12        |
| CD5   | T1, Tp67, Leu-1  | T            | CD72, BCR, gp35-37; Co-stimulatory molecule; receptor for constitutive (CD72) and inducible (gp35-37) B cell-specific molecules | 58/67    | +      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 11q13            |
| CD6   | T12              | T            | CD166; Adhesion molecule. In thymocyte resistance to apoptosis and in positive selection; important in T mature cell response to both alloantigen and self-antigen | -/-      | +      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 11q13            |
| CD7   | gp40             | T            | Possible co-activation/adhesion modulating molecule | 40       | +      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 17q25.2-q25.3    |
| CD8α  | Leu2, T8         | T            | MHC I, Lck; Co-receptor molecule; binds to MHC class I | 68/30–34 | +      | ⊗      |               | ⊗      | ⊗    | ⊗          | ⊗              |             |           |             | 2p12             |
| CD  | Alternative name   | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Monocyte/macrophage | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD  |
|-----|--------------------|--------------|-----------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|---------|-------------------|---------------------|-------------|----------|-------------|----------------|---------------|-----------|------|
| CD8β | CD8, Leu2, Lyt3    | T            | Co-receptor molecule; binds to MHC class I    |                                                                                        |          | +      | -      | -       | -                 | -                  | -          | -        | -           | -              | -            | 2p12      | CD8β |
| CD9  | p24, DRAP-1, MR1   | Platelet     | CD63, CD81, CD82                              | Modulates cell adhesion and migration; triggers platelet activation; expressed on eosinophils and basophils | - / 24,26 | ⊕ +    | -      | +       | +                 | +                  | +          | +        | 2p13       | CD9            |
| CD10 | CALLA, NEP, gp100  | B            | Zinc metalloprotease; neutral endopeptidase; regulator of B cell growth and proliferation by hydrolysis of peptides with proliferative/anti-proliferative effects |                                                                                       | 100/-    | -      | -      | -       | -                 | +                  | +          | +        | 3q25.1-q25.2 | CD10           |
| CD11a| LFA-1a             | Adhesion structure | ICAM-1,2,3 | Intracellular adhesion and co-stimulation; binds to ICAM-1, ICAM-2, ICAM-3; expressed on eosinophils and basophils | 170/180 | +      | +      | +       | +                 | -                  | -          | 16p11.2   | CD11a       |
| CD11b| Integrin αM        | Adhesion structure | iC3b, Fibrinogen | Adherence of polymorphonuclear neutrophils and monocytes to fibrinogen, ICAM-1 endothelium, extravasation, chemotaxis, apoptosis | 165/170  | +      | +      | +       | +                 | -                  | -          | 16p11.2   | CD11b       |
| CD11c| Integrin αX, p15095a | Adhesion structure | iC3b | Adherence of polymorphonuclear neutrophils and monocytes to fibrinogen, ICAM-1 endothelium, binds iC3b-coated particles | 145/150  | +      | +      | +       | +                 | -                  | -          | 16p11.2   | CD11c       |
| CDw12| p90-120            | Myeloid      | Function unknown                              |                                                                                        | 150-160/120 | -     | +      | +       | +                 | -                  | -          | CDw12     |
| CD13 | APN, Gp150         | Myeloid      | Acts as receptor for coronavirus which causes upper respiratory tract infections; involved in interactions between human CMV and target cells; CD13 auto-Ab associated with GVHD |                                                                                       | 150/-    | -      | -      | +       | +                 | +                  | -          | +        | +           | 15q25-q26 | CD13       |
| CD14 | LPS-R              | Myeloid      | LPS Receptor for lipopolysaccharide (endotoxin) |                                                                                        | 53/55    | -      | -      | -       | +                 | +                  | 5q31.1     | CD14       |
| CD15 | X-hapten, Lewis X  | Carbohydrate | CD62 selectin                                  | May be important for direct carbohydrate–carbohydrate interactions                     | -        | -      | -      | -       | -                 | 15q25-q26 | CD15       |
| CD15s| Stialyl Lewis X    | Carbohydrate and lectin | E-selectins | Expressed on myelomonocytic leukemia, some lyphocytic leukemia cells, and on adenocarcinomas | + ⊕ +     | +      | +      | +       | +                 | CD15s           |
| CD15u| 3′ sulpho Lewis X  | Carbohydrate and lectin | P-selectins | CD15 subgroups involved with different carbohydrate to carbohydrate cell adhesion | + ⊕ +     | +      | +      | +       | +                 | CD15u          |
| CD     | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/microphage | Granulocyte | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD     |
|--------|------------------|--------------|-----------------------------------------------|------------------------------------------------------------------------------------------|----------|--------|--------|---------|-------------------|---------------------|-------------|-------------|----------------|---------------|------------|--------|
| CD15su | 6 sulphohiobyl  | Carbohydrate | L-selectins                                    | CD15 subgroups involved with different carbohydrate to carbohydrate cell adhesion        |          | +      | @      | +       | +                 | –                   | –           | –           | –               |               | 21q11.2    | CD15su |
| CD16   | FcγRIIIa         | NK           | Fc                                             | Low affinity receptor for IgG. Major histocompatibility complex                           | 50–65/65 | –      | –      | +       | +                 | +                   | +           | +           | +               | -             | CD16      |
| CD16b  | FcγRIIIB         | NK           | Fc                                             | Function unknown                                                                       |          | +      |        | +       | +                 | –                   | –           | –           | –               |               | CD16b     |
| CDw17  | None             | Myeloid      | Possible role in phagocytosis. Expressed in basophils |                                                                           | 150–160/120 | +      | +      | –       | +                 | +                   | –           | +           | +               |               | CDw17     |
| CD18   | Integrin β2      | Adhesion structure | CD11a, b, c                                 | Leukocyte adhesion                                                                    | 90/95   | +      | +      | +       | –                 | –                   | –           | –           | –               | 21q22.3     | CD18      |
| CD19   | B4               | B             | CD2, CD81, CD225                               | A critical signal transduction molecule that regulates B cell development, activation and differentiation | 90      | –      | +      | –       | –                 | –                   | –           | –           | –               | 16p11.2     | CD19      |
| CD20   | B1, Bp35         | B             | Regulation of B cell activation and proliferation by regulating transmembrane Ca2+ conductance and cell cycle progression |                                                                           | 37/35   | –      | +      | –       | –                 | –                   | –           | –           | –               | 11q12-q13.1 | CD20      |
| CD21   | CR2, EBV-R, C3dR | B             | C3d, CD23, CD19, CD81                          | Receptor for EBV and C3d, C3dg, and iC3b; subset of immature thymocytes; CD21 is part of a large signal transduction complex that also involves CD91, CD81, and Leu1 | 130–145 | –      | +      | –       | –                 | –                   | –           | –           | +               | 1q32         | CD21      |
| CD22   | BL-CAM, Lyb8     | B             | p72sky, p53/56lyn, SHP1                         | Adhesion molecule; signaling molecule; antibody treatment of leukemia and lymphoma       | 135     | –      | +      | –       | –                 | –                   | –           | –           | –               | 10p15-p14    | CD22      |
| CD23   | FcεRII, B6, BLAST-2 | B           | IgE, CD21, CD11b, CD11c                         | Low affinity IgE receptor; regulates IgE synthesis; triggers monokine release; serum soluble CD23 level is a significant prognostic marker in CLL  | 50–45   | –      | +      | –       | –                 | –                   | –           | –           | –               | 19p13.3     | CD23      |
| CD24   | BBA-1, HSA       | B             | P-selectin                                      | Function unknown; homologous to mouse heat stable antigen; P-selectin on human carcinomas is involved in carcinoma binding to platelets | 41/38   | –      | +      | –       | –                 | –                   | –           | +           | –               | 6g21         | CD24      |
| CD25   | Tac antigen, IL-2Rα | CK/CKR     | IL-2                                           | IL-2 receptor α chain; associated with CD122 and CD132                               | 55      | @      | +      | –       | –                 | –                   | –           | –           | –               | 10p15-p14    | CD25      |
| CD   | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|------|------------------|--------------|-----------------------------------------------|------------------------------------------------------------------------------------------|----------|--------|--------|--------|-------------------|-------------------|-------------|----------|------------|----------------|---------------|------------|---------|
| CD26 | DPP IV ectoenzyme | T            | CD26, TRAF5, TRAF2                             | Co-stimulatory molecule in T cell activation; associated marker of autoimmune diseases, adenosine deaminase-deficiency and HIV pathogenesis | 120      | +      | +      | –      | –                 | –                 | –          | –        | –          | –              | –            | 2q24.3     | CD26 |
| CD27 | T14, S152        | T            | CD70, TRAF5, TRAF2                             | Mediates a co-stimulatory signal for T cell activation. Involved in murine T cell development | 110–120  | +      | +      | –      | –                 | –                 | –          | –        | –          | –              | –            | 12p13      | CD27 |
| CD28 | Tp4H, T44        | T            | CD80, CD86                                     | Co-stimulates T cell proliferation and cytokine production with CD3; co-stimulates T cell effector function and T cell-dependent antibody production | 90       | +      | –      | –      | –                 | –                 | –          | –        | –          | –              | –            | 2q33       | CD28 |
| CD29 | Platelet GPIa, β-1 integrin | Adhesion structure | VCAM-1 and MAdCAM-1                             | Critical molecule for embryogenesis and development; essential to the differentiation of hematopoietic stem cells, associated with tumor progression and metastasis/invasion | 110–130  | +      | +      | +      | +                 | +                 | +          | –        | –          | –              | –            | 10p11.2    | CD29 |
| CD30 | Ber-H2, Ki-1 Non-lineage | CD153, TRAF1,2,3,5 | Member of TNFR family, involved in negative selection of T cells in thymus and TCR-mediated cell death; expressed on R-5 cells in Hodgkin's lymphomas | 120 | +      | +      | –      | –                 | –                 | –          | –        | –          | –              | –            | 1p36       | CD30 |
| CD31 | PECAM-1, endocam | Adhesion structure | CD38                                           | Adhesion receptor with signaling function that participates in an adhesion cascade; transendothelial migration cell–cell adhesion | 130–140  | +      | +      | +      | –                 | +                 | –          | –        | –          | –              | –            | 17q23      | CD31 |
| CD32 | FCyRII Non-lineage | Phosphatases | CD15, CD64                                      | Regulates B cell functions; major player in immune complex-induced tissue damage | 40       | –      | +      | –      | +                 | +                 | –          | –        | –          | –              | –            | 1q23       | CD32 |
| CD33 | P67 Myeloid Sugar chains | CD34       | Myeloid                                        | Diagnosis of acute myelogenous leukemia; negative selection for human self-regenerating hematopoietic stem cells | 67       | –      | –      | +      | +                 | +                 | –          | –        | –          | –              | –            | 19q13.3    | CD33 |
| CD34 | gp 105–120       | Adhesion structure | L-selectin                                     | Cell adhesion; CD34 also expressed on embryonic fibroblasts and nervous tissue | 105–120  | –      | –      | –      | –                 | –                 | –          | –        | –          | –              | –            | 1q32       | CD34 |
| CD35 | CR1, C3b/C4b receptor | Myeloid | CD3b, C4b, iC3, iC4                             | C3b/C4b receptor; promotes phagocytosis (immune adherence); plays a major role in removal of immune complexes; regulates complement activation | 160–250  | +      | +      | –      | –                 | +                 | –          | –        | –          | –              | –            | 1q32       | CD35 |
| CD36 | Gplllb, GpIV Platelet | Thrombospondin | Recognition and phagocytosis of apoptotic cells; involved in platelet adhesion and aggregation; cytoadherence of plasmodium falciparum-infected erythrocytes | 90       | –      | –      | +      | –                 | +                 | –          | –        | –          | –              | –            | 7q11.2     | CD36 |
| CD37 | gp52-40 B        | CD53, CD81, CD82, MHC II | Involved in signal transduction                 | 40–52/40–52 | +      | +      | –      | +                 | –                 | –          | –        | –          | –              | –            | 19p13-q13.4 | CD37 |
| CD   | Alternative name                  | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|------|----------------------------------|--------------|-----------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|---------|-------------------|---------------------|-------------|-------------|-----------------|---------------|------------|-----|
| CD38 | ADP-ribosyl cyclase, T10         | B            | CD31                                          | Regulates cell activation and proliferation; involved in lymphocyte and endothelial cell adhesion | 45/45    | +      | +      | +       | +     | -      | -       | -       | -       | 4p15       | CD38 |
| CD39 | None                             | B            | ADP/ATP                                       | May protect cells from lytic effects of extracellular ATP                                | 80/80    | ⊕      | +      | +       | +     | -      | +       | -       | +       | 10q24      | CD39 |
| CD40 | Bp50                             | B            | CD40L                                         | Involved in B cell growth, differentiation and isotype switching; potent rescue signal from apoptosis; promotes cytokine production | 85/48    | -      | +      | +       | +     | -      | −       | −       | +       | 20q12- q13.2 | CD40 |
| CD41 | GPIIb, IIIb integrin             | Platelet     | Fg, Fn, vWF                                   | CD41/CDC61 complex plays a central role in platelet activation and aggregation           | 135/120, 23 | - | - | - | - | - | - | - | - | 17q21.32 | CD41 |
| CD42a| GPIIX                            | Platelet     | vWF, thrombin                                 | Forms complex with GPIIbγ GPIIbδ, and GPV, which binds to vWF and thrombin                | 22/17-22 | - | - | - | - | - | - | - | - | 3q21       | CD42a |
| CD42b| GPIIbγ                          | Platelet     | vWF, thrombin                                 | Forms complex with GPIIX, GPIIbδ, and GPV, which binds to vWF and thrombin               | 160/145  | - | - | - | - | - | - | - | - | 17pter-p12 | CD42b |
| CD42c| GPIIbβ                          | Platelet     | vWF, thrombin                                 | Forms complex with GPIIX, GPIIbγ, and GPV, which binds to vWF and thrombin               | 160/24   | - | - | - | - | - | - | - | - | 22q11.21   | CD42c |
| CD42d| GPV                              | Platelet     | vWF, thrombin                                 | Forms complex with GPIIX, GPIIbγ, and GPV, which binds to vWF and thrombin               | 82/82    | - | - | - | - | - | - | - | - | 3          | CD42d |
| CD43 | Sialophorin, leukostatin         | Non-lineage   | Hyaluronan                                    | Anti-adhesion molecules mediates repulsion between leukocytes and other cells; under some circumstances it may act as an adhesion molecule | 95–135/ 95–135 | + | - | + | + | + | + | + | + | 16p11.2    | CD43 |
| CD44 | ECMRII, H-CAM, Pgp-1             | Adhesion structure | Hyaluronan                                    | An adhesion molecule in lymphocyte-endothelial cell interaction; a differentiation antigen during lymphopoiesis; a potential marker of malignancy and metastasis | 85/-    | + | + | + | + | + | + | + | + | 11p13      | CD44 |
| CD44R| CD44v, CD44h9                    | Adhesion structure | Hyaluronan                                    | Involved in adhesion of leukocytes and endothelial cells; leukocyte homing               | 85/200/- | ⊕ | + | + | + | + | + | + | + | 11p13      | CD44R |
| CD45 | LCA, T200                        | Non-lineage   | p56, p59, Src kinases                         | Critical requirements for TCR- and BCR-mediated activation; possible requirement for receptor-mediated activation in other leukocytes | 180-220/- | + | + | + | + | + | + | + | + | 1q31- q32   | CD45 |
### Table 3.5  Human leukocyte differentiation antigens (continued)

| CD     | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell precursor | Macrophage/microcyte | Granulocyte | Erythrocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus |
|--------|------------------|--------------|-----------------------------------------------|-----------------------------------------------------------------------------------------|----------|--------|--------|-------------|---------|-------------------|---------------------|-------------|------------|----------|-----------|----------------|----------------|-----------|
| CD45RA | Non-lineage p56, p59, Src kinases | Critical requirement for TCR- and BCR-mediated activation; expressed on resting/naive T cells; possible requirement for receptor-mediated activation in other leukocytes | 220 | + | + | + | + | + | - | - | - | 1q31-32 | CD45RA |
| CD45RB | Non-lineage p45, p59, Src kinases | Critical requirement for TCR- and BCR-mediated activation; possible requirement for receptor-mediated activation in other leukocytes | 220 | + | + | + | + | + | - | - | - | 1q31-32 | CD45RB |
| CD45RC | Non-lineage p56, p59, Src kinases | Critical requirement for TCR- and BCR-mediated activation; possible requirement for receptor-mediated activation in other leukocytes | 220 | + | + | + | + | + | - | - | - | 1q31-32 | CD45RC |
| CD45RO | UCHL-1 Non-lineage p56, p59, Src kinases | Critical requirement for TCR- and BCR-mediated activation; expressed on activated/memory T cells; possible requirement for receptor-mediated activation in other leukocytes | 180 | þ | + | + | + | + | - | - | - | 1q31-32 | CD45RO |
| CD46   | MCP Non-lineage SCR | Co-factor for factor I proteolytic cleavage of C3b and C4b | 52–58/64–68 | + | + | + | + | + | - | - | + | 1q32 | CD46 |
| CD47   | gp42, IAP, OA3 Adhesion structure SIRP | Adhesion molecule; thrombospondin receptor | 45–60/50–55 | + | + | + | + | + | + | - | - | 3q13.1–q13.2 | CD47 |
| CD47R  | MEM-133 Non-lineage CDw149 mAbs actually recognized with low affinity the CD47 glycoprotein | | 120/- | + | + | + | + | + | - | - | - | 3q13.1–q13.2 | CD47R |
| CD48   | Blast-1, Hu lym3 Non-lineage CD2; lck, lyn | Adhesion molecule; acts as an accessory molecule for γ/δ T-cell recognition; as predicted for α/β T-cell antigen recognition | 45/45 | + | + | + | + | - | - | - | 1q21.3–q22 | CD48 |
| CD49a  | VLA-1α, 2α1 integrin Adhesion structure Collagen, laminin-1 | Adhesion receptor | 200/200 | þ | - | þ | - | - | - | - | 5 | CD49a |
| CD49b  | VLA-2α, GPlα Adhesion structure Collagen, laminin | Adhesion molecule | 150/160 | þ | + | + | + | - | - | - | + | 5q23–31 | CD49b |
| CD49c  | VLA-3α, 2β5 integrin Adhesion structure laminin-5, Fn, collagen | Component of adhesion receptor; associates with TM4 of proteins; may be involved in signal transduction | 145–150/125,10 | - | - | + | - | + | - | 1q21.3 | CD49c |
| CD49d  | VLA-4α, 2α4 integrin Adhesion structure CD106, MAICAM | Cell adhesion, lymphocyte migration, tethering or rolling and homing of T cells | 145/150 | + | + | + | þ | - | - | + | 2q31–q32 | CD49d |
| CD   | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | DC/DC precursor | NK cell | Stem cell/monocyte | Granulocyte | Macrophage/endothelial cell | Epithelial cell | Gene locus  |
|------|-----------------|--------------|-----------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|-----------------|---------|-------------------|-------------|---------------------------|--------------|------------|
| CD49e| VLA-5a, 25 integrin | Adhesion structure | Fibronectin, invasin | Adhesion molecule | 160/135, 25 | +      | +      | +      | +               | +       | −                 | +           | 12p11-11q13 | CD49e       |
| CD49f| VLA-6a, 26 integrin, gp130 | Adhesion structure | Laminins, invasin | Component of adhesion receptor; CD49f/CD29-mediated T cell binding to laminin receptor provides a co-stimulatory signal to T cells for activation and proliferation | 150/125 | +      | +      | +      | +               | −       | −                 | +           | 2p14-14q33  | CD49f       |
| CD50 | ICAM-3 | Adhesion structure | LFA-1, integrin ad/b2 | Co-stimulatory molecule; regulates LFA-1/ICAM-1 and integrin-β1-dependent pathways adhesion; soluble form can be detected in the blood | 110/140/- | +      | +      | +      | +               | +       | −                 | −           | 19p13.3-3p13.2 | CD50        |
| CD51 | Integrin av, VNR-α | Platelet | Arg-Gly-Asp | Involved in cell adhesion and signal transduction; role in bone metabolism and apoptosis; possible role in infection | 150/124, 24 | +      | −      | +      | +               | −       | +                 | +           | 2q31-3q32   | CD51        |
| CD52 | CAMPATH-1, HE-5 | Non-lineage | VLA-4, HLA-DR | CD52 antibodies are remarkably lytic for target cells, both with human complement and by antibody-dependent cellular cytotoxicity | 25–29/29–29 | +      | +      | +      | +               | −       | −                 | +           | 1p16        | CD52        |
| CD53 | Non-lineage | VLA-4, HLADR | Signal transduction; CD53 cross-linking promotes activation of B cells | | 32–42/ | +      | +      | +      | +               | −       | −                 | +           | 1p31-1p32   | CD53        |
| CD54 | ICAM-1 | Adhesion structure | LFA-1, Mac-1, rhinovirus | Involved in immune reaction and/or inflammation; receptor for Rhinovirus or RBCs infected with malarial parasite; soluble form can be detected in the blood | 90/95 | +      | +      | +      | +               | −       | −                 | +           | 19p13.3-3p13.2 | CD54        |
| CD55 | DAF | Non-lineage | SCR, CD97 | Complement regulation by decay acceleration, ligand or protective molecule in fertilization; involved in signal transduction; soluble form can be detected in plasma and body fluid | 55–70/80 | +      | +      | +      | +               | +       | +                 | +           | 1q32        | CD55        |
| CD56 | Leu-19, NKH-1, NCAM | NK | NCAM, Heparin sulfate | Homophilic and heterophilic adhesion | 140 | +      | +      | +               | +       | +                 | +           | 11q23-23q24 | CD56        |
| CD57 | HNK1, Leu-7 | NK | L-selectin, P-selectin Laminin | Cell–cell adhesion | 110–115 | +      | +      | +               | +       | +                 | +           | CD57        |
| CD58 | LFA-3 | Adhesion structure | CD2 | Mediates adhesion between killer and target cells, antigen-presenting cells and T cells; activation of killer cells; co-stimulatory molecule | 55–70 | +      | +      | +      | +               | +       | +                 | +           | 1p13        | CD58        |
| CD59 | IF3Ag, H19 | Non-lineage | C8-α, C9, lck, fyn | Associates with C9, inhibiting incorporation into C5b-8 preventing the completion of MAC formation | 18–25 | +      | +      | +      | +               | +       | +                 | +           | 11p13       | CD59        |
| CD    | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|-------|------------------|--------------|-----------------------------------------------|------------------------------------------------------------------------------------------|----------|--------|--------|---------|---------------------|--------------------|-------------|----------|-------------|-----------------|----------------|-----------|-----|
| CD60a | GD3              | Carbohydrate and lectin | GD3, CD3 | Induces mitochondrial permeability transition during apoptosis; marker for malignant melanomas | +        |        |        | +       | +       | +       | +       | +       | +       | +       |                | CD60a |
| CD60b | 9-0-acetyl CD3   | Carbohydrate and lectin | 9-0-acetyl-CD3 | mAbs immunoreactive to CD60b have co-mitogenic activity of synovial T cells; also observed on some breast carcinomas and melanomas | 90–94/120 | +      |        | +       | +       | +       |         |         | +       | +       | CD60b |
| CD60c | 7-0-acetyl CD3   | Carbohydrate and lectin | 7-0-acetyl-CD3 | T cell activation receptor; T cell activation by CD60c does not require co-stimulatory signals | +        |        |        | +       | +       |         |         |         |         | +       | CD60c |
| CD61  | GP IIIa, β3 integrin | Platelet | Fibronectin | CD41/61 mediates attachment of cells to diverse matrix proteins | 90–110   | +      | +      | +       | +       | +       |         |         |         | +       | 17q21.32 | CD61 |
| CD62E | E-selectin       | Adhesion structure | (CD15s) | Mediates leukocyte rolling on activated endothelium at inflammatory sites; may support cell adhesion during hematogenous metastasis and play a role in angiogenesis | 115      | +      | +      | +       | +       | +       | +       | +       | +       | +       | 1q22-2q25 | CD62E |
| CD62L | L-selectin       | Adhesion structure | CD34, GlyCAM-1, M | Mediates lymphocyte homing to high endothelial venules or peripheral lymphoid tissue and leukocyte rolling on activated endothelium at inflammatory sites | 74       | +      | +      | +       | +       | +       | +       | +       | +       | +       | 1q21.3-q25 | CD62L |
| CD62P | P-selectin, GMP-140 | Platelet | CD162, CD24 | Interaction of CD62P and CD162 mediates tethering and rolling of leukocytes on the surface of activated endothelial cells; mediates rolling of platelets on endothelial cells | 120      | +      | +      | +       | +       | +       | +       | +       | +       | +       | 1q21.3-q25 | CD62P |
| CD63  | LIMP, MLA1, gp55 | Platelet | VLA-1, VLA-6, CD81 | CD63 gene may play a role in tumor suppression; expression of CD63 in melanoma cells reduces metastasis | 40–60    | +      | +      | +       | +       | +       | +       | +       | +       | +       | 12q12-q13 | CD63 |
| CD64  | FCRI             | Myeloid       | IgG | Receptor-mediated endocytosis of IgG-antigen complexes; antigen capture for presentation to T cells. ADCC | 72       | –      | –      | –       | –       | +       | +       | +       | +       | +       | 1q21.2-q21.3 | CD64 |
| CD65  | Ceramide, VIM-2  | Myeloid       | E-selectin | Function unknown | +        | +      | +      | +       | +       | +       | +       | +       | +       | +       | +       | CD65 |
| CD65s | Sialylated-CD65, VIM2 | Myeloid | Possibly E- or P-selectin | VIM2 antibody has been described to inhibit phagocytosis and to induce phagocyte calcium flux and oxidative burst | –        | –      | –      | +       | +       | –       | –       | –       | –       | –       | +       | CD65s |
| CD   | Alternative name | HLDA section | Ligand/substrate | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell | Macrophage/monocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD |
|------|------------------|--------------|------------------|--------------------------------------------------------------------------------------------|----------|--------|--------|---------|-----------|---------------------|-------------|----------|------------------|----------------|------------|----|
| CD66a| NCA-160, BGP     | Myeloid      | Homophilic and heterophilic adhesion; E-selectin binding; capable of activating granulocytes; functions as a receptor for Neisseria gonorrhoea | 140–180  | –      | –      | –      | +        | –         | –         | –       | +       | CD66a |
| CD66b| CD67, CGM6, NCA-95 | Myeloid    | Capable of heterophilic adhesion and transmembrane signaling; capable of activating neutrophils | 95–100   | –      | –      | –      | +        | –         | –         | –       | +       | CD66b |
| CD66c| NCA, NCA-50/90   | Myeloid      | Homophilic and heterophilic adhesion, E-selectin binding; capable of activating granulocytes; functions as a receptor for Neisseria gonorrhoea | 90       | –      | –      | –      | +        | –         | –         | –       | +       | CD66c |
| CD66d| CGM1             | Myeloid      | Capable of activating granulocytes. Functions as a receptor for Neisseria gonorrhoea | 35       | –      | –      | –      | +        | –         | –         | –       | +       | CD66d |
| CD66e| CEA              | Myeloid      | Homophilic and heterophilic adhesion | 180–200  | –      | –      | –      | –        | –         | –         | –       | +       | CD66e |
| CD66f| SP-1, PSG        | Myeloid      | Unclear, may be involved in immune regulation and regulation and protection of fetus from maternal immune system, necessary for successful pregnancy | 54–72   | –      | –      | –      | –        | –         | –         | –       | +       | CD66f |
| CD68 | gp110, macrosialin | Myeloid    | Lysosomal membrane glycoprotein (LAMP 1 group); possible receptor | 110      | +      | +      | +      | +        | +         | +         | –       | –       | CD68 |
| CD69 | AIM, EA 1, MLR3, gp34/28 | NK       | Involved in lymphocyte, monocyte, and platelet activation | 60      | 0      | 0      | 0      | 0        | 0         | 0         | 0       | 0       | CD69 |
| CD70 | Ki-24            | Non-lineage  | CD27  | Co-stimulation of T and/or B cells; enhances the proliferation of cytotoxic T cells and cytokine production. Co-stimulates B cell proliferation and Ig production | 55–170  | 0      | 0      | 0      | 0        | 0         | 0         | 0       | 0       | CD70 |
| CD71 | T9, Transferrin receptor | Non-lineage | Transferrin | Controls the supply of iron uptake during proliferation | 190     | –      | –      | –      | –        | +         | –         | –       | –       | CD71 |
| CD72 | Ly-19.2, Ly-32.2, Lyb-2 | B              | CDS   | Plays a role in downregulation of signaling through the BCR on B cells as a regulator of signaling thresholds | 43/39   | –      | +      | –      | –        | –         | –         | –       | 9p      | CD72 |
| CD73 | Ecto-5-nucleotidase | B             | AMP   | Hydrolyzes adenosine monophosphate into adenosine; can mediate co-stimulatory signals in T cell activation | 69–72   | +      | +      | –      | –        | –         | –         | +       | 6q14-21 | CD73 |
| CD74 | invariant chain  | B             | HLA-DR, CD44 | Intracellular sorting of MHC class II molecules; also known as Class II specific chaperone li | 41      | +      | +      | –      | +        | –         | +         | +       | 5q32    | CD74 |
| CD   | Alternative name | HLDA section | Ligand/ receptor/ substrate/ associated molecule | Description and function                                                                                                                                                                                                 | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell precursor | Macrophage/ monocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD |
|------|-----------------|--------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|--------|----------------|---------|-------------------|---------------------|-------------|----------|----------------|--------------|-----------|-----|
| CD75 | Sialo-masked lactosamine Carbohydrate and lectin | CD75 is newly clustered including CDw75 and CDw76, CDw76 has been deleted |                                                                 | -- | + | -- | -- | + | -- | -- | -- | + | -- | -- | -- | CD75 |
| CD75s | a2, 6 sialylated lactosamine Carbohydrate and lectin CD22 (proposed) | May be involved in regulation of CD95-mediated apoptosis and may be important for infection by a lymphotropic virus |                                                                 | + | + | -- | -- | -- | + | -- | + | + | + | + | + | CD75s |
| CD77 | Pk antigen/ BLA/ CTH/ Gb3 | Receptor for Shiga toxin Cross-linking of CD77 induces apoptosis in Burkitt's lymphoma cells |                                                                 | 1 | | + | -- | -- | -- | -- | -- | -- | -- | -- | -- | CD77 |
| CD79a | Ig γ/MB1 | Ig/CD5/ CD19/ CD22/ CD79b Transmits signals into cytoplasm upon antigen-binding to surface Ig |                                                                 | 40–45 | | -- | + | | | | | | | | | CD79a |
| CD79b | Ig B/B29, BCR | Ig/CD5/ CD19/ CD22/ CD79a B cell antigen receptor (BCR) mediates the response of B cells to foreign antigens and determines the fate of B cells during development and differentiation |                                                                 | -- | | + | -- | -- | -- | -- | -- | -- | -- | -- | -- | CD79b |
| CD80 | B7-1/BB1 | CD28/ CD152 (CTLA-4) Co-regulation of T-cell activation with CD86 |                                                                 | 60/- | | | | | | | | | | | | | CD80 |
| CD81 | TAPA-1 | Leu-13/ CD19/ CD21 Member of CD19/CD21/Leu-13 signal transduction complex. *Or ly on eosinophils, not neutrophils |                                                                 | 26/- | | + | | | | | | | | | | | | CD81 |
| CD82 | 4F9/C13/ IaA/ KAI1/ R2 | Signal transduction. *Also associates with MHC class I and II, B1 integrins, CD4 and CD8 |                                                                 | 45–90/- | | + | + | + | + | + | -- | + | + | -- | -- | CD82 |
| CD83 | HB15 | Unknown Function unknown | | | | | | | | | | | | | | CD83 |
| CD84 | None | Unknown Function unknown, some indication that it may be a signaling molecule |                                                                 | 68–80 | | + | | | | | | | | | | | | CD84 |
| CD85a | ILT1/ LIR3/ HL9 | Dendritic cell HLA class I Contains ITIM sequences in cytoplasmic tail, involved in the suppression of NK-mediated cytotoxicity |                                                                 | + | | + | | | | | | | | | | | | CD85a* |
| CD     | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                                                    | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|--------|------------------|--------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------|--------|--------|---------------|---------|------------------|------------------|-------------|------------------|----------------|-----------|----|
| CD85b*| ILT8             | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity                                                                     |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85b* |
| CD85c*| LIR8             | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity                                                                     |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85c* |
| CD85d*| ILT4/LIR2/MIR10  | Dendritic    | HLA class I                                   | Contains ITIM sequences in cytoplasmic tail; involved in the suppression of NK-mediated cytotoxicity                      | 110      | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85d* |
| CD85e*| ILT6/LIR4        | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity                                                                     |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85e* |
| CD85f*| ILT11            | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity. Mainly expressed on PBL                                               |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85f* |
| CD85g*| ILT7             | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity                                                                     |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85g* |
| CD85h*| ILT1/LIR7        | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity. Mainly expressed on myeloid cells and some NK cells               |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85h* |
| CD85i*| LIR6a            | NK           | FcRγ                                          | Involved with activation of NK-mediated cytotoxicity                                                                     |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85i* |
| CD85j*| ILT2/LIR1/MIR7   | Dendritic    | HLA class I                                   | Contains ITIM sequences in cytoplasmic tail; involved in the suppression of NK-mediated cytotoxicity                      | 110      | +      | +      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85j* |
| CD85k*| ILT3/LIR5/HM18   | Dendritic    | HLA class I                                   | Ligation of CD85K induces an inhibitory signal via recruitment of SHP-1 phosphatase                                        | 60       | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85k* |
| CD85l*| ILT9             | NK           | FcRγ                                          | Binds FcRγ                                                                                                              |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85l* |
| CD85m*| ILT10            | NK           | FcRγ                                          | Binds FcRγ                                                                                                              |          | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.4   | CD85m* |
| CD86  | B7-2/B70         | B            | CD28/CD152 (CTLA-4)                           | Co-regulator of T cell activation with CD80                                                                               | -/80     | @      | @      | +             | -       | -                | +                | -           | -                | -              | 3q21      | CD86  |
| CD87  | uPAR             | Myeloid      | uPA/Pro-UPA/vitronectin                       | CD87 serves as the cellular receptor for pro-uPA and uPA                                                                   | 35–68/32–66 | +      | +      | +             | -       | +                | -                | -           | -                | -              | 19q13     | CD87  |
| CD88  | C5aR             | Myeloid      | C5a/ C5adesArg                               | C5a-mediated inflammation, activation of granulocytes                                                                  | 43/-     | -      | -      | +             | -       | +                | -                | -           | -                | -              | 19q13.3-13.4 | CD88  |
| CD89  | IgA FC receptor  | Myeloid      | IgA1/IgA2                                    | Induces phagocytosis, degranulation, respiratory burst, and the killing of microorganisms                               | 45–100/45–100 | -      | -      | -             | +       | +                | -                | -           | -                | -              | 19q13.2-13.4 | CD89  |
| CD   | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell precursor | Macrophage/microphage | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Epithelial cell precursor | Endothelial cell precursor | Gene locus | CD   |
|------|------------------|--------------|---------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|--------------|---------|---------------------|----------------------|-------------|---------|---------------|---------------|-----------------------------|-----------------------------|------------|------|
| CD90 | Thy-1            | Endothelial cell | CD45/lyn/fyn/P100                          | May contribute to lymphocyte co-stimulation, inhibition of stem cell proliferation/differentiation and neuron memory formation | 25–35/35 | –      | –      | –            | –       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD90       |      |
| CD91 | ALPHA2M-R/LRP    | Myeloid      | ALPHA2M/LDLs                               | Endocytosis-mediating receptor expressed in coated pits. *Expressed on erythroblast/reticulocytes | 600/-    | –      | –      | –            | –       | +#                  | –            | –           | –       | –              | –              | –                          | –                          | CD91       |      |
| CD92 | None             | Myeloid      | Unknown                                    | Function unknown                                                                       | 70/70    | +      | +      | –            | –       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD92       |      |
| CDw93| None             | Myeloid      | Unknown                                    | Function unknown                                                                       | 110/120  | –      | –      | –            | –       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CDw93      |      |
| CD94 | Kp43             | NK           | HLA class I                                | Assembled with other C-type lectins (NKG2) forms inhibitory or activating receptors for HLA class I | 70, 30   | +      | –      | +            | –       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD94       |      |
| CD95 | APO-1, FAS, TNFRI | Cytokine receptor | Fas ligand                                | Receptor molecule for Fas ligand, which mediates apoptosis-inducing signals          | 45, 90, 200/45 | +      | +      | +            | +       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD95       |      |
| CD96 | TACTILE          | NK           | Unknown                                    | Adhesion of activated T and NK cells during the late phase of immune response; weakly expressed by peripheral resting NK or T cells, upregulated after activation | 160/-    | @      | –      | @           | –       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD96       |      |
| CD97 | Non-lineage      | CD55         | Member of the EGF-TM7 family; weakly expressed on resting lymphocytes, upregulated by activation | /28, 75–85                           | @      | @      | +      | @           | +       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD97       |      |
| CD98 | 4F2, FRP-1, RL-388 | Non-lineage | actin                                      | Possible amino acid transporter; broad reactivity on activated and transformed cells, not hematopoietic specific, and found at lower levels on quiescent cells | 125/80, 45 | +      | +      | +            | +       | +                   | +                  | +           | –       | –              | –              | –                          | –                          | CD98       |      |
| CD99 | MIC2, E2         | T            | Modulates T-cell adhesion; induces apoptosis of double-positive thymocytes; expressed on all hematological cells and present on many other cell types | 32/32 | +      | +      | +            | –       | +                   | +                  | +           | +       | +              | +              | +                          | +                          | CD99       |      |
| CD99R| CD99 Mab restricted | T            | Modulates T-cell adhesion; induces apoptosis of double-positive thymocytes | 32/32 | +      | –      | –            | +       | –                   | –                  | –           | –       | –              | –              | –                          | –                          | CD99R      |      |
| CD100| SEMA4D           | Non-lineage  | CD45, serine kinase                        | Co-stimulatory molecule for T-cells; increases PMCA, CD3, and CD2 induced T cell proliferation; Soluble form is 120 kD | 300/150  | +      | –      | +            | –       | +                   | –                  | –           | –       | –              | –              | –                          | –                          | CD100      |      |
| CD     | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/macocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD |
|--------|------------------|-------------|-----------------------------------------------|------------------------------------------------------------------------------------------|----------|--------|--------|---------|---------------------|---------------------|------------|---------|-----------------|----------------|-----------|------|
| CD101  | IGSF2, P126, V7  | Myeloid     |                                                | Co-stimulatory molecule; antibodies against CD101 inhibit allogenic T cell responses and co-stimulate T cell proliferation with suboptimal anti-CD3 activation | 240/120  | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 1p13      | CD101|
| CD102  | ICAM-2           | Adhesion structure | LFA-1, CD11b/CD18                             | Provides co-stimulatory signal in immune response, lymphocyte recirculation; expressed on some resting lymphocytes | 55–65    | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 17q23–q25 | CD102|
| CD103  | HML-1, integrin 2E | Adhesion structure | E-cadherin, integrin β7                        | Expressed on intestinal intraepithelial lymphocytes, lamina propria T cells in intestine; stimulation of PBL with PHA induce CD103 expression | 175/150/25 | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 17p13     | CD103|
| CD104  | β4 integrin chain, TSP-180 | Adhesion structure | Laminins (II, IV, V), CD49F                   | Hemidesmosomal CD49F/CD104 (α6β4 integrin) plays an important role in the adhesion of epithelia to basement membranes.*CD4-CD8-pre-T cells | 205/220  | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 17q11–qter | CD104|
| CD105  | Endoglin         | Endothelial cell | TGF-β 1, TGF-β 3                              | Regulatory component of the TGF β receptor complex, modulator of cellular responses to TGF-β 1 | 180/90   | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 9q33–q34.1 | CD105|
| CD106  | VCAM-1, INCAM-110 | Endothelial cell | Integrin α4β1                                 | Leukocyte adhesion, transmigration and co-stimulation of T cell proliferation; expressed on activated endothelial cells, follicular dendritic cells, and certain tissue macrophages** | 110/130  | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 1p32–p31  | CD106|
| CD107a | LAMP-1           | Platelet     |                                              | Possible role in cell adhesion; highly metastatic tumor cells express more LAMP molecules on the cell surface than poorly metastatic cells; expressed on lysosomal membrane | 100–120  | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 13q34     | CD107a|
| CD107b | LAMP-2           | Platelet     |                                              | Possible role in cell adhesion; highly metastatic tumor cells express more LAMP molecules on the cell surface than poorly metastatic cells; expressed on lysosomal membrane | 100–120  | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | Xq24      | CD107b|
| CD108  | SEMA7A, JMH      | Non-lineage  | CD232                                        | Function unknown; carries JMH blood group antigen; expressed at low levels on circulating lymphocytes, at moderately high levels by cells and lymphoblastic cell lines | 76/80    | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 15q22.3–q23| CD108|
| CD109  | 8A3, 7D1, E123   | Endothelial cell |                                              | Function unknown                                                                                       | 170/170  | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 1p13      | CD109|
| CD110  | TPO-R, MPL, C-MPL | Platelet     | TPO                                         | Receptor for TPO. Receptor binding results in the prevention of apoptosis, stimulation of cell growth and differentiation of megakaryocyte and platelet formation | 82–92    | ⊕      | ⊕      | ⊕       | ⊕                   | ⊕                   | ⊕          | ⊕       | ⊕               | ⊕            | 1p13      | CD110|
Table 3.5  Human leukocyte differentiation antigens (continued)

| CD   | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | DC cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD   |
|------|------------------|--------------|-----------------------------------------------|---------------------------------------------------------------------------------------|----------|--------|--------|---------|---------|---------------------|---------------------|-------------|-------------|---------------|---------------|-----------|------|
| CD111 | HveC, PRR1, PVRL1,nectin1 | Myeloid | gD, nectin3, afadin | Intercellular adhesion molecule; involved in epithelial cell physiology; pan-alphaherpes virus entry receptor | 75       | –      | –      | +       | +       | –       | –       | –       | –       | +       | 11q23-q24 | CD111 |
| CD112 | HveB, PRR2, PVRL2,nectin2 | Myeloid | PRR3, afadin | Homophilic adhesion receptor that could play a role in the regulation of hematopoietic/endothelial cell functions; involved in cell to cell spreading of viruses | 72, 68, 72, 64 | –      | +      | +      | +       | –       | –       | +       | –       | +       | 19q13.2-13.4 | CD112 |
| CD114 | CSF1R, G-CSFR, HG-CSFR | Myeloid | G-CSF, Jak1, Jak2 | Regulates myeloid proliferation and differentiation | 130      | –      | –      | –       | +       | +       | –       | –       | –       | –       | 1p35-p34.3 | CD114 |
| CD115 | c-fms, CSF-1R, M-CSFR | Myeloid | CSF-1 | Receptor for CSF-1 (macrophage colony stimulating factor); mediates all of the biological effects of this cytokine | 150      | –      | –      | –       | +       | –       | –       | –       | –       | –       | 5q33.2-33.3 | CD115 |
| CD116 | GM-CSFRα | CD / CKR | GM-CSF | Primary binding subunit of GM-CSF with low affinity and binds it with high affinity when it is coexpressed with the common beta subunit CDw131 | 80       | –      | –      | –       | +       | –       | –       | +       | –       | –       | Xp22.32 or Yp11.3 | CD116 |
| CD117 | c-KIT SCRF | CK / CKR | SCF, MGF, KL | Growth factor receptor, tyrosine kinase | 145      | –      | –      | –       | –       | –       | –       | –       | –       | –       | 4q11-q12 | CD117 |
| CDw119 | iFN-γR, IFNγRa | CK / CKR | IFNγ | Interferon γ binding | 80–95    | +      | +      | +       | +       | –       | +       | –       | –       | –       | 6q23-q24 | CDw119 |
| CD120a | TNFRI, p55 | CK / CKR | TNF, TRADD, TRAF, RIP, LTa | Programmed cell death anti-viral activity; receptor for TNF | 55       | +      | +      | +       | +       | –       | +       | –       | +       | 12p13.2 | CD120a |
| CD120b | TNFRII, p75, TNFRII p80 | CK / CKR | TNF, TRADD, TRAF, RIP, LTa | Programmed cell death anti-viral activity; receptor for TNF | 75       | +      | +      | +       | +       | –       | +       | –       | +       | 1p36.1-36.2 | CD120b |
| CD121a | IL-1R type 1 | CK / CKR | H-1α and H-1β | IL-1 signaling | 75–85, 75–85 | +      | –      | –       | –       | –       | –       | –       | –       | –       | 2q12 | CD121a |
| CD121b | IL-1R type 2 | CK / CKR | IL-1β, IL-1Rα, IL-1β | Negative regulator of IL-1 | 60–68, 60–68 | +      | +      | –       | –       | –       | –       | –       | –       | –       | 2q12-q22 | CD121b |
| CD    | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD       |
|-------|------------------|--------------|-----------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|---------|-------------------|-------------------|-------------|----------|------------|---------------|-------------|------------|----------|
| CD122 | IL-2Rβ           | CK/CKR       | IL-2, IL-15, CD25, CD132                      | Critical component of IL-2 and IL-15-mediated signaling                                  | 70–75/   | +      | +      | +       | +                 | +                 | +          | +        | +          | +             | +          | 22q13.1    | CD122    |
| CD123 | IL-3Rα subunit   | CK/CKR       | IL-3                                           | Primary low affinity binding subunit of IL-3 receptor                                   | 70       | −      | −      | +       | +                 | +                 | +          | +        | +          | +             | +          | Xp22.3 or Yp11.3 | CD123    |
| CD124 | IL-4R            | CK/CKR       | IL-4, IL-13                                    | Receptor subunit for IL-4 and IL-13; expression on B cells is upregulated by LPs, anti-IgM or IL-4; expression on T cells is increased by stimulation with ConA or IL-4 | 140/   | @#    | @#    | −       | +                 | +                 | −          | −        | −          | −             | −          | 16p11.2-12.1 | CD124    |
| CD125 | IL-5Rα           | CK/CKR       | IL-5                                           | Low affinity receptor for IL-5; alpha chain of IL-5 receptor, expressed on eosinophils and basophils | 60/    | −      | @     | −       | −                 | −                 | −          | +        | −          | −             | −          | 3p26-p24   | CD125    |
| CD126 | IL-6R            | CK/CKR       | IL-6                                           | Required, in association with gpl30(CD130), for mediating biological activities of interleukin-6; expressed on hepatocytes and some non-hematopoietic cells | 80/80  | +     | @     | −       | −                 | −                 | −          | −        | −          | −             | −          | 1q21       | CD126    |
| CD127 | IL-7Rα           | CK/CKR       | IL-7, CD132, lyn, Fyn, Jak1                    | Specific receptor for IL-7; expression downregulated following T cell activation         | 65–90/  | +      | +      | −       | −                 | −                 | −          | −        | −          | −             | −          | 3p13       | CD127    |
| CD128a| IL-8RA, CXCR1     | CK/CKR       | IL-8                                           | Critical regulation of IL-8 mediated neutrophil chemotaxis and activation; potential role in angiogenesis | 44–59/  | −      | −      | +       | +                 | +                 | −          | +        | +          | +             | 2q35       | CD128a     |
| CD128b| IL-8RB, CXCR2     | CK/CKR       | IL-8                                           | Critical regulators of IL-8 mediated neutrophil chemotaxis and activation; potential role in angiogenesis | 44–59/  | −      | −      | +       | +                 | +                 | −          | +        | +          | +             | 2q35       | CD128b     |
| CD130 | gpl30            | CK/CKR       | Oncostatin M                                   | Required for transducing biological activities of IL-6, IL-11, ILIP, ciliary neutrophil factor, oncostatin M, and cardiotrophin-1 | 130–140/130–140| +      | +      | +      | +                 | +                 | +          | +        | +          | +             | 5q11       | CD130      |
| CD131 | Common beta subunit | CK/CKR   | CD123, CD125, CD116                             | Key signal transducing molecule of the IL-3, GM-CSF, and IL-5 receptors; expressed on early B cells and early progenitors | 120–140/ | −      | −      | −      | +                 | +                 | +          | −        | +          | +             | 22q13.1    | CD131      |
| CD132 | IL-2Rγ           | CK/CKR       | IL-12                                          | Common subunit of IL-2, IL-4, IL-7, IL-9, IL-15 receptors; mutation causes X-linked severe combined immunodeficiency (XSCID) | 65–70/  | +      | +      | +      | +                 | +                 | +          | +        | +          | +             | Xq13.1     | CD132      |
| CD  | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                                                                                                                                                 | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus CD |
|-----|------------------|--------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------|--------|----------------|--------|------------------|-------------------|-------------|----------|-----------------|----------------|-------------|
| CD133 | AC133            | Stem Cell   | N/A                                            | Used for positive selection of hematopoietic stem and progenitor cells for transplantation studies                                                                                                                          | 120     | −      | −      | −              | +      | −                | −                 | −           | −        | −               | −              | 4p16.2      |
| CD134 | OX40             | CK/CKR      | OX40 ligand                                    | Receptor for OX40 ligand, co-stimulatory signal transducer of T cell receptor-mediated activation, cell adhesion                                                                                                         | 48−50/− | −      | −      | −              | +      | −                | −                 | −           | −        | −               | −              | 1p36        |
| CD135 | Flt3, FLK2, STK1 | CK/CKR      | FL                                             | Receptor tyrosine kinase; co-stimulatory molecule; survival receptor, growth factor receptor for early hematopoietic progenitors                                                                                         | 130/155−160 | −      | −      | −              | +      | −                | −                 | −           | −        | −               | −              | 13q12       |
| CDw136 | MSP-R, RON     | CK/CKR      | MSP, HGFI                                       | Chemotactic migration, morphological change, cell growth, cytokine induction, phagocytosis, and cell differentiation                                                                                                    | 180/150,40 | +      | −      | +              | +      | +                | +                 | +           | +        | −               | −              | 13p12.3     |
| CDw137 | 4-1BB, IIA     | CK/CKR      | 4-1BB ligand                                   | Receptor for 4-1BB ligand, co-stimulatory molecule                                                                                                                                                                       | 85/39   | −      | +      | −              | −      | −                | +                 | +           | +        | −               | −              | 1p36        |
| CD138 | Syndecan1       | B           |                                                | Extracellular matrix receptor; co-receptor for fibroblast growth factor signaling receptors; "expressed on plasma cells"                                                                                                 | + −#   | −      | −      | −              | −      | −                | −                 | −           | −        | −               | +              | 2p24.1      |
| CD139 | None            | B           |                                                | Function unknown                                                                                                                                                                                                     | 209/228 | −      | +      | −              | +      | +                | +                 | +           | +        | +               | +              | CD139       |
| CD140a | PDGF a receptor | Endothelial cell | PDGF                                          | Involved in signal transduction associated with PDGF receptors; expressed on mesenchymal cells                                                                                                                        | 160/180/− | −      | −      | −              | −      | −                | +                 | +           | −        | +               | −              | 4p11−q13   |
| CD140b | PDGF B receptor | Endothelial cell | PDGF                                          | Involved in signal transduction associated with PDGF receptors; expressed on mesenchymal cells                                                                                                                        | 160/180/− | −      | −      | −              | +      | −                | −                 | +           | −        | +               | −              | 5q31−q32   |
| D141 | Thrombomodulin  | Endothelial cell | Thrombin, protein C                           | Critical for activation of protein C and initiation of the protein C anticoagulant pathway; co-factor in the thrombin-mediated activation of protein C                                                                    | 75/105  | −      | −      | +              | +      | +                | +                 | +           | −        | +               | −              | 20p12−cen  |
| CD142 | Tissue factor   | Endothelial cell | Factor VIIa, factor Xa/TFPI                    | Initiator of the blood clotting cascade; cell surface receptor/ cofactor for factor VII; can be induced by inflammatory mediators                                                                                        | 45−47/45−47 | −      | −      | −              | −      | −                | +                 | +           | −        | −               | +              | 1p22−p21   |
Table 3.5  Human leukocyte differentiation antigens (continued)

| CD   | Alternative name | HLDA section | Ligand/ receptor/ substrate/ associated molecule | Description and function | MW (kDa) | T cell | B cell | Dendritic cell | Stem cell/precursor | Macrophage/monocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD |
|------|------------------|--------------|-----------------------------------------------|--------------------------|----------|--------|--------|---------------|-------------------|-------------------|------------|----------|----------------|----------------|-----------|-----|
| CD143| ACE              | Endothelial cell | ANG-1, bradykinin | Angiotensin-converting enzyme, peptidyl dipeptidase, is necessary for spermatozoa to bind to eggs | 90, 170/90, 170 | +      | –      | –               | –                 | –                 | –         | –        | –             | –              | 17q2      | CD143 |
| CD144| VE-cadherin, cadherin-5 | Endothelial cell | β-catenin, p120 CAS | Controls endothelial permeability, growth, migration, and contact inhibition of cell growth; expressed only on endothelial cells | 135/130 | –      | –      | –               | –                 | –                 | –         | –        | +             | +              | CD144     |
| CDw145| None             | Endothelial cell | Highly expressed on endothelial cells; antibodies were originally raised against human urinary bladder carcinoma cells | | 25, 90, 110 | –      | –      | –               | –                 | –                 | –         | –        | –             | +              | CDw145    |
| CD146| Muc 18 S-endo    | Endothelial cell | Potential adhesion molecule; expressed by melanoma, smooth muscle, and intermediate trophoblasts | | 118/130 | ⊕      | –      | –               | –                 | –                 | –         | –        | –             | +              | 11q23.3   | CD146 |
| CD147| Neurothelin, OX-47 | Endothelial cell | Potential adhesion molecule; involved in regulation of T cell function | | 50-60/ 55-95 | +      | +      | +               | +                 | +                 | +         | –        | –             | +              | 19p13.3   | CD147 |
| CD148| HPTPn, p260DEP-1 | Non-lineage | HPTP-etc/Dep-1 involved in contact inhibition of cell growth; chromosomal location region frequently detailed in carcinoma | | 200-260/ 200-260 | +      | +      | +               | +                 | +                 | +         | +        | –             | +              | 11p11.2   | CD148 |
| CD150| SLAM-1, IPO-3    | Non-lineage | Tyrosine phosphatase CD45 | An important molecule associated with intracellular adaptor protein SAP. Absence of SAP causes X-linked lymphoproliferative disease | 65-85/ 75-95 | +      | +      | –               | –                 | –                 | –         | –        | +             | +              | 1q22-q23  | CD150 |
| CD151| PETA-3           | Platelet | β1 integrins | Integrin-associated protein; transmembrane signaling | 32/- | –      | –      | –               | +                 | –                 | +         | –        | +             | +              | 11p15.5   | CD151 |
| CD152| CTLA-4           | T | Receptor for CD80/CD86, negative regulator of T cell activation | | 50/33 | ⊕      | ⊕      | –               | –                 | –                 | –         | –        | –             | 2q13           | CD152     |
| CD153| CD30L            | T | CD30 | Co-stimulatory signal for peripheral blood T cells | 40 | +      | –      | –               | ⊕                 | ⊕                 | –         | –        | –             | +              | 9q13      | CD153 |
| CD154| CD40L, gp39, TRAP-1, T-BAH | T | Ligand for CD40 | Essential for germinal center formation and antibody class switching; co-stimulatory molecule; regulator of TH1 generation and function | 33 | ⊕      | –      | –               | –                 | –                 | –         | –        | –             | Xq26           | CD154     |
| CD155| PVR              | Myeloid | Polio virus receptor | Possible interaction with CD44 | 60–90 | –      | +      | –               | –                 | –                 | 19q13.2   | –        | –             | 19q13.2       | CD155     |
| CD156a| CD156, ADAM8, MS2 | Myeloid | Myeloid | Possible involvement in extravasation of leukocytes | -/69 | +      | +      | –               | –                 | –                 | –         | –        | +             | +              | 10q26.3   | CD156a |
| CD     | Alternative name | HLDA section | Ligand/ receptor/ substrate/ associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | DC cell | NK cell | Stem cell precursor | Macrophage/ monocyte | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD  |
|--------|------------------|--------------|-------------------------------------------------|------------------------------------------------------------------------------------------|----------|--------|--------|---------|---------|------------------|-------------------|-------------|----------|------------|-------------|--------------|------------|--------|------|
| CD156b | TACE, ADAM17     | Adhesion structure | Pro-INF1, pro-TGFβ, MAD2 | Cleavers the transmembrane form of TNF-α to yield the soluble active form | 100–120  | +      | –      | –       | –       | +                | –                | +           | –         | –          | –           | –            | 2p25    | CD156b |
| CD157  | Mo5, BST-1       | Myeloid      |                                                  | A sister molecule of CD38, a type II membrane protein with identical ectoenzyme activity; a distribution complementary to that of CD38 | 42–45    | +      | +      | +       | +       | +                | –                | +           | –         | –          | –           | CD157      |
| CD158a | KIR2DL1, p58.1   | NK           | HLA-Cw4, 2,5,6 | Contains ITIM sequences in cytoplasmic tail, involved in the suppression of NK-mediated cytotoxicity | 58/58    | +      | +      |          |         |                  |                  |             |           |            | CD158a      |
| CD158b | KIR2DL2, p58.2   | NK           | HLA-11, 7, 8 | Contains ITIM sequences in cytoplasmic tail, involved in the suppression of NK-mediated cytotoxicity | 58/58    | +      | +      |          |         |                  |                  |             |           |            | CD158b      |
| CD158c | KIR2DL3, p58.3   | NK           | HLA-Cw3, 1, 7, 8 | Contains ITIM sequences in cytoplasmic tail, involved in the suppression of NK-mediated cytotoxicity | 58/58    | +      | +      |          |         |                  |                  |             |           |            | CD158c      |
| CD158d | KIR2DL4          | NK           | Function unknown |                                                  |          |        |        |          |         |                  |                  |             |           |            | CD158d      |
| CD158e | KIR3DL1/S1, p70  | NK           | HLA-Bw4 | Involved in the suppression of NK-mediated cytotoxicity (KIR3DL1); expressed on subsets of NK and cytotoxic cells | 70/70    | +      | +      |          |         |                  |                  |             |           |            | CD158e      |
| CD158f | KIR2DL5          | NK           | Function unknown |                                                  |          |        |        |          |         |                  |                  |             |           |            | CD158f      |
| CD158g | KIR2DS5          | NK           | Associated with KARAP/DAP12, involved in the activation of NK-mediated cytotoxicity | +      | +      |         |          |         |                  |                  |             |           |            | CD158g      |
| CD158h | KIR2DS1, p50.1   | NK           | HLA-C | Associated with KARAP/DAP12, involved in the activation of NK-mediated cytotoxicity | +      | +      |         |          |         |                  |                  |             |           |            | CD158h      |
| CD158i | KIR2DS4, p50.3   | NK           | HLA-C | Associated with KARAP/DAP12, involved in the activation of NK-mediated cytotoxicity | 50/50    | +      | +      |          |         |                  |                  |             |           |            | CD158i      |
| CD158j | KIR2DS2, p50.2   | NK           | HLA-C | Associated with KARAP/DAP12, involved in the activation of NK-mediated cytotoxicity | +      | +      |         |          |         |                  |                  |             |           |            | CD158j      |
| CD158k | KIR3DL2, p40     | NK           | HLA-A | Contains ITIM sequences in cytoplasmic tail, involved in the suppression of NK-mediated cytotoxicity | 140/70   | +      | +      |          |         |                  |                  |             |           |            | CD158k      |

**Table 3.5** Human leukocyte differentiation antigens (continued)
| CD    | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell precursor | Macrophage/macrocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD |
|-------|------------------|--------------|---------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|-----------------|---------|-------------------|----------------------|-------------|----------|------------------|------------------|-----------|-----|
| CD158α | KIR3DL7, KIR3C1 | NK           | Contains ITIM sequences in cytoplasmic tail; involved in the suppression of NK-mediated cytotoxicity |                                                                                     | 9q13.4   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD159a | NKG2A            | NK           | HLA-E                                       | CD94/CD159a heterodimer constitutes a potent negative regulator of NK- T and cell activation programs; expressed on subsets of NK and CD8+ (γδ) cells                      | 12p13-1p13.1 |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD160  | BY55, NK1, NK28  | T            | MHC class I                                  | Cross-linking CD160 with certain mAbs triggers co-stimulatory signals in CD8 T cells. CD160 is also expressed on all intestinal intraepithelial lymphocytes                 | 1p12.3   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD161  | NKR-P1A          | NK           | NK cell cytolytic activity; regulation of thymocyte precursor proliferation |                                                                                     | 1q12.3   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD162  | PSGL-1           | Adhesion structure | P-selectin                                 | Binds P- and L-selectins; can mediate leukocyte rolling                                | 1q42.3   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD162R | PEN5             | NK           | L-selectin                                   | Post-translational modification of the P-selectin glycoprotein ligand-1 (CD162); developmentally regulated marker of both immune and neural cells                      | 240/140  |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD163  | M130, GHI/61, RM1/1 | Myeloid     | Expressed on tissue macrophages and LPS activated monocytes |                                                                                     | 5q33.2   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD164  | MGC-24, MUC-24   | Adhesion structure | Facilitating the adhesion of human CD34+ cells to stroma and by negatively regulating CD34+CD38−progenitor cell proliferation |                                                                                     | 6p21.3   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD165  | Ad2, gp37        | Adhesion structure | Adhesion of thymocytes to thymic epithelial cells, expressed on many T cell acute lymphoblastic leukemia (ALL) |                                                                                     | 5q33.2   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD166  | ALCAM, KG-CAM    | Adhesion structure | Binds CD6                                    | Adhesion receptor                                                                    | 5q33.2   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD167a | DDR1             | Adhesion structure | Collagen                                    | Adhesion molecule, DDR1 overexpression in several human cancers suggests a function in tumor progression | 5q33.2   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |
| CD168  | RHAMM            | Adhesion structure | CD44                                        | Involved in adhesion of early thymocyte progenitors to matrix and its interaction with HA can mediate signals to other cell adhesion molecules | 5q33.2   |        |        |                 |         |                   |                      |             |          |                   |                   |           |     |

**Table 3.5** Human leukocyte differentiation antigens (continued)
| CD     | Alternative name       | HLEA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell/precursor | Macrophage/monocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD |
|--------|------------------------|--------------|---------------------------------------------|-----------------------------------------------------------------------------------------|----------|--------|--------|--------|---------------------|---------------------|-------------|----------|------------------|-----------------|-----------|----|
| CD169  | Sialoadhesion/Siglec-1  | Adhesion     | MUC1, CD206                                 | Mediates cell–cell, cell matrix interaction; may facilitate phagocytosis              | 180/200  | ±      | ±      | ±      | ±                   | ±                   | ±           | ±        | ±                | ±               | ±         | ±  |
| CD170  | Siglec-5               | Adhesion     | Terminal steric acid residues                | Adhesion molecule, as a pattern or self/non-self recognition receptor and mediates negative signals into the cell | 140      | ±      | ±      | ±      | ±                   | ±                   | ±           | ±        | ±                | ±               | ±         | ±  |
| CD171  | N-CAM, L1              | Adhesion     | CD56, CD24                                  | Neuronal cell recognition molecule L1 involved in cell adhesion, cell spreading and motility. Also acts as a co-stimulatory molecule on lymphocytes | 200-230  | +      | +      | +      | +                   | ±                   | ±           | ±        | ±                | ±               | ±         | ±  |
| CD172  | SIRP-1a                | Adhesion     | CD47                                        | Adhesion molecule, binds to CD47 and may mediate inhibitory signals via the FcεR1/SHP-2 | 65       | ±      | +      | +      | +                   | −                  | −           | ±        | ±                | ±               | 20p13     | ±  |
| CD173  | Blood group H type 2   | Carbohydrate and lectin | Biosynthetic precursor of A and B antigen, carcinoma-associated antigen; may be involved in the homing process of hematopoietic stem cells to the bone marrow | −        | +      | ±      | ±      | ±                   | −                  | −           | ±        | ±                | ±               | CD173     | ±  |
| CD174  | Lewis Y                | Carbohydrate and lectin | New hematopoietic progenitor cell marker; may be involved in the homing process of hematopoietic stem cells to the bone marrow | −        | +      | ±      | ±      | ±                   | −                  | −           | ±        | ±                | ±               | CD174     | ±  |
| CD175  | Tn                     | Carbohydrate and lectin | TFRA                                         | Tumor-specific antigen expressed on various carcinomas; histo-blood group-related carbohydrate antigen; precursor of the blood groups ABO and TF antigen | −        | −      | −      | −      | +                   | ±                  | ±           | ±        | ±                | ±               | CD175     | ±  |
| CD175s | Sialyl-Tn (s-Tn)       | Carbohydrate and lectin | TFRA                                         | Tumor-specific antigen expressed on various carcinomas; histo-blood group-related carbohydrate antigen; precursor of the blood groups ABO and TF antigen | −        | +      | −      | −      | +                   | ±                  | ±           | ±        | ±                | ±               | CD175s    | ±  |
| CD176  | TF antigen             | Carbohydrate and lectin | TFRA                                         | Pan-carcinoma antigen tumor antigen marker; may be involved in metastasis of tumor cells | 120–198  | −      | +      | ±      | ±                   | ±                  | ±           | ±        | ±                | ±               | CD176     | ±  |
| CD177  | NB1, HNA-2a            | Myeloid       | NB antigens play a critical role in autoimmune neonatal neutropenia and autoimmune neutropenia; polymorphic; expressed in 89–97% of healthy individuals | 49–55/56–64 | −      | ±      | ±      | ±      | ±                   | ±                  | ±           | +        | ±                | ±               | CD177     | ±  |
| CD    | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD   |
|-------|------------------|--------------|-----------------------------------------------|-----------------------------------------------------------------------------------------|----------|--------|--------|---------|-------------------|-------------------|-------------|---------|-------------|----------------|---------------|-----------|------|
| CD178 | Fas ligand       | CKR          | CD95(Fas)                                     | Involved in Fas/Fas ligand interaction, apoptosis, regulates immune responses, *Expressed on immature dendritic cells | 27–40    | +      | +      | −       | −                 | −                 | +          | +       | −           | −             | +            | 1q23      | CD178 |
| CD179a| VpreB            | B            | CD179b, μ heavy chain                         | Surrogate light chain VpreB is one of the components of the pre-B-cell receptor complex. *Expressed in cytoplasm of pro-B cells and on the surface of pre-B cells | 16–18    | −      | +      | −       | +                 | +                 | −          | +       | −           | +             | +            | 22q11.22  | CD179a|
| CD179b| λ5, 14.1         | B            | CD179a, μ heavy chain                         | λ5 is one of the components of the pre-B-cell receptor complex. *Expressed in cytoplasm of pro-B cells and on the surface of pre-B cells | −/22     |        | +      |         |                   |                   |            |         | +          | −             | +            | 22q11.23  | CD179b|
| CD180 | RP105/Bgp95      | B            | LPS, MD-1                                     | May regulate the LPS signaling in B cells in concert with TLR4, ligation of CD180 induces proliferation of B cells and increases susceptibility to BCR-induced cell death | 95–105   | +      | +      | +       | +                 | +                 | −          |          | −           | +             | +            | 5q12      | CD180 |
| CD183 | CXCR3            | CK/CR        | IP-10, Mig, I-TAC                             | Involved with inflammation-associated effector T-cell chemotaxis                           | 40–41    | +      | +      | +       | −                 | +                 | −          | −       | −           | −             | +            | 8p12-11.2, Xq13 | CD183 |
| CD184 | CXCR4            | CK/CR        | HIV-1                                         | Homing receptor of hematopoietic progenitor cells; co-stimulation of B cells; induces apoptosis; involved with the entry of HIV-1 | +        | +      | +      | +       | +                 | +                 | −          | −       | −           | +             | +            | 2q21      | CD184 |
| CD195 | CCR5             | CK/CR        | HIV-1                                         | Regulates lymphocyte chemotaxis activation and transendothelial migration during inflammation. Neutralizes HIV infection. *Expressed on immature dendritic cells | 17.0/40.6| +     | −      | +      | −                 | +                 | −          | −       | −           | −             | −            | CD195     |       |
| CDw197 | CCR7, EBI1, BLR2 | CK/CR        | SLC/6Ckin, ELC/MIP-3b                         | Lymphocytes and dendritic cell homing to lymphoid organs                                  | 90       | +      | +      | +       | +                 | +                 | −          | −       | −           | −             | +            | 9p13      | CDw197|
| CD200 | OX2              | Non-lineage  | OX2R                                          | Ig-SF, OX2 shares many biochemical similarities with Thy-1, may regulate myeloid cell activity | 40–45    | +      | −      | −       | −                 | −                 | −          | −       | −           | −             | +            | CD200     |       |
| CD201 | EPCR             | Endothelial cells | Protein C                                    | Involved in protein C activation                                                        | 49/25    |        |        | +       |                   |                   | −          | +       | −           | +             | +            | 20q11.2   | CD201 |
| CD202b| TEK/Tie2         | Endothelial cells | Angiopoietin-1,2, and 4                      | Involved in vascular development                                                        | 140      |        |        | +       |                   |                   |            |         | +           | −             | +            | 9p21      | CD202b|
| CD    | Alternative name | HLDA section | Ligand/ receptor/ substrate/ associated molecule | Description and function                                                                                                                                                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell/precursor | Macrophage/monocyte | Granulocyte | Platelet | Endothelial cell | Epithelial cell | Gene locus | CD   |
|-------|-----------------|--------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|--------|---------|-------------------|--------------------|-------------|---------|-----------------|-----------------|-----------|------|
| CD203c | PDPN3, B10, PDIβ, E-NPP3 | Myeloid | Oligonucleotides | Multi-functional ectonucleosome involved in the clearance of extracellular nucleotides. Expressed on basophils, mast cells, and their precursors. | 270/130, 150 | + - | + - | + - | + - | 6q22 | CD203c |
| CD204  | MSR             | Myeloid | LDL | Role in deposition of cholesterol through receptor mediated uptake of LDL, recognition and elimination of pathogenic microorganisms. | 220 | + - | + - | + - | + - | CD204 |
| CD205  | DEC-205         | Dendritic cell | Unknown | Antigen-uptake receptor for mannosylated antigens; present on both CD11c+ blood dendritic cells and in lesser density on surface of T and B cells. | 198 | + | + | + | + | CD205 |
| CD206  | MMR             | Dendritic cell | Sialodineins and CD45 | Mediates endocytosis of glycoconjugates with terminal mannose, fucose N-acetylglycosamine or glucose residues. | 162–175 | + | + | + | 10p13 | CD206 |
| CD207  | Langerin        | Dendritic cell | | Found on a subset of cultured blood CD11c+ DC and TGF beta differentiated MoDC. Provides new reagent for characterizing Langerhans histiocytosis. Endocytic receptor with functional lectin domain with mannose specificity. | + | + | + | 2p13 | CD207 |
| CD208  | DG-LAMP         | Dendritic cell | | Function unknown. Possible participation in peptide loading onto MHC class II. | + | + | CD208 |
| CD209  | DC-SIGN         | Dendritic cell | | Expressed on MoDC but not on blood DC even after activation, contributes to the initial adhesion interaction between MoDC and naive T cells, regulation of T cell proliferation. | 44 | + | - | - | 19p13 | CDw209 |
| CD210  | CK              | CK/CKR | IL-10 | Receptors involved with cell signaling and immune regulation. | 90 | - | + | - | 11q23.3, 21q21.11 | CDw210 |
| CD212  | CK              | CK/CKR | IL-12 | Tyrosine kinase membrane receptor for angiopoietin; involved in cell signaling and immune regulation. | -/-110 | + | - | + | - | 19p13.1 | CD212 |
| CD213a | CK              | CK/CKR | IL-13 | Receptors involved in cell signaling and immune regulation. CD211a1, CD211a2 | - | - | + | - | - | CD213a |
| CDw217 | CK              | CK/CKR | IL-17 | Involved in inflammation, osteogenesis, and granulopoiesis. | + | + | + | + | 2p13 | CDw217 |
| CD220  | Insulin R       | Non-lineage | Insulin | Functions in the clearance of ligands rather than intracellular signaling. | + | + | - | + | - | 19p13.3 | CD220 |
| CD       | Alternative name | HLDA section | Ligand/ receptor/ substrate/ associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | DC cell | NK cell | Stem cell precursor | Macrophage/monocyte | Granulocyte | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|----------|------------------|--------------|-----------------------------------------------|----------------------------------------------------------------------------------------|----------|--------|--------|--------|--------|-------------------|-----------------|-------------|------------|---------------|----------------|-----------|-----|
| CD221    | IGF1 R           | Non-lineage  | Insulin                                        | Functions in the clearance of ligands rather than intracellular signaling             |          | +      | +      | +      | +      | +                 |                 |             |            |               |               |          |     |
| CD222    | M6P/IGFII-R      | Non-lineage  | Plasminogen, M6P and IGFII                     | Plays role in the transport of newly synthesized acid hydrolases to lysosomes         | 250      | +      | +      | +      | +      | +                 |                 |             |            |               |               |          |     |
| CD223    | LAG-3            | Non-lineage  | MHC class II                                   | Cell activation Gene-3, like CD4, interacts with MHC class II molecules               | 70       | @      | –      | –      | @      | –                 |                 |             |            |               |               | 12p13    |     |
| CD224    | GGT              | Non-lineage  | GSH                                            | G-glutamyl transferase; ectoenzyme, maintains intracellular glutathione (GHS) concentrations and consequently a state of oxidative homeostasis within cellular microenvironments | 27–68    | +      | +      | –      | +      | –                 |                 |             |            |               |               |          |     |
| CD225    | Leu 13           | Non-lineage  | IFN-γ                                          | Interferon-inducible protein may play role in controlling cell–cell interactions     | 17       | +      | +      | +      | –      | –                 |                 |             |            |               |               |          |     |
| CD226    | DNAM-1, PTA1     | T            | LFA-1                                          | Adhesion molecule, cytolytic function mediated by CTL and NK cells; platelet and T cell activation antigen 1 | 65       | +      | +      | +      | +      | –                 |                 |             |            |               |               | 18q22.3  |     |
| CD227    | MUC1             | Non-lineage  | CD54, CD169                                    | Involved in cell surface protection and modulation of adhesion and cell migration      | 300      | @      | +      | +      | @      | –                 |                 |             |            |               |               |          |     |
| CD228    | p97, gp95, MT    | Non-lineage  | GPI-anchored melanoma-associated protein        | In activated T cells, the SAP protein binds to and regulates signal transduction events initiated through the engagement of SLAM, 2B4, CD84, and Ly-9                                           | 97       | –      | –      | –      | –      | –                 |                 |             |            |               |               |          |     |
| CD229    | Ly9              | Non-lineage  | SAP protein                                    | In activated T cells, the SAP protein binds to and regulates signal transduction events initiated through the engagement of SLAM, 2B4, CD84, and Ly-9                                           | 100      | +      | +      | +      | –      | –                 |                 |             |            |               |               | 1q22     |     |
| CD230    | Prion Protein (PrP) | Non-lineage  | Isform PrPc (pathological) is present in transmissible spongiform encephalitis (TSE)          |                                                                              | 33–37    | +      | +      | +      | +      | +                 |                 |             |            |               |               |          |     |
| CD231    | TALLA-1/ A15, TALLA | Non-lineage  | Highly expressed on T cell acute lymphoblastic leukemia; can be potentially useful as an anti-tumor agent |                                                                              | 30–45    | +      | +      | +      | +      | +                 |                 |             |            |               |               |          |     |
| CD232    | VESP-R           | Non-lineage  | CD108                                          | Receptor for CD108 and semaphorin from virus; A39R (protein of semaphorin family) upregulates ICAM-1 and induces cytokine production | 200      | +      | +      | +      | +      | +                 |                 |             |            |               |               |          |     |
| CD233    | Band 3/AE1       | RBC          | Carrier of the Diego blood group system; maintains red cell morphology; Band 3 is essential for terminal erythroid differentiation |                                                                              | 95–105   | –      | –      | –      | –      | –                 |                 |             |            |               |               |          |     |
| CD    | Alternative name                  | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function                                                                 | MW (kDa) | T cell | B cell | NK cell | Stem cell precursor | Monocyte/macrophage-associated molecule | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|-------|----------------------------------|--------------|-----------------------------------------------|-----------------------------------------------------------------------------------------|----------|--------|--------|---------|------------------|---------------------------------------|-------------|----------|-------------|---------------|---------------|------------|-----|
| CD234 | DAR/C/Fy-glycoprotein            | RBC          | IL-8, MGSA RANTES, MCP-1                      | Carrier of the Duffy blood group system; binds to a number of chemokines to modulate the intensity of inflammatory reactions | 34–43   | –      | –      | –       | –                | –                                     | –           | +        | –            | –             | –             | 1q22-23    | CD234 |
| CD235a| Glycoporphin A                   | RBC          |                                               | Major membrane sialoglycoprotein of RBC membrane and carrier of blood group M and N specificites |         | –      | –      | –       | –                | –                                     | –           | –        | +           | +             | –             | 4q28-q31   | CD235a |
| CD235ab| Glycoporphin A and B             | RBC          |                                               | Glycoporphin B is the carrier of blood group S, s, and N specificities (for Glycoporphin A see CD235a) |         | –      | –      | –       | –                | –                                     | –           | –        | +           | +             | –             | 4q28-q31   | CD235ab |
| CD236 | Glycoporphin C and D             | RBC          | One of the chored protein of red blood cell skeleton that maintains cell morphology; carrier of Gerbich blood group | | 30–40   | +      | +      | +       | +                | +                                     | +           | +        | –            | +             | 2q14-q21     | 7q33       | CD236 |
| CD236R| Glycoporphin C, GYPC             | RBC          |                                               | Plays a role in the invasion and intra-erythrocytic development of P. falciparum | 40      | +      | +      | +       | +                | +                                     | +           | +        | –            | –             | 2q14-q21     | 7q33       | CD236R |
| CD238 | Kell                            | RBC          | Endothelin-3                                   | Kell is classified as a member of the small nephrilysin (M13) family of zinc metalloproteases, which include CD10. Kell antibodies inhibit erythropoiesis | 93      | +      | +      | +       | +                | +                                     | –           | –        | –            | –             | 19q12-q13   | 7q33       | CD238 |
| CD239 | Lu/B-CAM                        | RBC          | Laminin                                       | Carrier of the Lutheran blood group; receptor for laminin; plays role in terminal erythrocyte differentiation, facilitates trafficking of more mature RBC | 78–85   | +      | +      | +       | +                | +                                     | +           | +        | +            | +             | 19q13.2      | 19q13.2    | CD239 |
| CD240 |                                 | RBC          |                                               | CD240 includes CD240CE (RhCE), CD240D (RhD), and CD240DCE (RhD/RhCE). Rh system is one of the most polymorphic in the blood group system comprising 45 different antigens; Rh antigen may promote export of ammonium | 30      | +      | +      | +       | +                | +                                     | +           | +        | –            | –             | 1p34.3-p36.1 | 6p11-p21.1 | CD240 |
| CD241 | RhAG/Rh50                       | RBC          |                                               | Promotes export of ammonium that accumulates within erythrocytes, promotes erythrocyte-mediated retention of ammonium from the plasma and its release to detoxifying organs | 50      | –      | –      | –       | –                | –                                     | +           | –        | –            | –             | 6p11-p21.1   | 19p13.3    | CD241 |
| CD242 | ICAM-4/LW                       | RBC          | LEA-1, Mac-1, VLA-4                           | Carrier of LW blood group system; involved in red cell senescence; interaction with VLA-4 may stabilize erythroblastic islands in normal BM | 37–43   | –      | –      | –       | +                | –                                     | –           | +        | +            | +             | 19p13.3      | CD242     |
| CD243 | MDR-1                           | Stem/ progenitor cells | p-glycoprotein, drug resistance pump | | 180     | –      | –      | –       | –                | –                                     | –           | –        | –            | –             | –             | –          | CD243 |
### Table 3.5 Human leukocyte differentiation antigens (continued)

| CD    | Alternative name | HLDA section | Ligand/receptor/substrate/associated molecule | Description and function | MW (kDa) | T cell | B cell | Dendritic cell | NK cell | Stem cell/precursor | Macrophage/monocyte | Granulocyte | Platelet | Erythrocyte | Endothelial cell | Epithelial cell | Gene locus | CD |
|-------|------------------|--------------|-----------------------------------------------|--------------------------|----------|--------|-------|----------------|---------|---------------------|---------------------|-------------|----------|------------|--------------|---------------|-----------|---------|
| CD244 | 2B4, P18, NAIL   | NK           | CD48                                          | Engagement of 2B4 with its ligand, CD48, or with specific antibodies enhances NK cell cytokine production and cytolytic function. *Found only on basophils | 70/70    | +      | +     | +              | +       | +/#                | +                   | +           | +        | +          | +            | +            | 1q22      | CD244  |
| CD245 | p220/240         | T            | Lymphocyte receptor                           | Signal transduction and co-stimulation of T and NK cells; function is distinct from CD45 or CD148 | 220-250  | +      | +     | +              | +       | +                   | +                   | +           | +        | +          | +            | +            | CD245    |
| CD246 | ALK              | T            | Tyrosine kinase R                             | Expressed in T cell lymphoma subtype; suggested role in cellular proliferation, apoptosis and embryonic neural differentiation | 200      | +      |       |                | +       |                     | +                   | +           | +        | +          | 2p23     | 2p23     | CD246    |
| CD247 | Zeta chain       | T            |                                               | Essential signal sub-unit of activating receptor on T and NK cells | +        | +      |       |                | +       |                     | 2p23     | +           | +        | +          | CD247    |

**Key:**
- + Positive
- ± Positive upon activation
- + Positive by cytoplasm staining
- − Negative
- +/# Refer to ‘Description and function’ column for further details

* A CD nomenclature of detailing LIR/ILT genes (CD85) as well as KIR genes (CD158) has been proposed based on the previous

† CD designation of some members of this family and on the position of the genes on chromosomes 19q13.4 from centromeric to telomeric loci

**Abbreviations:**
- MW Molecular weight is shown as non-reduced/reduced where available
- CK/CKR Cytokine/chemokine receptors
Table 3.6  Human leukocyte differentiation antigens

| CD no. | Session | Main antigen expression                                                                 | Family          |
|--------|---------|--------------------------------------------------------------------------------------------|-----------------|
| CD1a   | T       | Cortical mature thymocytes, dendritic cell subset, Langerhans cells                         | IgSF            |
| CD1b   | T       | Cortical mature thymocytes, dendritic cell subset, Langerhans cells                         |                 |
| CD1c   | T       | Cortical mature thymocytes, dendritic cell subset, Langerhans cells, B cell subset         |                 |
| CD1d   | T       | Cortical thymocytes, dendritic cell subset, Langerhans cells, intestinal epithelium       |                 |
| CD1e   | T       | Cortical thymocytes, dendritic cell subset                                                 |                 |
| CD2    | T       | Thymocytes, T cells, most NK cells, B cells                                               | IgSF            |
| CD2R   | T       | Activated T cells, NK cells                                                               |                 |
| CD3d   | T       | T cells                                                                                    | T cell receptor complex |
| CD3e   | T       | T cells                                                                                    |                 |
| CD3g   | T       | T cells                                                                                    |                 |
| CD3z   | N       | T cells, NK cells, macrophages                                                             | ND              |
| CD4    | T       | Helper/inducer T cells, monocyte subset, thymocyte subset, macrophages                    | IgSF            |
| CD5    | T       | Mature T cells, thymocytes, B cell subset                                                  | SRCR            |
| CD6    | T       | Mature T cells, B cell subset, medullary thymocytes                                        | SRCR            |
| CD7    | T       | Mature T cells, NK cells, immature myeloid cell subset                                     | IgSF            |
| CD8a   | T       | Cytotoxic/suppressor T cells, NK cell subset, thymocytes                                   | T cell coreceptor |
| CD8b   | T       | Cytotoxic/suppressor T cells, NK cell subset, thymocytes                                   |                 |
| CD9    | P       | Platelets, activated T cells, eosinophils, basophils, endothelial cells, pre-B cells       | TM4SF           |
| CD10   | B       | Pre-B cell subset, B cell subset, cortical thymocyte subset, granulocytes, monocyte subset| Zinc metalloprotease |
| CD11a  | Ad      | Most of lymphoid and myeloid cells                                                        | Integrin a chain|
| CD11b  | Ad      | Myeloid cells and NK cells                                                                | Integrin a chain|
| CD11c  | Ad      | Myeloid cells, NK cells macrophages, activated T cells                                    | Integrin a chain|
| CD11d  | Ad      | Leucocytes                                                                               | Integrin a chain|
| CDw12  | M       | Monocytes, granulocytes, platelets, NK cells                                              | --              |
| CD13   | M       | Monocytes, neutrophils                                                                    | --              |
| CD14   | M       | Monocytes, macrophages, Langerhans cells                                                  | LRG             |
| CD15   | Ad      | Neutrophils, eosinophils, monocytes, Reed Sternberg cells                                 | Carbohydrate 2   |
| CD15s  | Ad      | Neutrophils, basophils, monocytes                                                         | Sialylated carbohydrate 2 |
| CD no. | Session | Main antigen expression                                                                 | Family  |
|--------|---------|----------------------------------------------------------------------------------------|---------|
| CD15u  | Ca      |                                                                                        |         |
| CD16a  | N       | NK cells, macrophages, mast cells, monocytes                                           | IgSF    |
| CD16b  | N       | Granulocytes neutrophil only                                                            | IgSF    |
| CDw17  | M       | Neutrophils, basophils, monocytes, platelets, B cell subset                            | LacCer  |
| CD18   | Ad      | Leucocytes                                                                              | Integrin|
| CD19   | B       | Precursor B cells and B cells, follicular dendritic cells                               | IgSF    |
| CD20   | B       | Precursor B cell subset, B cells                                                        | CD20 family |
| CD21   | B       | Mature B cells, follicular dendritic cells, thymocyte subset                            | RCA     |
| CD22   | B       | Precursor and mature B cells                                                           | IgSF    |
| CD23   | B       | B cells, monocytes, follicular dendritic cells                                          | C-type lectin |
| CD24   | B       | B cells, granulocytes                                                                   | CD52/CD24/HSA |
| CD25   | Ck      | Activated T and B cells, stimulated monocytes/macrophages                              | –       |
| CD26   | X       | Mature thymocytes, activated T cells, B cells, macrophages, NK cells                    | Serine-type exopeptidase |
| CD27   | T       | Mature T cells, B cell subset, NK cells                                                | TNF receptor family |
| CD28   | T       | Mature thymocytes subset, T cells, plasma cells                                         | IgSF    |
| CD29   | Ad      | Broad                                                                                   | Integrin|
| CD30   | X       | Activated T and B cells, activated NK cells, monocytes, Reed Sternberg cells            | TNF receptor family |
| CD31   | Ad      | Platelets, endothelial cells, monocytes, NK cells, neutrophils, T cell subset           | IgSF    |
| CD32   | M       | Broad except NK cells                                                                   | Fc receptor |
| CD33   | M       | Pan myeloid, majority of monocytic cells                                               | Sialoadhesin family, IgSF |
| CD34   | M       | Hematopoietic precursor cells, endothelial cells                                        | Sialomucin|
| CD35   | M       | Neutrophils, eosinophils, monocytes, follicular dendritic cells, B cells, erythrocytes, T cell subset RCA |
| CD36   | P       | Platelets, monocytes, macrophages, early erythroid cells, endothelial cells             | –       |
| CD37   | B       | B cells, weak on T cells, monocytes, granulocytes                                       | Tetraspan|
| CD38   | B       | Plasma cells, majority of hemopoietic cells                                            | ADP-ribosyl cyclase |
| CD39   | B       | Mantle zone B cells, activated T cells, NK cells, dendritic cells, Langerhans cells, monocytes | Ecto-apyrase |
| CD40   | B       | B cells, macrophages, follicular dendritic cells, endothelial cells, platelets         | TNF/NGF receptor |
| CD41   | P       | Platelets and platelet precursors                                                      | Integrin |
| CD42a  | P       | Platelets, megakaryocytes                                                             | LGR     |
### Table 3.6  Human leukocyte differentiation antigens (continued)

| CD no. | Session | Main antigen expression | Family |
|--------|---------|--------------------------|--------|
| CD42b  | P       | Platelets, megakaryocytes | LGR    |
| CD42c  | P       | Platelets, megakaryocytes | LGR    |
| CD42d  | P       | Platelets, megakaryocytes | LGR    |
| CD43   | X       | Broad, except resting B cells | Sialomucin |
| CD44 and CD44S | Ad | Most cell types | Hyaladherin |
| CD44R  | Ad      | Epithelial cells, monocyctic cells | – |
| CD45   | X       | All hematopoietic cells | PTPase |
| CD45RA | X       | Naive resting T cells, medullary thymocytes | |
| CD45RB | X       |                          |        |
| CD45RC |         |                          |        |
| CD45RO | X       | Memory-activated T cells, cortical thymocytes | |
| CD46   | X       | Broad                    | RCA    |
| CD47   | Ad      | Broad                    | IgSF   |
| CD47R  | X       | Broad                    |        |
| CD48   | X       | Pan leukocyte            | IgSF   |
| CD49a  | Ad      | Activated T cells, monocytes, NK cells, endothelial cells | Integrin |
| CD49b  | Ad      | Platelets, megakaryocytes, NK cells, endothelial cells | Integrin |
| CD49c  | Ad      | Non-hematopoietic cells  | Integrin |
| CD49d  | Ad      | Broad                    | Integrin |
| CD49e  | Ad      | Broad                    | Integrin |
| CD49f  | Ad      | Broad (except erythrocytes) | Integrin |
| CD50   | Ad      | Leukocytes, endothelial cells, epidermal Langerhans cells | IgSF |
| CD51   | P       | Platelets, endothelial cells, activated T cells, B cell subset | Integrin |
| CD52   | X       | Thymocytes, lymphocytes, monocytes, macrophages | CD52/CD24/HSA |
| CD53   | X       | Pan leukocyte            | TM4SF  |
| CD54   | Ad      | Activated endothelial cells, activated T and B cells, monocytes | IgSF |
| CD55   | X       | Broad                    | RCA    |
| CD56   | N       | NK cells, T cell subset  | IgSF   |
| CD57   | N       | NK cell subset, T cell subset | – |
| CD58   | Ad      | Broad                    | IgSF   |
| CD no. | Session | Main antigen expression                                      | Family                      |
|-------|---------|-------------------------------------------------------------|-----------------------------|
| CD59  | X       | Broad                                                      | Ly6                         |
| CD60a | Ca      | T cell subset, platelets                                    | Glycolipid                  |
| CD60b | Ca      |                                                            | Glycolipid                  |
| CD60c | Ca      |                                                            | Glycolipid                  |
| CD61  | P       | Platelets, megakaryocytes                                   | Integrin                    |
| CD62E | Ad      | Endothelial cells                                           | Selectin                    |
| CD62L | Ad      | T and B cells, monocytes, granulocytes, some NK cells       | Selectin                    |
| CD62P | Ad      | Platelets, megakaryocytes, activated endothelial cells      | Selectin                    |
| CD63  | P       | Activated platelets, monocytes, degranulated neutrophils, endothelium | Tetraspan, TM4SF |
| CD64  | M       | Monocytes, macrophages, dendritic cell subset               | IgSF                        |
| CD65  | M       | Granulocytes (monocytes)                                    | poly-N-acetyllactosamine    |
| CD65s | M       | Granulocytes, monocytes                                      | poly-N-acetyllactosamine    |
| CD66a | M       | Granulocytes and epithelial cells                            | IgSF, CEA                   |
| CD66b | M       | Granulocytes                                                | IgSF, CEA                   |
| CD66c | M       | Granulocytes and epithelial cells                            | IgSF, CEA                   |
| CD66d | M       | Granulocytes                                                | IgSF, CEA                   |
| CD66e | M       | Epithelial cells                                            | IgSF, CEA                   |
| CD66f | M       | Myeloid cell lines, fetal liver, placental syncytiotrophoblasts | IgSF, CEA                   |
| CD67  | cancelled: now CD66b                                        |                             |
| CD68  | M       | Monocytes, macrophages, dendritic cells, neutrophils, myeloid progenitor cells | Sialomucin                  |
| CD69  | N       | Activated T and B cells, thymocytes, NK cells, neutrophils, eosinophils | C-type lectin               |
| CD70  | X       | Activated B and T cells                                     | TNF                         |
| CD71  | X       | Proliferating cells, reticulocytes, erythroid precursors    | Transferrin receptor        |
| CD72  | B       | Pan B, including progenitors                                | C-type lectin               |
| CD73  | B       | B and T cell subsets, follicular dendritic cells, epithelial cells, endothelial cells | GPI-anchored               |
| CD74  | B       | B cells, activated T cells, macrophages, activated epithelial and endothelial cells | --                         |
| CD75  | Ca      | Mature B cells, T cell subset                               | Lactosamine                 |
| CD75s | Ca      | Mature B cells, T cell subset                               | Sialylated lactosamine      |
| CDw76 | cancelled: now CD75s                                       |                             |
| CD no. | Session | Main antigen expression                                                                 | Family             |
|--------|---------|-----------------------------------------------------------------------------------------|--------------------|
| CD77   | B       | Burkitt’s lymphoma cells, germinal center B lymphocytes                                  | Carbohydrate       |
| CD78   |         | **cancelled**                                                                           |                    |
| CD79a  | B       | B cells                                                                                 | IgSF               |
| CD79b  | B       | B cells                                                                                 | IgSF               |
| CD80   | B       | Activated B and T cells, macrophages                                                    | IgSF               |
| CD81   | B       | Broad hemopoietic, endothelial and epithelial cells                                      | Tetraspan          |
| CD82   | B       | Broad                                                                                   | Tetraspan          |
| CD83   | B       | Circulating and interdigitating reticular dendritic cells, Langerhans cells              | IgSF, Siglec       |
| CD84   | B       | Mature B cells, monocytes, macrophages, platelets, thymocytes and T cell subset         | –                  |
| CD85a  | D       | Monocytes, macrophages, granulocytes, dendritic cells, T cell subset                     | IgSF               |
| CD85b  | D       | Monocytes, macrophages, dendritic cells                                                  | IgSF               |
| CD85c  | D       |                                                                                         | IgSF               |
| CD85d  | D       | Monocytes, macrophages, dendritic cells                                                  | IgSF               |
| CD85e  | D       | Monocytes                                                                               | IgSF               |
| CD85f  | D       |                                                                                         | IgSF               |
| CD85g  | D       | Monocytes                                                                               | IgSF               |
| CD85h  | D       | Monocytes, dendritic cell subset, macrophages, granulocytes, NK subset                   | IgSF               |
| CD85i  | D       | Monocytes                                                                               | IgSF               |
| CD85j  | D       | Monocytes, macrophages, dendritic cells, NK subset, T cell subset, B cells               | IgSF               |
| CD85k  | D       | Monocytes, macrophages, dendritic cells                                                 | IgSF               |
| CD85l  | D       |                                                                                         | IgSF               |
| CD85m  | D       |                                                                                         |                    |
| CD86   | B       | Memory B cells, monocytes, dendritic cells, endothelial cells and activated T cells      | IgSF               |
| CD87   | M       | T cells, NK cells, monocytes and neutrophils as well as non-hemopoietic cells            | GPI-anchored       |
| CD88   | M       | Granulocytes, monocytes, dendritic cells                                                 | Rhodopsin          |
| CD89   | M       | Myeloid cells                                                                            | IgSF, Fc receptor, MIRR |
| CD90   | En      | Hemopoietic stem cells, neurons                                                         | IgSF, GPI linked   |
| CD91   | M       | Monocytes, macrophages, neurons, fibroblasts                                             | LDL receptor       |
| CD92   | M       | Monocytes, granulocytes                                                                  | –                  |
| CD no. | Session | Main antigen expression | Family |
|--------|---------|-------------------------|--------|
| CDw93 | M       | Monocytes, granulocytes, endothelial cells |        |
| CD94  | N       | NK cells, g/d and a/b T cell subsets | C-type lectin |
| CD95  | Ck      | Broad including activated T and B cells | TNF/NGF receptor |
| CD96  | N       | Activated T and NK cells | IgSF |
| CD97  | X       | Activated T and B cells, monocytes, granulocytes | EGF-TM7 |
| CD98  | X       | Broad on activated cells |        |
| CD99  | T       | Broad, including lymphocytes |        |
| CD99R | T       | Restricted hematopoietic expression |        |
| CD100 | X       | Broad | Semaphorin |
| CD101 | M       | Granulocytes, monocytes, dendritic cells, activated T cells | IgSF |
| CD102 | Ad      | Resting lymphocytes, monocytes, platelets, vascular endothelial cells | IgSF |
| CD103 | Ad      | Mucosa associated T lymphocytes | Integrin |
| CD104 | Ad      | Epithelial cells, keratinocytes, Schwann cells, monocytes, endothelial cells | Integrin |
| CD105 | En      | Activated monocytes, endothelial cells, stromal cells, pre-B cells | TGF receptor |
| CD106 | En      | Follicular dendritic cells, activated endothelium | IgSF |
| CD107a| P       | Degranulated platelets, activated neutrophils, activated T cells |        |
| CD107b| P       | Degranulated platelets, activated neutrophils |        |
| CD108 | X       | Erythrocytes, circulating lymphocytes |        |
| CD109 | Ca      | Activated T cells and platelets, endothelial cells |        |
| CD110 | P       | Hematopoietic stem and progenitor cells, megakaryocytes, platelets | IgSF |
| CD111 | M       | CD34+ hematopoietic progenitors, epithelial and neuronal cells | IgSF |
| CD112 | M       | CD34+ hematopoietic progenitors, epithelial and endothelial cells | IgSF |
| CD113 | NA (reserved) | | |
| CD114 | M       | Granulocytes, monocytes, mature platelets, endothelial cells | Class I CK-R |
| CD115 | M       | Monocytes, macrophages and their precursors, placenta | IgSF, tyrosine kinase R |
| CD116 | Ck      | Macrophages, neutrophils, eosinophils, dendritic cells and their precursors | IgSF, class I CK-R |
| CD117 | Ck      | Hematopoietic progenitor cells, tissue mast cells | IgSF, tyrosine kinase R |
| CD118 | NA (reserved) | | |
| CDw119| Ck      | Broad | IgSF, class II CK-R |
| CD120a| Ck      | Broad | TNF receptor |
| CD120b| Ck      | Broad | TNF receptor |
| CD no.   | Session | Main antigen expression                                                                 | Family                       |
|---------|---------|-----------------------------------------------------------------------------------------|------------------------------|
| CD121a  | Ck      | Broad                                                                                   | IgSF                         |
| CDw121b | Ck      | B cells, myeloid cells, some T cells                                                    | IgSF                         |
| CD122   | Ck      | NK cells, T cells and B cells, monocytes/macrophages                                      | IgSF, CK-R                   |
| CD123   | Ck      | Myeloid cells including early progenitors endothelial cells                               | IgSF, class I CK-R           |
| CD124   | Ck      | Broad                                                                                   | IgSF, CK-R                   |
| CDw125  | Ck      | Eosinophils, activated B cells, basophils                                                | IgSF, CK-R                   |
| CD126   | Ck      | T cells, monocytes, activated B cells                                                    | IgSF, class I CK-R           |
| CD127   | Ck      | T cells, B cell precursors                                                              | IgSF, CK-R                   |
| CDw128a | Ck      | Neutrophils, T cell subset, monocytes, endothelial cells, fibroblasts, platelets         | Chemokine receptor           |
| CDw128b | Ck      | Neutrophils, T cell subset, monocytes, melanocytes                                       | Chemokine receptor           |
| CD129   | NA (res) |                                                                                         |                              |
| CD130   | Ck      | Broad                                                                                   | Class I CK-R                 |
| CDw131  | Ck      | Myeloid cells, early B cells                                                            | Class I CK-R                 |
| CD132   | Ck      | T and B cells, NK cells, monocytes/macrophages, neutrophils                              | Class I CK-R                 |
| CD133   | S       | CD34+ hematopoietic progenitors, neural and endothelial stem cells                       | 5-TM                         |
| CD134   | Ck      | Activated T cells                                                                       | TNF/NGF receptor             |
| CD135   | Ck      | Early and lymphoid committed progenitors                                                 | Tyrosine kinase receptor     |
| CDw136  | Ck      | Broad                                                                                   | Tyrosine kinase receptor     |
| CDw137  | Ck      | T cells                                                                                 | TNF receptor                 |
| CD138   | Ad      | Pre-B cells, plasma cells                                                                | Syndecan                     |
| CD139   | B       | B cells, monocytes, granulocytes, follicular dendritic cells                             |                              |
| CD140a  | En      | Fibroblasts, smooth muscle cells, platelets                                             | Split-tyrosine kinase        |
| CD140b  | En      | Fibroblasts, smooth muscle cells, monocytes, neutrophils, endothelial cells             | Split-tyrosine kinase        |
| CD141   | En      | Endothelial cells, monocytes, neutrophils, megakaryocytes, platelets                     | C-type lectin                |
| CD142   | En      | Epithelial cells, stromal cells, keratinocytes                                          | Serine protease cofactor     |
| CD143   | En      | Endothelial and epithelial cells, activated macrophages                                  | Peptidylpeptidase            |
| CD144   | En      | Endothelial cells                                                                       | Cadherin                     |
| CDw145  | En      | Endothelial cells, some stromal cells                                                   |                              |
| CD146   | En      | Endothelial cells, smooth muscle cells, activated T cells, melanoma cells                | IgSF                         |
Table 3.6 Human leukocyte differentiation antigens (continued)

| CD no. | Session | Main antigen expression | Family |
|--------|---------|--------------------------|--------|
| CD147  | En      | Leukocytes, red blood cells, platelets and endothelial cells | IgSF   |
| CD148  | X       | Granulocytes, monocytes, resting T cells, dendritic cells, platelets, fibroblasts | RPTPase type III, phosphatase |
| CD149  | cancelled: now CD47R |
| CD150  | X       | Thymocytes, B cells, T cell subset, dendritic cells, endothelial cells | IgSF   |
| CD151  | P       | Platelets, megakaryocytes, endothelial and epithelial cells | Tetraspan |
| CD152  | T       | Activated T and B cells | IgSF   |
| CD153  | T       | Activated T cells, activated macrophages, neutrophils, B cells | TNF    |
| CD154  | T       | Activated CD4⁺ T cells | TNF    |
| CD155  | M       | Monocytes, broad tissue distribution | IgSF   |
| CD156a | M       | Monocytes, neutrophils | ADAM   |
| CD156b | M       | Broad                     | ADAM   |
| CD157  | M       | Granulocytes, monocytes, bone marrow stromal cells | ADP-ribosyl cyclase |
| CD158a | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158b1| N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158b2| N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158c | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158d | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158e1| N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158e2| N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158f | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158g | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158h | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158i | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158j | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158k | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD158z | N       | NK cell subset, minor subset of T cells | IgSF   |
| CD159a | N       | NK cell subset, T cells, thymocytes | C-type lectin |
| CD160  | N       | NK cells, cytotoxic T cells | IgSF   |
| CD161  | N       | NK cells, T cells | C-type lectin |
| CD162  | Ad      | Monocytes, granulocytes, T cells, some B cells | Sialomucin |
| CD162R | N       | NK cell subset |       |
| CD no. | Session | Main antigen expression                                                                 | Family          |
|--------|---------|-----------------------------------------------------------------------------------------|-----------------|
| CD163  | M       | Monocytes, macrophages                                                                   | Scavenger receptor |
| CD164  | Ad      | Monocytes, B cells (weak expression), CD34⁺ progenitor cells, bone marrow stromal cells, epithelial cells | Sialomucin     |
| CD165  | Ad      | Lymphocyte subset, monocytes, platelets, thymocytes                                     |                 |
| CD166  | Ad      | Activated T cells, activated monocytes, epithelium fibroblasts, neurons                   | IgSF            |
| CD167a | Ad      | Epithelial cells                                                                        | Kinases         |
| CD168  | Ad      | Broad                                                                                   |                 |
| CD169  | Ad      | Macrophages                                                                             | IgSF            |
| CD170  | Ad      | Neutrophils, macrophages                                                                 |                 |
| CD171  | Ad      | Neurons, some epithelial cells and some lymphoid and myelomonocytic cells                | IgSF            |
| CD172a | Ad      | Stem cells, monocytes, T cell subset                                                    |                 |
| CD173  | Ca      | Red blood cells, platelets, CD34 stem cell subset                                         | Blood group antigen |
| CD174  | Ca      | Epithelial and endothelial cells, granulocytes, CD34 stem cell subset                    | Blood group antigen |
| CD175  | Ca      | Stem cell subset                                                                        |                 |
| CD175s | Ca      | Erythroblasts                                                                           |                 |
| CD176  | Ca      | Stem cell subset                                                                        |                 |
| CD177  | M       | Neutrophil subset                                                                       |                 |
| CD178  | Ck      | Lymphoid cells                                                                          | TNF             |
| CD179a | B       | Pro-B and early pre-B cells                                                              | IgSF            |
| CD179b | B       | Pro-B and early pre-B cells                                                              | IgSF            |
| CD180  | B       | Mantle and marginal zone B cells, monocytes, dendritic cells                             | Toll-like receptor family |
| CD181-CD182 | NA (reserved) |                                               |                 |
| CD183  | Ck      | T cells, plasmacytoid dendritic cells, subsets of NK and B-cells, eosinophils           | Chemokine receptor |
| CD184  | Ck      | Broad in blood and tissue cells, CD34 stem cell subset                                   | Chemokine receptor |
| CD185-CD194 | NA (reserved) |                               |                 |
| CD195  | Ck      | Monocytes, T cell subset                                                                 |                 |
| CD196  | NA (reserved) |                                               |                 |
| CDw197 | Ck      | Peripheral T and B cells, bone marrow and cord blood CD34⁺ HPC, dendritic cells         | Chemokine receptor |
| CD198-CD199 | NA (reserved) |                               |                 |
| CD200  | X       | Thymocytes, B cells, activated T cells                                                  |                 |
## Table 3.6 Human leukocyte differentiation antigens (continued)

| CD no. | Session | Main antigen expression                                                                 | Family                        |
|--------|---------|-----------------------------------------------------------------------------------------|-------------------------------|
| CD201  | En      | Endothelial cell subset                                                                 | CD1/MHC super family          |
| CD202b | En      | Endothelial cells, stem cells                                                            | Tyrosine kinase receptor      |
| CD203c | M       | Basophils, mast cells                                                                    | Ectoenzyme                    |
| CD204  | M       | Macrophages                                                                              |                               |
| CD205  | D       | Dendritic cells                                                                          | C-type lectin                 |
| CD206  | D       | Dendritic cells, macrophages                                                             | C-type lectin                 |
| CD207  | D       | Langerhans cells                                                                         | C-type lectin                 |
| CD208  | D       | Interdigitating dendritic cells, mature dendritic cells                                   | LAMP family                   |
| CD209  | D       | Dendritic cell subsets                                                                   | C-type lectin                 |
| CDw210 | Ck      | T and B cells, NK cells, monocytes, macrophages                                          |                               |
| CD211  | NA (reserved)                                           |                                                                                   |
| CD212  | Ck      | Activated T cells, activated NK cells                                                    |                               |
| CD213a1| Ck      | Basophils, mastocytes                                                                     |                               |
| CD213a2| Ck      | B cells, monocytes                                                                       |                               |
| CD214-CD216 | NA (reserved)                                             |                                                                                   |
| CDw217 | Ck      | Monocytes, erythroblasts                                                                  |                               |
| CD218-CD219 | NA (reserved)                                             |                                                                                   |
| CD220  | X       | Broad                                                                                   | Lectins                       |
| CD221  | X       | Broad                                                                                   |                               |
| CD222  | X       | Broad                                                                                   |                               |
| CD223  | X       | Activated T cells, activated NK cells                                                    |                               |
| CD224  | X       | Vascular endothelium, peripheral blood macrophages, activated T cells, CD45RO⁺ T cells, B cell subset | Membrane-bound ectoenzyme     |
| CD225  | X       | Broad                                                                                   |                               |
| CD226  | T       | NK cells, platelets, monocytes, subset of T cells, thymocytes                             | IgSF                          |
| CD227  | X       | Granular and ductal epithelial cells                                                     | Mucin                         |
| CD228  | X       | Melanoma cells, progenitor cells                                                          | Transferrin family, GPI anchor |
| CD229  | X       | T and B cells                                                                            |                               |
| CD230  | X       | Broad                                                                                    |                               |
| CD231  | X       | T cell acute lymphoblastic leukemia, neuroblastoma cells                                  | TM4SF                         |
| CD no. | Session | Main antigen expression                                      | Family                        |
|--------|---------|-------------------------------------------------------------|-------------------------------|
| CD232  | X       | Broad                                                       |                               |
| CD233  | Q       | Erythrocyte plasma membrane                                 | Bicarbonate transporter       |
| CD234  | Q       | Erythroid cells, endothelial cells, some epithelial cells    | Chemokine receptor            |
| CD235a | Q       | Red blood cells, erythroid precursor cells                  |                               |
| CD235b | Q       | Red blood cells, erythroid precursor cells                  |                               |
| CD235ab| Q       | Red blood cells, erythroid precursor cells                  |                               |
| CD236  | Q       | Red blood cells, stem cell subset                           |                               |
| CD236R | Q       | Red blood cells, stem cell subset                           |                               |
| CD237  | NA (reserved) |                                                |                               |
| CD238  | Q       | Red blood cells, stem cell subset                           | Neutral endopeptidase         |
| CD239  | Q       | Red blood cells, stem cell subset                           | IgSF                          |
| CD240CE| Q       | Red blood cells                                             |                               |
| CD240D | Q       | Red blood cells                                             |                               |
| CD240DCE| Q      | Red blood cells                                             |                               |
| CD241  | Q       | Red blood cells                                             |                               |
| CD242  | Q       | Erythrocytes, lymphocytes                                   | IgSF                          |
| CD243  | S       | Stem cells, NK cells, T cells, Tumor cells                  | ABC transporters              |
| CD244  | N       | NK cells, T cell subset, monocytes, basophils                | IgSF                          |
| CD245  | T       | T cell subset                                               |                               |
| CD246  | T       | Anaplastic T cell leukemia                                   |                               |
| CD247  | T       | T cells, NK cells                                           |                               |

**Session keys:**
- Ad: Adhesion
- B: B cells
- Ca: Carbohydrates/lectins
- Ck: Cytokines/chemokines
- D: Dendritic cells
- En: Endothelial cells
- Er: Erythroid cells
- M: Myeloid cells
- N: NK cells
- P: Platelets
- S: Stem cells
- T: T cells
- X: Blind panel

Table 3.6 Human leukocyte differentiation antigens (continued)