Figure 4-3  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-3b,c Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-4 part 2 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-4 part 3  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-6 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
<table>
<thead>
<tr>
<th>Lipid</th>
<th>Human erythrocyte</th>
<th>Human myelin</th>
<th>Beef heart mitochondria</th>
<th>E. coli</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphatidic acid</td>
<td>1.5</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phosphatidylcholine</td>
<td>19</td>
<td>10</td>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td>Phosphatidyl-ethanolamine</td>
<td>18</td>
<td>20</td>
<td>27</td>
<td>65</td>
</tr>
<tr>
<td>Phosphatidylglycerol</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Phosphatidylserine</td>
<td>8.5</td>
<td>8.5</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>Cardiolipin</td>
<td>0</td>
<td>0</td>
<td>22.5</td>
<td>12</td>
</tr>
<tr>
<td>Sphingomyelin</td>
<td>17.5</td>
<td>8.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Glycolipids</td>
<td>10</td>
<td>26</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>25</td>
<td>26</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

*The values given are weight percent of total lipid.

Figure 4-9a  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
- Protective layer of polyethylene glycol
- Antibody
- Drug crystalized in aqueous fluid
- Lipid bilayer
- Lipid-soluble drug in bilayer
Asparagine

\[ \text{N-Acetylglucosamine} \]

Serine \( (X=H) \)
Threonine \( (X=CH_3) \)

\[ \text{N-Acetylgalactosamine} \]

Figure 4-10 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-12a Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-14 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-16  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Control

Trypsin treatment of control cell

Trypsin treatment of permeabilized cell

Figure 4-16b Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-20 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
<table>
<thead>
<tr>
<th>Fatty acid</th>
<th>cis Double bonds</th>
<th>M.p. (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stearic acid</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>Oleic acid</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>α-Linoleic acid</td>
<td>2</td>
<td>−9</td>
</tr>
<tr>
<td>Linolenic acid</td>
<td>3</td>
<td>−17</td>
</tr>
</tbody>
</table>

Table 4-2 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
CELL EXTERIOR

Transverse diffusion (flip-flop)

\[ \sim 10^5 \text{sec} \]

Flex \( \sim 10^{-9} \text{sec} \)

Lateral shift \( \sim 10^{-6} \text{sec} \)

CYTOSOL

Figure 4-24 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
(a) Human cell → Addition of Sendai (fusing) virus → Mouse cell → 40 minutes

(b) Image showing mosaics

(c) Graph showing mosaics (%) vs. incubation temperature (°C)

Figure 4-25 Cell and Molecular Biology, 4/e © 2005 John Wiley & Sons
Figure 4-25a Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Addition of Sendai (fusing) virus
1. Label proteins with fluorescent dye
2. Photobleach spot with laser beam
3. Recovery

(a) Figure 4-26 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
1. Label proteins with fluorescent dye
2. Photobleach spot with laser beam
3. Recovery

Figure 4-26a  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-26b  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Apical plasma membrane
- regulation of nutrient and water intake
- regulated secretion
- protection

Lateral plasma membrane
- cell contact and adhesion
- cell communication

Basal membrane
- cell-substratum contact
- generation of ion gradients

Figure 4-29 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Anterior head

Posterior head

Posterior tail
Figure 4-32 part 1  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-32 part 2  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Cerebrovascular permeability (cm/sec)

Octanol-water partition coefficient

A. Sucrose  J. Vinblastine  S. Misonidazole
B. Epipodophyllotoxin  K. Curare  T. Propylene glycol
C. Mannitol  L. Thiourea  U. Metronidazole
D. Arabinose  M. Dianhydrogalactitol  V. Spirohydantoin mustard
E. N-methyl nicotinamide  N. Glycerol  W. Procarbazine
F. Methotrexate  O. 5-FU  X. PCNU
G. Vincristine  P. Ethylene glycol  Y. Antipyrine
H. Urea  Q. Acetamide  Z. Caffeine
I. Formamide  R. Fторafur  ~. BCNU
*  . CCNU

Figure 4-33  Cell and Molecular Biology, 4/e © 2005 John Wiley & Sons
(a) Hypotonic solution
- Net water gain
- Cell swells

(b) Hypertonic solution
- Net water loss
- Cell shrinks

(c) Isotonic solution
- No net loss or gain

Figure 4-34 Cell and Molecular Biology, 4/e © 2005 John Wiley & Sons
Hypotonic solution

Net water gain
Cell swells

Figure 4-34a Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Hypertonic solution

Net water loss
Cell shrinks

Figure 4-34b Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Isotonic solution

No net loss or gain

Figure 4-34c Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-39  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Conventional Model

\[ \Delta V \]

(a)

New Model

\[ \Delta V \]

(b)

Figure 4-41 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Rest  Open  Inactivated

Figure 4-42b Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-45 part 1  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-45 part 2  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
<table>
<thead>
<tr>
<th>Inherited disorder</th>
<th>Type of channel</th>
<th>Gene</th>
<th>Clinical consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familial hemiplegic migraine (FHM)</td>
<td>Ca(^2+)</td>
<td>CACNL1A4</td>
<td>Migraine headaches</td>
</tr>
<tr>
<td>Episodic ataxia type-2 (EA-2)</td>
<td>Ca(^2+)</td>
<td>CACNL1A4</td>
<td>Ataxia (lack of balance and coordination)</td>
</tr>
<tr>
<td>Hypokalemic periodic paralysis</td>
<td>Ca(^2+)</td>
<td>CACNL1A3</td>
<td>Periodic myotonia (muscle stiffness) and paralysis</td>
</tr>
<tr>
<td>Episodic ataxia type-1</td>
<td>K(^+)</td>
<td>KCNA1</td>
<td>Ataxia</td>
</tr>
<tr>
<td>Benign familial neonatal convulsions</td>
<td>K(^+)</td>
<td>KCNQ2</td>
<td>Epileptic convulsions</td>
</tr>
<tr>
<td>Nonsyndromic dominant deafness</td>
<td>K(^+)</td>
<td>KCNQ4</td>
<td>Deafness</td>
</tr>
<tr>
<td>Long QT syndrome</td>
<td>K(^+)</td>
<td>HERG</td>
<td>Dizziness, sudden death from ventricular fibrillation</td>
</tr>
<tr>
<td></td>
<td>Na(^+)</td>
<td>SCN5A</td>
<td></td>
</tr>
<tr>
<td>Hyperkalemic periodic paralysis</td>
<td>Na(^+)</td>
<td>SCN4A</td>
<td>Periodic myotonia and paralysis</td>
</tr>
<tr>
<td>Liddle Syndrome</td>
<td>Na(^+)</td>
<td>β-ENaC</td>
<td>Hypertension (high blood pressure)</td>
</tr>
<tr>
<td>Myasthenia gravis</td>
<td>Na(^+)</td>
<td>nAChR</td>
<td>Muscle weakness</td>
</tr>
<tr>
<td>Dent’s disease</td>
<td>Cl(^-)</td>
<td>CLCN5</td>
<td>Kidney stones</td>
</tr>
<tr>
<td>Myotonia congenita</td>
<td>Cl(^-)</td>
<td>CLC-1</td>
<td>Periodic myotonia</td>
</tr>
<tr>
<td>Bartter’s syndrome type IV</td>
<td>Cl(^-)</td>
<td>CLC-Kb</td>
<td>Kidney dysfunction, deafness</td>
</tr>
<tr>
<td>Cystic fibrosis</td>
<td>Cl(^-)</td>
<td>CFTR</td>
<td>Lung congestion and infections</td>
</tr>
<tr>
<td>Cardiac arrhythmias</td>
<td>Na(^+), K(^+), Ca(^2+)</td>
<td>many different genes</td>
<td>Irregular or rapid heartbeat</td>
</tr>
</tbody>
</table>
Figure 4-50 Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-51b  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Figure 4-52  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)
Current flow depolarizes next node of Ranvier

Direction of impulse

Node of Ranvier

Myelin sheath

Axon

Na⁺
Acetylcholine (ACh)

Norepinephrine
Electric ray

Electroplax organs
SEPHEROSE 2B
EP Figure 4-2b  Cell and Molecular Biology, 4/e (© 2005 John Wiley & Sons)