Topics

• Presynaptic: transmitters
  – general considerations
    • criteria, types
  – small molecules
    • synthesis, location
  – peptides
    • roles, synthesis from precursors
    • co-existence

• Postsynaptic: second messengers
  – access
    • 7 transmembrane domain receptors, G proteins
  – types
    • cAMP, AA, DAG, IP_3
  – protein kinases
  – truncating pathway
  – utility

\[ \text{acetyl CoA} + \text{choline} \rightarrow \text{acetylcholine} \]
\[ \text{tyrosine} + \text{O}_2 \rightarrow \text{dopamine} \]
\[ \text{tryptophan} + \text{O}_2 \rightarrow \text{serotonin} \]

\[
\begin{align*}
\text{glutamate} & \quad \text{major excitatory transmitter} \\
\text{glutamate} & \quad \text{gonadotropin releasing hormone} \quad \text{major inhibitory transmitter} \\
\text{glycine} & \quad \text{major inhibitory transmitter} \\
\end{align*}
\]
<table>
<thead>
<tr>
<th>Family</th>
<th>Peptide examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioids</td>
<td>Opiocorine, enkephalin, dynorphine, methadone</td>
</tr>
<tr>
<td>Neuropeptide hormones</td>
<td>Vasopressin, oxytocin, amopressin</td>
</tr>
<tr>
<td>Serotonin</td>
<td>Serotonin, substance P, pimastine, somatostatin, enkephalin, substance K</td>
</tr>
<tr>
<td>Secretin</td>
<td>Secretin, glucagon, gastrointestinal peptide, gastrin inhibitory peptide, growth hormone-releasing factor, peptide histidine isoleucine, glucagon, pancreatic polypeptide</td>
</tr>
<tr>
<td>Insulin</td>
<td>Insulin, insulin-like growth factors 1 and 2</td>
</tr>
<tr>
<td>Somatostatin</td>
<td>Somatostatin, pancreatic polypeptide</td>
</tr>
<tr>
<td>Gastrocin</td>
<td>Gastrocin, cholecystokinin</td>
</tr>
</tbody>
</table>

Principles, Table 15-3

Principles, Fig. 13-6

Principles, pg. 236
Utility of second messengers

• lengthening of signal
• amplification of signal
• divergence to several targets
• convergence to single target
• spatial spreading of signal
• regulation of gene transcription