pass into one of the ganglia of the sympathetic chain (Guyton and Hall, 2005). The postganglionic neurons then travel to their destinations in the various organs (Fig 1).

**INFORMATION TRANSMISSION**

Sympathetic and parasympathetic nerve fibres all secrete one of the two synaptic transmitters: acetylcholine or noradrenaline (norepinephrine). Those that secrete acetylcholine are said to be cholinergic and those that secrete noradrenaline are said to be adrenergic (Richards et al, 2007; Guyton and Hall, 2005).

All preganglionic neurons are cholinergic. Thus, both sympathetic and parasympathetic preganglionic nerve fibres secrete acetylcholine. Although the postganglionic neurons of the parasympathetic nervous system also secrete acetylcholine and, therefore, remain cholinergic, the postganglionic nerve fibres of the sympathetic nervous system secrete noradrenaline. Thus, sympathetic postganglionic neurons are adrenergic (Fig 2).

For noradrenaline to stimulate a response within an effector organ, it must bind with highly specific receptor sites. According to Guyton and Hall (2005), experimentation with drugs that mimic the action of noradrenaline on sympathetic effector organs have shown there are two types of adrenergic receptors. These are known as alpha and beta receptors, with each being further classified into alpha1 and beta1, and alpha2 and beta2 (Bear et al, 2005). The postganglionic neurons then travel to their destinations in the various organs (Fig 1).

**Sympathetic Stimulation**

Sympathetic and parasympathetic nerve fibres all secrete one of the two synaptic transmitters: acetylcholine or noradrenaline (norepinephrine). Those that secrete acetylcholine are said to be cholinergic and those that secrete noradrenaline are said to be adrenergic (Richards et al, 2007; Guyton and Hall, 2005).

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**Drug action**

Sympathomimetic drugs stimulate the heart by activating beta-adrenergic receptors, and cause vascular smooth muscle contraction and vasoconstriction by activating alpha-adrenergic receptors.

Adrenergic receptors are a group of cell membrane receptors that receive neuronal impulses from postganglionic adrenergic fibres from the sympathetic nervous system (Nestler et al, 2001). These are divided into alpha and beta receptors.

Sympathomimetics are used in conditions where it is necessary to raise BP by stimulating the heart and inducing vasoconstriction (Nestler et al, 2001). They can, therefore, be classified into either inotropic or vasoconstrictor sympathomimetics.

**Inotropic sympathomimetics** include:
- Dobutamine;
- Dopexamine;
- Isoprenaline;
- Dopamine (rarely used today).

Inotropic sympathomimetics act on receptors in cardiac muscle to increase cardiac contractility. Dobutamine acts on beta receptors and is used to increase the heart’s contractility with little effect on rate. Dopexamine acts on beta receptors and is used to increase contractility, but does not cause vasoconstriction.

Isoprenaline increases both heart rate and contractility but is less selective than the other drugs.

**Vasoconstrictor sympathomimetics** include:
- Ephedrine;
- Phenylephrine;
- Norepinephrine/noradrenaline.

**TABLE 1. EFFECTS OF SYMPATHTIC OR PARASYMPATHTIC STIMULATION**

<table>
<thead>
<tr>
<th>Sympathetic stimulation</th>
<th>Structure</th>
<th>Parasympathetic stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate increases</td>
<td>(Beta1) Heart</td>
<td>Rate decreases</td>
</tr>
<tr>
<td>Myocardial contractility increases</td>
<td>(Beta1) Heart</td>
<td>Myocardial contractility decreases</td>
</tr>
<tr>
<td>Bronchial muscle relaxes</td>
<td>(Beta2) Lungs</td>
<td>Bronchial muscle contracts</td>
</tr>
<tr>
<td>Pupil dilates</td>
<td>Eye</td>
<td>Pupil constricts</td>
</tr>
<tr>
<td>Motility reduces</td>
<td>Intestine</td>
<td>Digestion increases</td>
</tr>
<tr>
<td>Sphincter closes</td>
<td>Bladder</td>
<td>Sphincter relaxes</td>
</tr>
<tr>
<td>Urine secretion decreases</td>
<td>Kidneys</td>
<td>Urine secretion increases</td>
</tr>
</tbody>
</table>

**SYMPATHOMIMETICS**

This is a group of drugs whose effect resembles activity in the stimulated sympathetic nervous system, especially of the heart and circulation (Crossman and Neary, 2005). They include drugs that act directly on adrenoceptors in tissues as well as those that act by releasing noradrenaline from sympathetic nerve terminals.

As such, these drugs work by increasing heart rate and contractility. They include substances such as epinephrine and norepinephrine, as well as synthetic drugs such as phenylephrine.

The properties of the drugs vary depending on the dose used and where each acts.

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