Chapter 10

Anti-adrenergic Drugs
1. \( \alpha \)-Adrenoceptor Antagonists
   (\( \alpha \) adrenergic blockers)

2. \( \beta \)-Adrenoceptor Antagonists
   (\( \beta \) adrenergic blockers)

3. \( \alpha \), \( \beta \)-Adrenoceptor Antagonists
   (mixed \( \alpha \), \( \beta \) adrenergic blockers)
Pharmacological effects

1. blocking $\alpha_1$-R effects
   - dilate peripheral vascular smooth muscles
   - baroreceptor stimulation
   - cardiac output
   - blood pressure ↓
   - reflex tachycardia
2. Blocking $\alpha_2$-R effects

- Blocking presynaptic $\alpha_2$-R
  - Blocking the negative feedback
    - Noradrenaline release $\uparrow$
      - Tachycardia
3. blocking $\beta_1$-R effects

Heart rate, delayed conduction $\downarrow$

oxygen consumption $\downarrow$

cardiac output $\downarrow$

rennin secretion $\downarrow$

lowering blood pressure (patients with hypertension, not normal subject)

lowering renal perfusion
4. blocking $\beta_2$-R effects

Blocking $\beta_2$ adrenergic receptor-mediated vasodilation and bronchial dilation

$\downarrow$

airway resistance $\uparrow$

$\downarrow$

Induced the asthma
(must never be used in airway obstructive disease)
α -R block drugs

Phentolamine, tolazoline,

Phenoxybenzamine, prazosine,

Yohimbine
1. phentolamine and tolazoline

Both of drugs produce similar action, but tolazoline is less potent than phentolamine.
A. Pharmacological effects

(a) Vascular smooth muscles

dilating vascular smooth muscles

blood pressure ↓

(b) Heart

Vasodilatation  blocking presynaptic $\alpha_2$-R

sympathetic reflex  NA release ↑

cardiac output↑, heart rate ↑
(c) Parasympathomimetic effects

Activating contraction of gastrointestinal smooth muscles
M-R ___________ atropine

(d) Histamine-like effects

Activating gastric secretion
H₁ and H₂-R ___________ peripheral vasodilatation
B. Therapeutic applications

(a) Raynaud’s Syndrome —— vasodilation

(b) shock

vasodilation

positive cardiac effects

tissue perfusion
(c) treatment and diagnosis of phaeochromocytoma

(d) treatment of acute myocardial infarction, congestive heart failure

- block sympathetic vasoconstriction
- reduce peripheral resistance
- decrease cardiac work
- decrease pulmonary congestion, edema
C. Adverse reactions

Arrhythmia
Anginal pain
Gastrointestinal irritation
2. phenoxybenzamine

Action similar to phentolamine but with longer duration.

Indications: relieving vasospasm and shock.

3. Prazosine

A selective $\alpha_1$-R antagonist for the treatment of hypertension (discussed in detail in chapter 24).
**β -adrenergic blocking drugs**

**Classification**

**A. Nonselective β -R blockers**

(a) full blockers: propranolol, timolol, sotalol, nadolol

(b) with ISA: alprenolol, oxprenolol, pindolol

**B. Selective β₁ -R blockers**

(a) full blockers: metoprolol, esmolol, atenolol

(b) with ISA: acebutolol

**C. Mixed β and α -R blockers: labetalol**
Pharmacological effects

A. Effects on the heart

- Negative inotropic
- Negative chronotropic
- Atrioventricular conduction

Blocking $\beta_1$-R
B. Vascular system and blood pressure

- Renin release
- Cardiac output

Lower blood pressure
(patients with hypertension, not normal subject)
C. Smooth muscle of respiratory tract

blocking $\beta_2$-R

airway resistance

Induced the asthma

(must never be used in airway obstructive disease)
D. Intrinsic sympathomimetic activity (ISA)

Some drugs such as alprenolol, pindolol, oxprenolol, bind to $\beta$ receptor, the $\beta$ receptor is partially activated.

These drugs have less inhibitory effects on heart and bronchial smooth muscles.
E. Metabolic effects

Be caution for insulin-dependent diabetes in using betta receptor antagonist such as propranolol, very careful monitoring of blood glucose is essential, since pronounced hypoglycemia may occur after insulin injection.
F. Effects on the eye

aqueous humor production ↓

intraocular pressure ↓
Therapeutic applications

1. angina pectoris
   - oxygen requirement of myocardium

2. Prevention and treatment of myocardial infarction, suraventricular and ventricular arrhythmias
   - heart rate, conductivity, contraction, oxygen requirement
3. Hypertension

   cardiac output
   ↓
   NA release (blocking positive feedback)
   ↓
   rennin release

4. Glaucoma

   timolol → intraocular pressure ↓

5. Hyperthyroidism

   $\beta$-R blockers such as propranolol, is used for hyperthyroidism
Adverse Effects

Asthma

Heart failure and conduction blocking
hypoglycemia, aggravation of peripheral vascular disease.

Treatment with $\beta$-R blockers must never be stopped suddenly, because of the risk of cardiac events. $\beta$-R blockers must be tapered off gradually for 1-2 week(s).
THANKS!