Physiology of Blood vessel

arteries, arterioles, capillaries, venules, and veins

1. Arterial blood pressure
   Systolic pressure 100~120mmHg;
   Diastolic pressure 60~80mmHg;
   Mean arterial pressure
   = Diastolic pressure + 1/3Pulse pressure

Factors affecting AP
1. Circulating blood
2. Cardiac output
3. Peripheral resistance arterioles
2. Factors affecting venous return

1. **Mean circulatory filling pressure**
   - (↑, Venous return↑)

2. **Heart contractility**
   - (↑, End-diastolic pressure ↓, ~↑)

3. **Posture**
   - Effects of gravity

4. **Compression of skeletal muscle**

5. **Respiration**
Physiology of Blood vessel

3. Formation of interstitial fluid

Effective filtration pressure

\[ \text{Effective filtration pressure} = (\text{Capillary pressure} + \text{Colloid osmotic } \sim \text{of interstitial fluid}) - (\text{Interstitial fluid pressure} + \text{Plasma colloid osmotic } \sim) \]
The Blood-Brain Barrier

From Silverthorn DU Human Physiology An Integrated Approach ©Pearson

Regulation of Cardiovascular Activity

- Nervous regulation
- Humoral regulation

Cardiac output
Peripheral resistance
Circulating blood volume
**Vagus** (Parasympathetic)
Mainly to the SA and AV nodes (Arrows)

**Cardiac nerves** (Sympathetic)
Mainly to the *myocardium*

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**Sympathetic nerve** *(NE)*
- **β$_1$-receptors**
- *Propranolol* (普萘洛尔, 心得安)
- ↑ $Ca^{2+}$ influx
- ↑ Rate of depolarization
- ↑ Heart Rate
- ↑ Contractility

**Parasympathetic nerve** *(ACh)*
- **Muscarinic receptors** *(Atropine)*
- ↓ $K^+$ efflux ↓ $Ca^{2+}$ influx
- Hyperpolarization
- ↓ Rate of depolarization
- ↓ Contractility; ↓ Heart Rate

SA node, AV node, Atrial muscle
Ventricular conduction pathway, Ventricular muscle
1. Nervous Regulation

1) Nervous control of the heart
   - Cardiac vagus nerve (ACh)
   - Cardiac sympathetic nerve (NE)

2) Nervous control of the blood vessels
   - Sympathetic vasoconstrictor nerve fiber
     - Norepinephrine (NE) **Tonic activity**
     - α-adrenoceptors Constriction
     * β₂-adrenoceptors Dilatation

3) Cardiovascular center
   - Medullary cardiovascular center
     - Vasoconstrictor area  rVLM 延髓头端腹外侧区
     - Vasodilator area cVLM 延髓尾端腹外侧区
     - Relay station of afferent nerve NTS 孤束核
     - Cardioinhibitory area 迷走运动背核、疑核
Regulation of Cardiovascular Activity
1. Nervous Regulation

4) Cardiovascular reflex
   - Depressor reflex
     - Arterial Baroreceptor: High pressure
   - Cardiopulmonary stretch receptor reflex

   low pressure

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Lecture 2

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Regulation of Cardiovascular Activity

2. Humoral Regulation

- Renin-angiotensin system

- Epinephrine & Norepinephrine

  E
  cardiac
  α-adrenoceptors constriction
  β-adrenoceptors dilatation

  NE
  α-adrenoceptors (vessels constriction)

  BP
  β1-adrenoceptors (Heart)
课堂作业

• 请比较心肌和骨骼肌的生理特性。