

Blood Pressure

Basic Concepts

Blood Pressure – the force exerted by the blood against a unit of area of the vessel wall (in mmHg)

During each heartbeat, the blood pressure changes between two values:

- a maximum – SYSTOLIC PRESSURE – the pressure when the heart releases the blood in the vessels - about 120 mmHg
- a minimum – DIASTOLIC PRESSURE – pressure in the blood vessels between each heartbeat (when the heart is resting) - about 80 mmHg

Pulse Pressure – the difference between systolic and diastolic pressures (40 mmHg)

Mean Arterial Pressure (MAP) – the average pressure within an artery over a complete cycle of one heartbeat

MAP = Diastolic Pressure + $\frac{1}{3}$ Pulse Pressure

Total Peripheral Resistance - the sum of the resistance of all peripheral vasculature in the systemic circulation.

A healthy adult's pressure should not be higher than 140/90 mmHg. High pressure is called hypertension and low pressure is called hypotension.

Blood pressure in selected parts of the circulation

	Systolic (mmHg)	Diastolic (mmHg)
Aorta	120	80
Left ventricle	120	0
Pulmonary artery	25	8
Right ventricle	25	0

	Systolic (mmHg)	Diastolic (mmHg)
Optimal	<120	<80
Normal	120-129	80-84
Prehypertension	130-139	85-89
Grade 1 Hypertension	140-159	90-99
Grade 2 Hypertension	160-179	100-109
Grade 3 Hypertension	>180	>110

Blood pressure table

Measurement of Blood Pressure

Blood pressure can be measured in several ways: directly (invasively), indirectly, and automatically. For automatic measurement, we can use the auscultation method and the oscillometric method.

Regulation of Blood Pressure

There are 2 main mechanisms that regulate blood pressure:

- Short/Fast Term Mechanism - Neurally mediated baroreceptor mechanism that regulate blood vessel diameter, heart rate and contractility
- Slower/Long Term Mechanism - Hormonally regulated renin-angiotensin-aldosterone mechanism that regulate blood volume

 For more information see *Measuring blood pressure*.

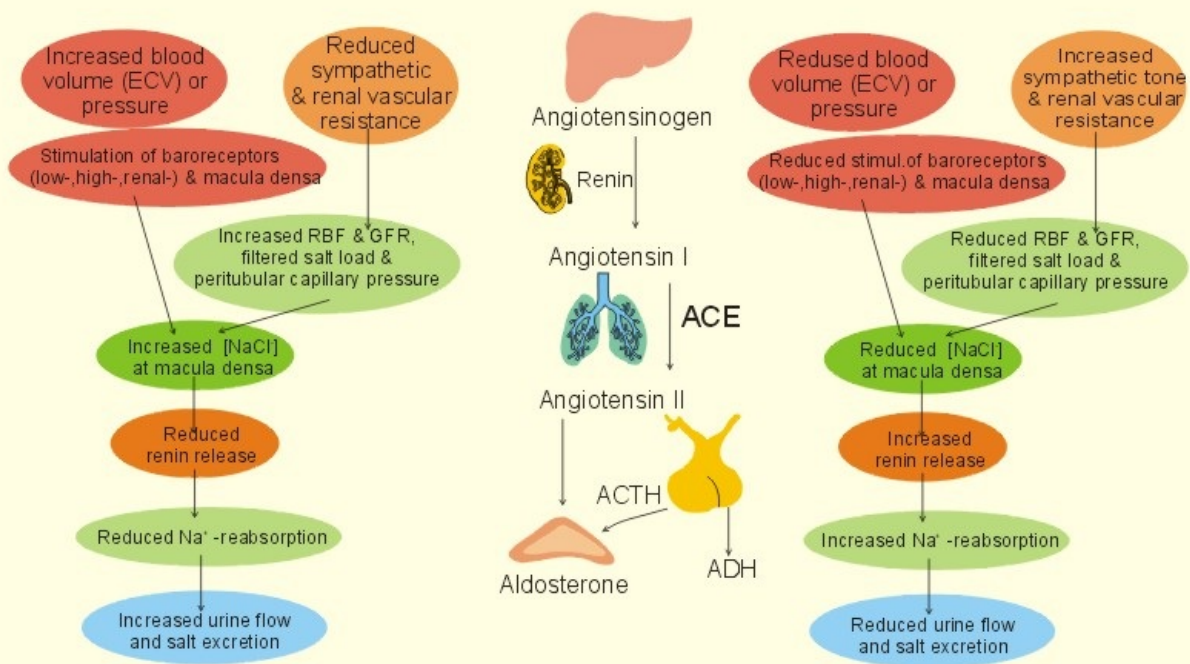
Fast Term Mechanism

- Is a negative feedback system that is responsible for the minute to minute regulation of arterial blood flow
- The sensor for MAP is provided by baroreceptors (stretch receptors) located in the carotid sinus and aortic arch
- Sensitive between 80 – 150 mmHg

Long Term Mechanism

- Slow hormonal mechanism by adjustment of blood volume
- Renin – angiotensin – aldosterone System

Blood Volume & Pressure Controls Renal Salt Excretion



Maintains effective circulating blood volume

Fig. 24-7

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Summary

- BP: FORCE EXERTED BY BLOOD AGAINST ANY UNIT AREA OF THE VESSEL WALL
- BP HAS DIFFERENT VALUE THROUGH THE CIRCULATORY SYSTEM
- ARTERIAL PRESSURE PULSATION: 120/80 mmHg
- REGULATION VIA AUTONOMIC AND HORMONAL SYSTEM
- BP IS CONTINUALLY CHANGING DEPENDING ON ACTIVITY, TEMPERATURE, DIET, PHYSICAL OR EMOTIONAL STATE, MEDICATION...

References

Guyton, Arthur C.; Hall, John E. Guyton and Hall textbook of medical physiology. 12th ed. USA: Saunders, 2011.
 GUYTON, Arthur C, et al. Textbook of Medical Physiology. 12th edition. USA : Saunders, 2011. [1] (http://www.aw-bc.com/info/ip/assignmentfiles/cardiovascular/Blood_Pressure_Regulation.pdf) [2] (<http://www.cvphysiology.com/Blood%20Pressure/BP002.htm>)