



Physiology  
OF THE CARDIOVASCULAR SYSTEM

# Regulation of Blood Pressure

# Regulation of Blood Pressure mechanisms

## Rapidly Acting Control mechanisms (short-term)

-Acts within seconds / minutes.  
-Concerned by regulating CO & PR.  
-Reflex mechanisms that act through autonomic nervous system:  
..Centers in medulla oblongata:  
- Vasomotor Center (VMC) ... Sympathetic nervous system.  
- Cardiac Inhibitory Center (CIC) .. Parasympathetic nervous system.

### Baroreceptors reflex

-Mechano-stretch receptors located in the wall of carotid sinus & aortic arch  
-Stimulated in response to BP changes  
-Fast, neurally mediated  
-Provide powerful moment-to-moment control of arterial pressure

### Chemoreceptors reflex

-Chemoreceptor reflex operates in much same way as the baroreceptor reflex, EXCEPT that chemoreceptors are chemo-sensitive cells instead of stretch receptors.  
-Peripheral & Central Chemoreceptors reflex.

### Atrial stretch receptor reflex

↑ Venous Return ⇒ ++ atrial stretch receptors ⇒ reflex vasodilatation & ↓ ABP.

### Thermo-receptors

(in skin / hypothalamus)  
-Exposure to heat ⇒ vasodilatation.  
-Exposure to cold ⇒ vasoconstriction.

### Pulmonary receptors

Lung inflation ⇒ vasoconstriction

## Long-Term Regulation of ABP

-Hormonally mediated.  
-Takes few hours to begin showing significant response.  
-Mainly renal: acts if BP is too low

### 1. Renin-Angiotensin-Aldosterone System.

### Vasopressin [Anti-diuretic hormone (ADH)] Mechanism.

-Hypovolemia & dehydration stimulates Hypothalamic Osmoreceptors.  
-ADH will be released from posterior pituitary gland:  
1.promotes water reabsorption at kidney tubules...↑ blood volume.  
2.causes vasoconstriction, in order to ↑ ABP.  
-Thirst stimulation. -Usually when secreted, aldosterone is secreted.

### 3. Atrial Natriuretic Peptide Mechanism (Low-pressure volume receptors.)

-Hormone released from cardiac muscle cells (wall of right atrium) as a response to an increase in ABP.  
-Stimulates an ↑ in urinary production, causing a ↓ in blood volume & blood pressure.

### EPO (erythropoietin.)

-Secreted by the kidneys when blood volume is too low.  
-Leads to RBCs formation → ↑ blood volume

## Intermediate Mechanisms (Long-Term)

-Activated within 30 min to several hrs.  
-During this time, the nervous mechanisms usually become less & less effective

### Stress-relaxation of the vasculature

-Movement of fluid from interstitial spaces into capillaries in response to ↓ BP to maintain blood volume.  
-Conversely, when capillary pressure ↑ too high, fluid is lost out of circulation into the tissues, reducing blood volume as well as all pressures throughout circulation.

### Renin-angiotensin vasoconstrictor mechanism

### Fluid Shift mechanism

• Adjustment of blood vessel smooth muscle to respond to changes in blood volume.  
• When pressure in blood vessels becomes too high, they become stretched & keep on stretching more & more for minutes or hours; resulting in fall of pressure in the vessels toward normal.  
• This continuing stretch of the vessels can serve as an intermediate-term pressure "buffer."