

# Original slides-Circulation lecture

**CIRCULATION – closed system –**  
**parallel circuits permit variations in regional BF**  
**(nutrition, special function) without changes in BP**

**Systemic regulation**

**Nervous**  
 H: Startling p. frequency effect  
 Parasymp.  
 Sympat.

**Humoral**  
 Adrenalin  
 Noradrenalin  
 Angiotensin II

**Vessels:**  
 Myogenic  
 Metabolic  
 Humoral (NO, Endothelin, Prostaglandins...)

**HIERARCHIE different in different organs, changes with activity**

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**Blood pressure**  
**Variation beat by beat**

**Systolic**  
 Diastolic

**Pulse**  
 Mean

dependent on peripheral resistance and cardiac interval  
 dependent on stroke volume  
 long lasting change of compliance

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 Figure 15-3 Pressure pulse waveform recorded from the ascending aorta (Reprinted from Guyton BF, Textbook 11:734, 1992)  
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## RECEPTORS

**BARORECEPTORS**  
 Homeostasis of BP (rabbit n. depressor)  
 ↓ tone aa. (sy)  
 ↓ HR (↑ paras, ↓ sy)

**VOLUMORECEPTORS**  
 Low pressure – atrial rec. A – sec. + in r. of Bainbridge ↑ HR during ↑ VR  
 Rec. B – paral. +

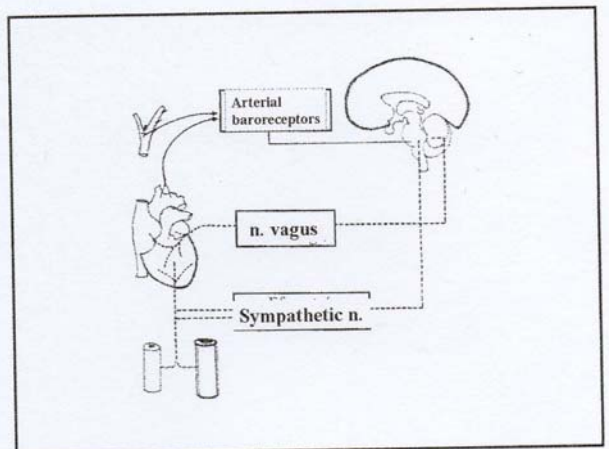
**CHEMORECEPTORS**  
 At ↓ pO<sub>2</sub>, ↑ pCO<sub>2</sub>, ↓ pH  
 ↑ HR + vasoconstr.

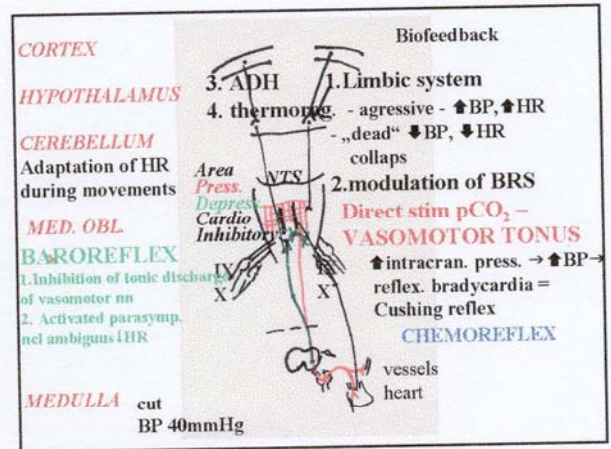
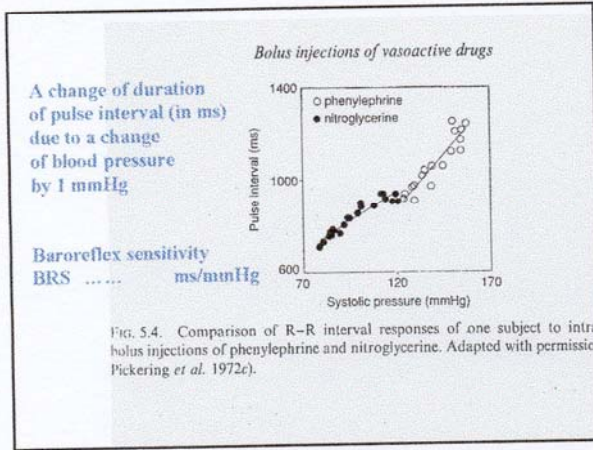
**CH. in VENTRICLES**  
 Vagus veratridin, nicotin R. of Bezold-Jarisch Ischemic (MI) ↓ HR  
 Symp pain, vasoconstr. and ↑ HR (MI)

Metabolites in muscles, Pain, Emotions, Oculocard. reflex, Digestive system

Active during atrial syst.  
 r. of Bainbridge ↑ HR during ↑ VR  
 Rec. B – paral. +

Active at the end of diastole  
 ↓ HR, ↓ ADH (Henry-Gauer reflex), + secretion of ANF and BF in kidney  
 antidiuretic hormon  
 atrial natriuretic hormon





## Inervation of Blood Vessels

- Sympathetic nerves – plexus on adventitia, current spreads between cells by gap junctions, tonic vasoconstrictory activity (sympathectomy – dilation); NA ... + neuropeptid Y (constr)
- Sympathetic cholinergic vasodilator system – muscle - animals
- Cholinergic innervation in vessels of heart, lungs, kidneys, uterus; + VIP (dil)
- Sensory nerves – (antidromic reflex - dil), subst.P (skin), CGRP

## Cardiac Inervation

- Vagus – ACh – chronotropic, prevalence at rest = „vagal tone“, - dromotropic, atrial myocardial cells neg. - inotropic via inhibition of symp.
  - Sympathetic nerves – NA + chronotropic, + dromotropic, inhibition of vagal stim. (by cotransmitter neurop. Y), + inotropic, + bathmotropic
- Blockade of vagus – HR 150-180 bpm  
Blockade of both – HR 100 bpm