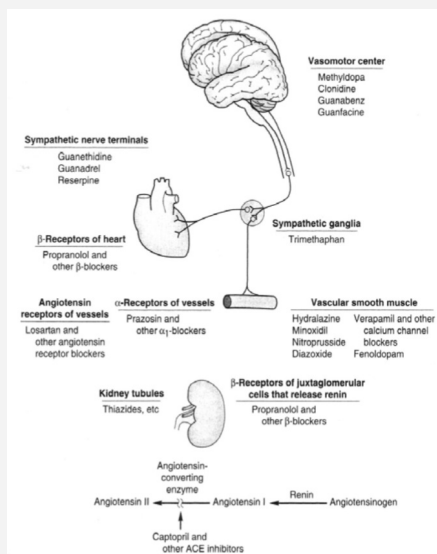


Cardiovascular Effects of Sympathomimetics



General Hemodynamics

General Equation Blood Pressure = Cardiac Output x Total Peripheral Resistance

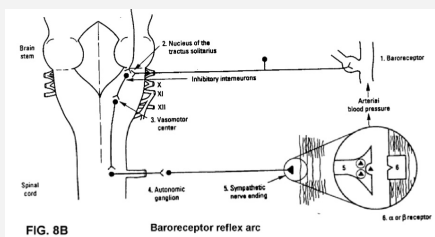
Blood Pressure (BP) Combination of Systolic & Diastolic BP

Cardiac Output (CO) CO = Stroke volume x Heart Rate

Total Peripheral Resistance (TPR) alpha 1 receptor ALWAYS DOMINATE ("alpha dominates")

Integration: Purpose: Maintain homeostasis & coordinate autonomic state by integrating afferent and efferent components of the SYMpathetic & PARAsympathetic ANS within CNS

Baroreceptor Reflex (General)



The Baroreceptor Reflex is the rapid response system for dealing with BP changes (EITHER increase OR decrease).

1. If the BP is DECREASED, the baroreflex will initiate responses to INCREASE CO, causing vasoCONSTRICTION. End result: INCREASE BP

2. If the BP is INCREASED, the baroreflex will initiate responses to DECREASE CO, causing vasoDILATION. End result: DECREASE BP

The Baroreceptor Reflex (DO and DO NOT)

Baroreceptor DO (1) Response to BP change. (2) Dampen any BP changes. (3) Dampen HR changes, reverse/enhance HR changes.

Baroreceptor DO NOT (1) NO Response to HR change. (2) NEVER alter direction of BP change

Direct Effects of Activating ANS receptors

Alpha ₁ receptors	vasoconstriction	↑ TPR	↑ BP
Beta ₁ receptors	↑ heart rate	↑ CO	↑ BP
Beta ₂ receptors	vasodilation	↓ TPR	↓ BP
M ₂ receptors (vagus)	↓ heart rate	↓ CO	↓ BP
M receptors (vascular)	Vasodilation (NO)	↓ TPR	↓ BP

(Note: ANS receptors are ranked based on relative effect)

1. Alpha₁ receptors = MAJOR player = BIGGEST action.
2. Muscarinic-2 receptors (vagus) works AGAINST Alpha₁ receptor
3. Beta₂ & Muscarinic (M, vascular) receptors are NOT attached (innervated) to Baroreceptor Reflex.

Para- & Sympathetic Tone on BP & HR

	BP (mmHg)	HR (bpm)
Normal (resting)	120 / 80	70
No tone*	60 / 40	75

* Central and circulation hormone actions removed
Note: Athletic individuals have lower HR due to higher vagal tone ie. Lance Armstrong (resting HR 32 bpm)

Heart Rate: Vagus nerve (-10 bpm) + Beta₁-receptor (+5 bpm) = 5 bpm increase



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Influence of BP change on ANS tone

	Resting	After ↑ BP	After ↓ BP
Alpha ₁	++++	0	++++++
Beta ₁	+	0	++
*Beta ₂	+	++	0
Vagus (M ₂)	++	++++	0

* Non-innervated, respond to circulation epinephrine (EPI)
Note: Vascular M receptors have no major role in BP regulation (Ach is not a circulating hormone).



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