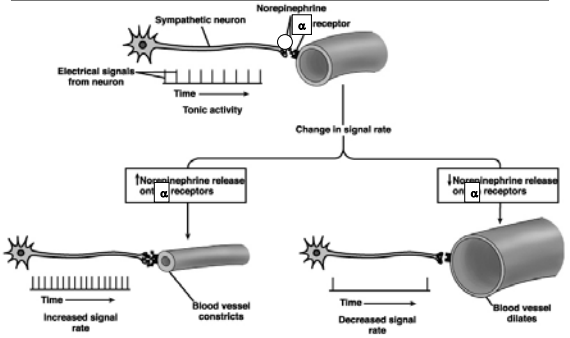
Regulation and homeostasis

- List and describe the components in specific 2nd messenger signal transduction pathways
- Define each of the following and predict their effect on signal transduction:
  - one ligand on one receptor (tonic control)
  - receptor isoforms (one ligand, >1 receptor)
  - agonists for one receptor(>1 ligand, receptor)
  - two ligands, two receptors (antagonistic control)

Class problem set:

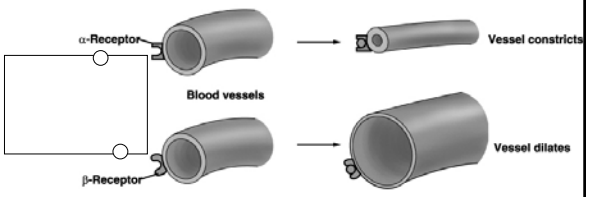
1. Norepinephrine (NE) is a large protein. Would the receptors for NE be *inside the target cell* or *on the target cell membrane?*
2. When NE binds an α_1 receptor on a cell's membrane, there is an increase in IP_3 and DAG in the cell. What membrane bound amplifier enzyme is activated to cause the IP_3 and DAG increase?
3. What ion will be increased in the ICF due to IP_3?
4. What ICF enzyme will be activated by DAG?

One ligand, one receptor (tonic control)



Receptor isoforms:

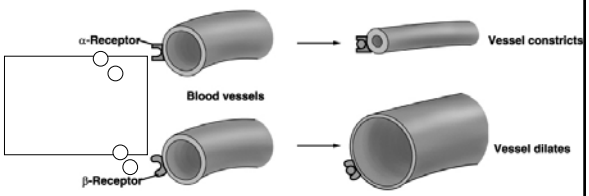
Norepinephrine ○ acts on α and β receptors



Note, receptors are on different tissues and illicit different effects.

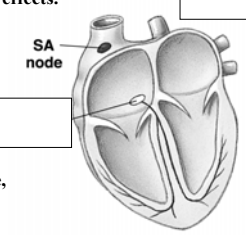
Agonists for same receptor.

Norepinephrine ○ and Epinephrine ○ activate the same receptors.



Example of antagonistic control through different receptors on same tissue

Norepinephrine ○ and Acetylcholine ○ activate different receptors for opposite effects.



○ **NE speeds heart rate, adrenergic receptors**

○ **ACh slows heart rate, cholinergic receptors**

http://www.blackwellpublishing.com/matthews/neurotrans.html

Predict the responses for the following:

Stimulus	Effector tissue	Response?
⇑ NE	blood vessel with α_1 receptors	
⇑ ACh	blood vessel with α_1 receptors	
⇑ NE	heart SA node cells	
⇓ NE	blood vessel with β_2 receptors	