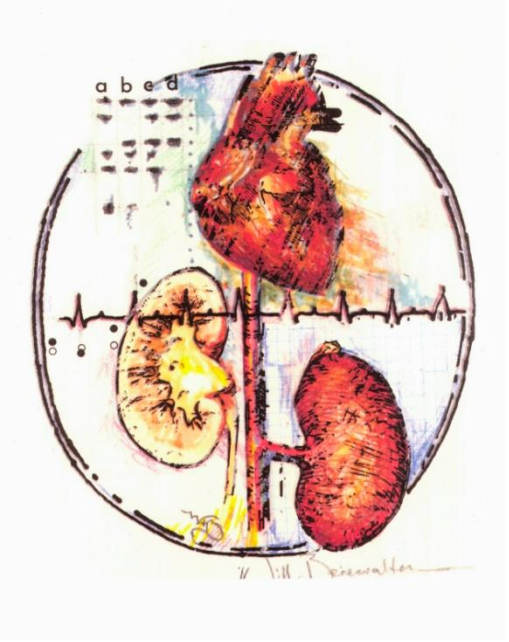
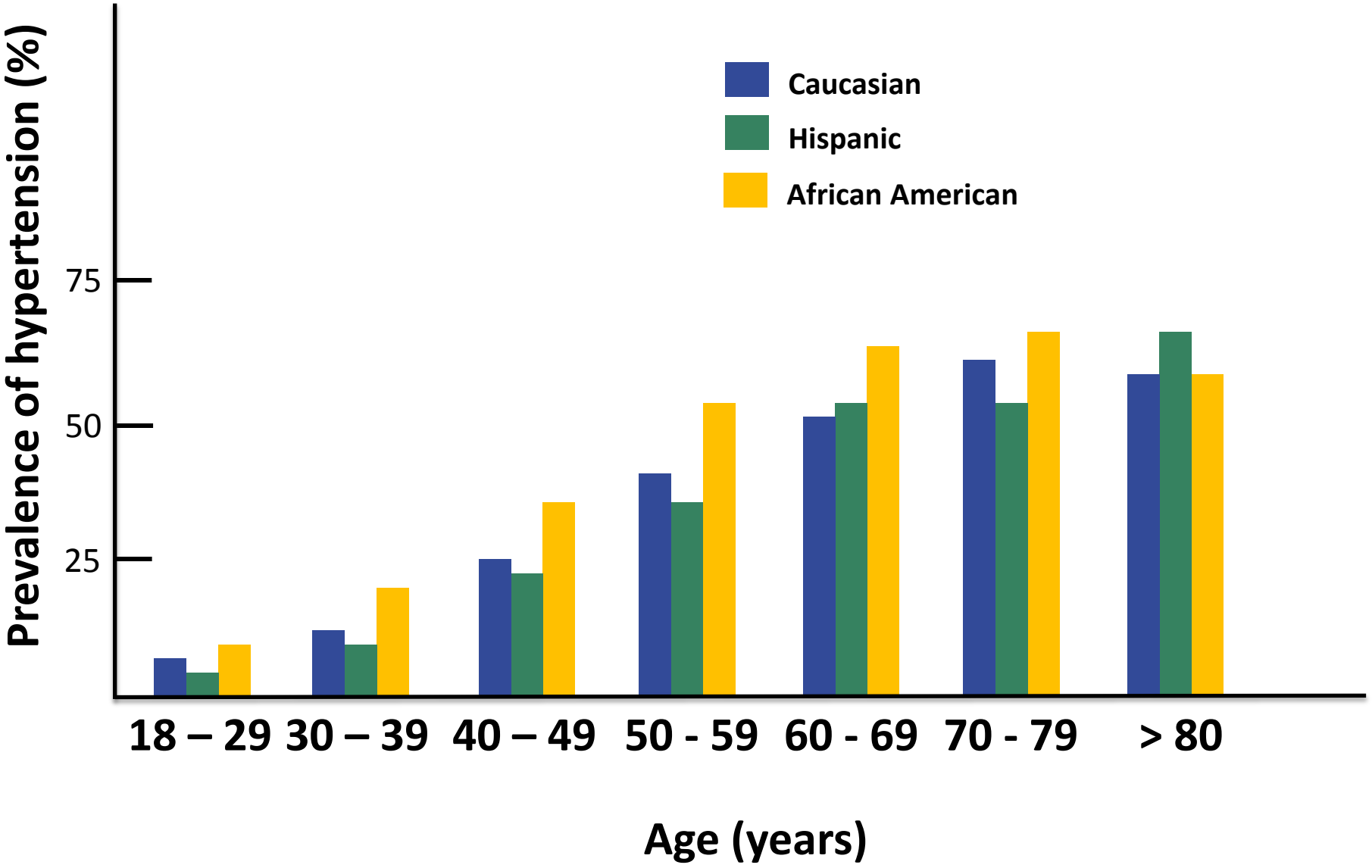



# Hypertension
# &
# Vascular
# Research Division

Department of Internal Medicine

***Jeffrey L. Garvin, Ph.D. – Division Head***

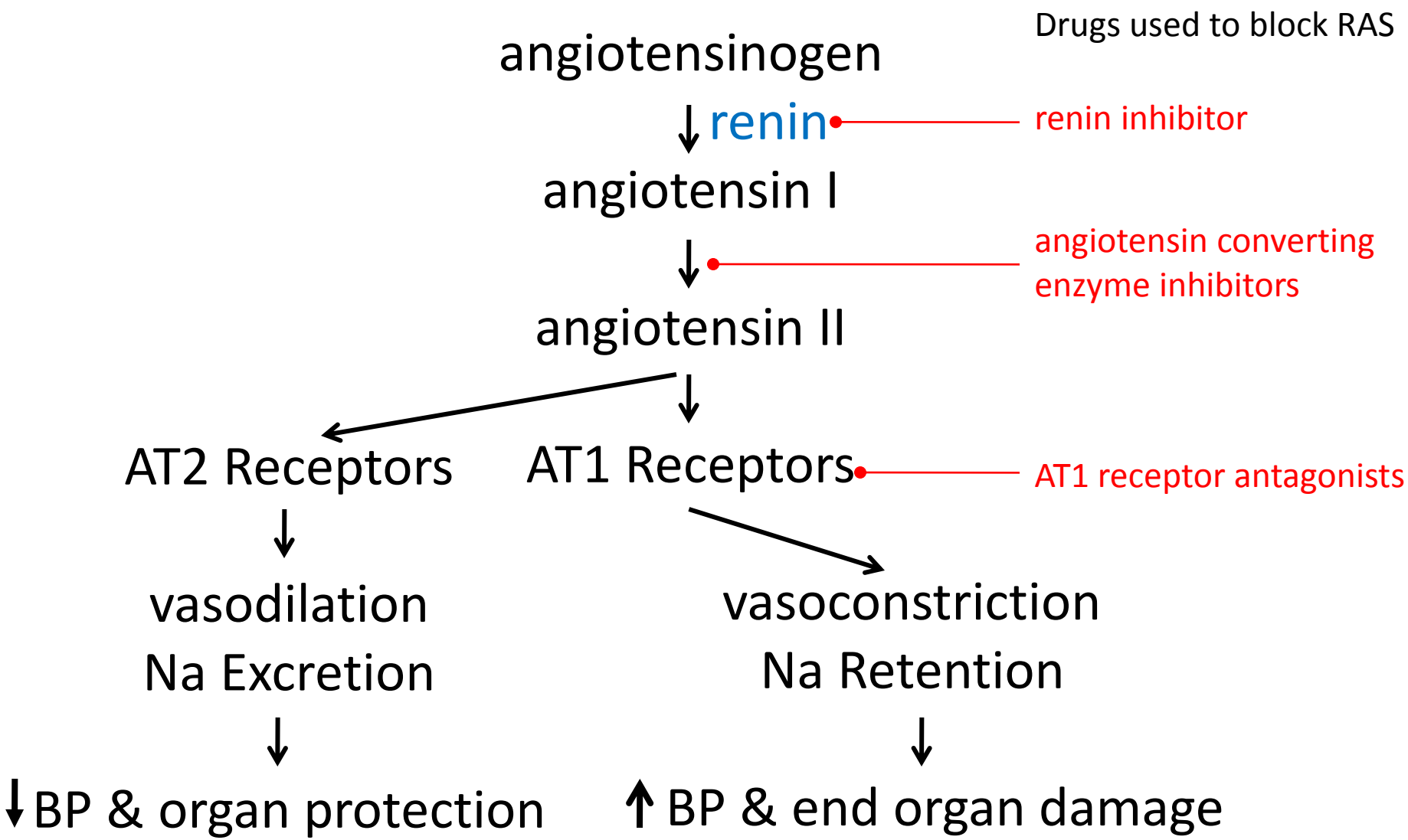
# Prevalence of Hypertension in U.S. Men by Age and Ethnicity




Adapted from Burt et al. *Hypertension* 1995;25:305.

**Hypertension is often called the “silent killer” because many people who are hypertensive don’t know it. Over time, if untreated, high blood pressure can lead to stroke, heart attack, heart failure, kidney and vascular disease.**

# The Renin-Angiotensin System (RAS)

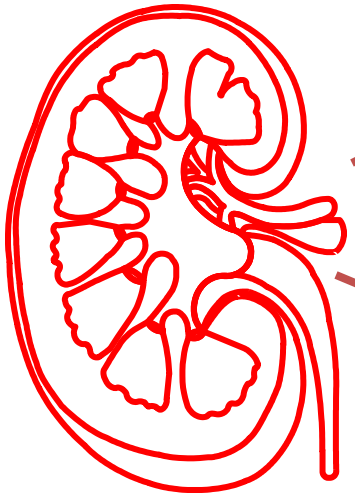


# Investigators

W. Beierwaltes, Ph. D.
O. Carretero, M.D.
J. Garvin, Ph.D.
P. Ortiz, Ph.D.
M. Mendez, Ph.D.

O. Carretero, M.D.
P. Harding, Ph.D.
S. Palaniyandi, Ph.D.
N.-E. Rhaleb, Ph.D.
E. Shesely, Ph.D.
X.-P. Yang, M.D.

# Role of the Kidney in Blood Pressure Regulation

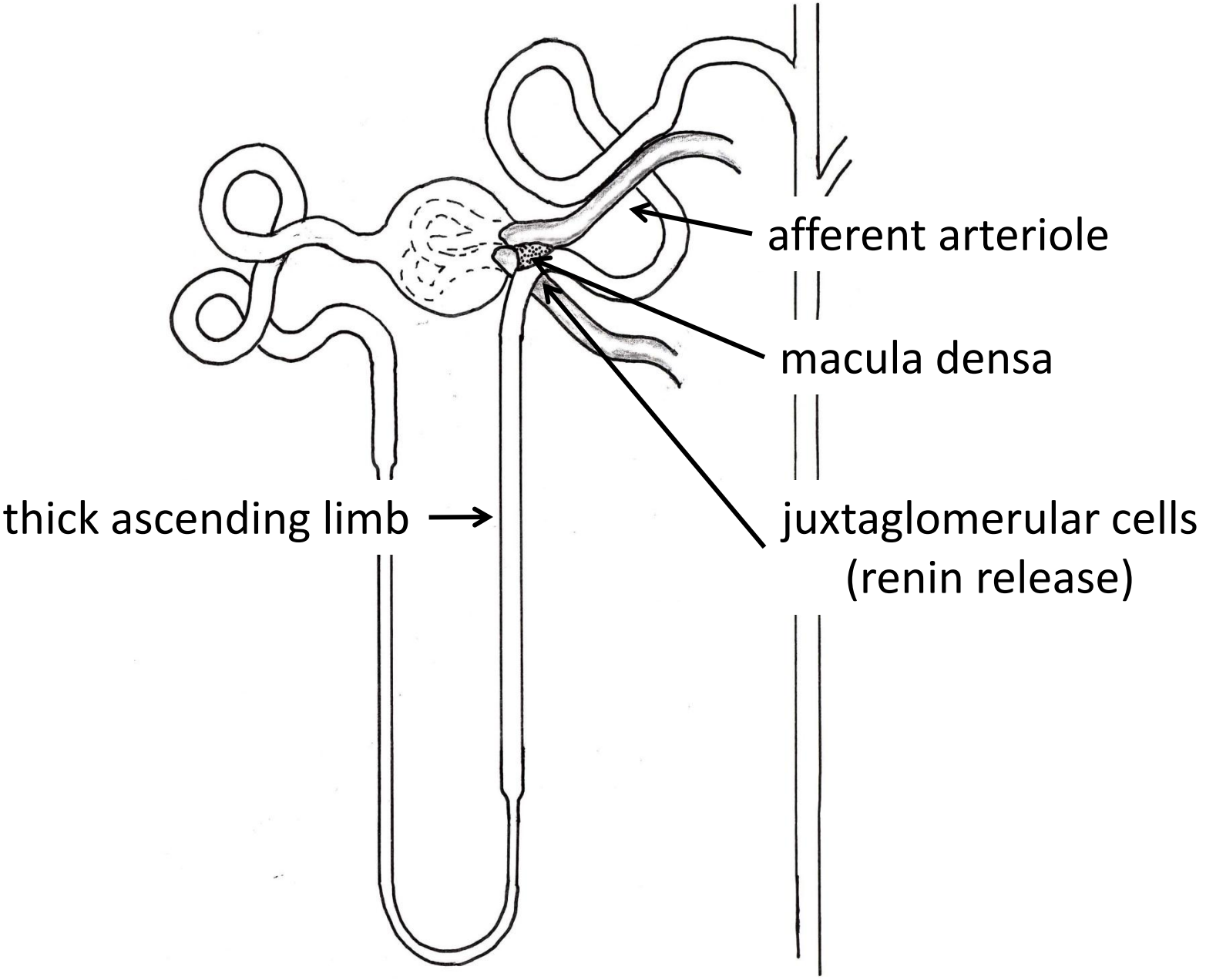


ECF Volume → Blood Volume → Stroke Volume

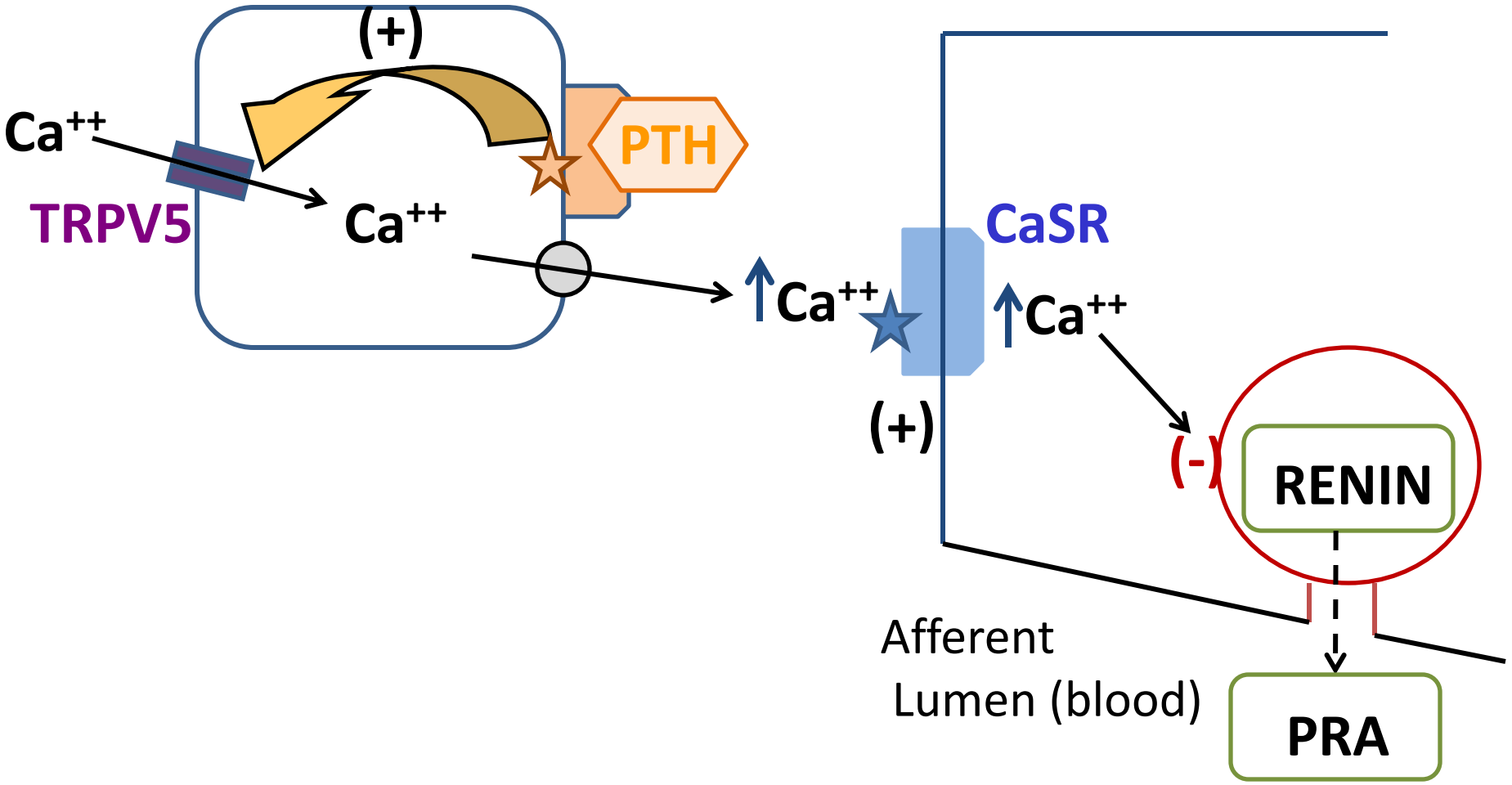
Humoral → TPR

TPR X CO = Blood Pressure

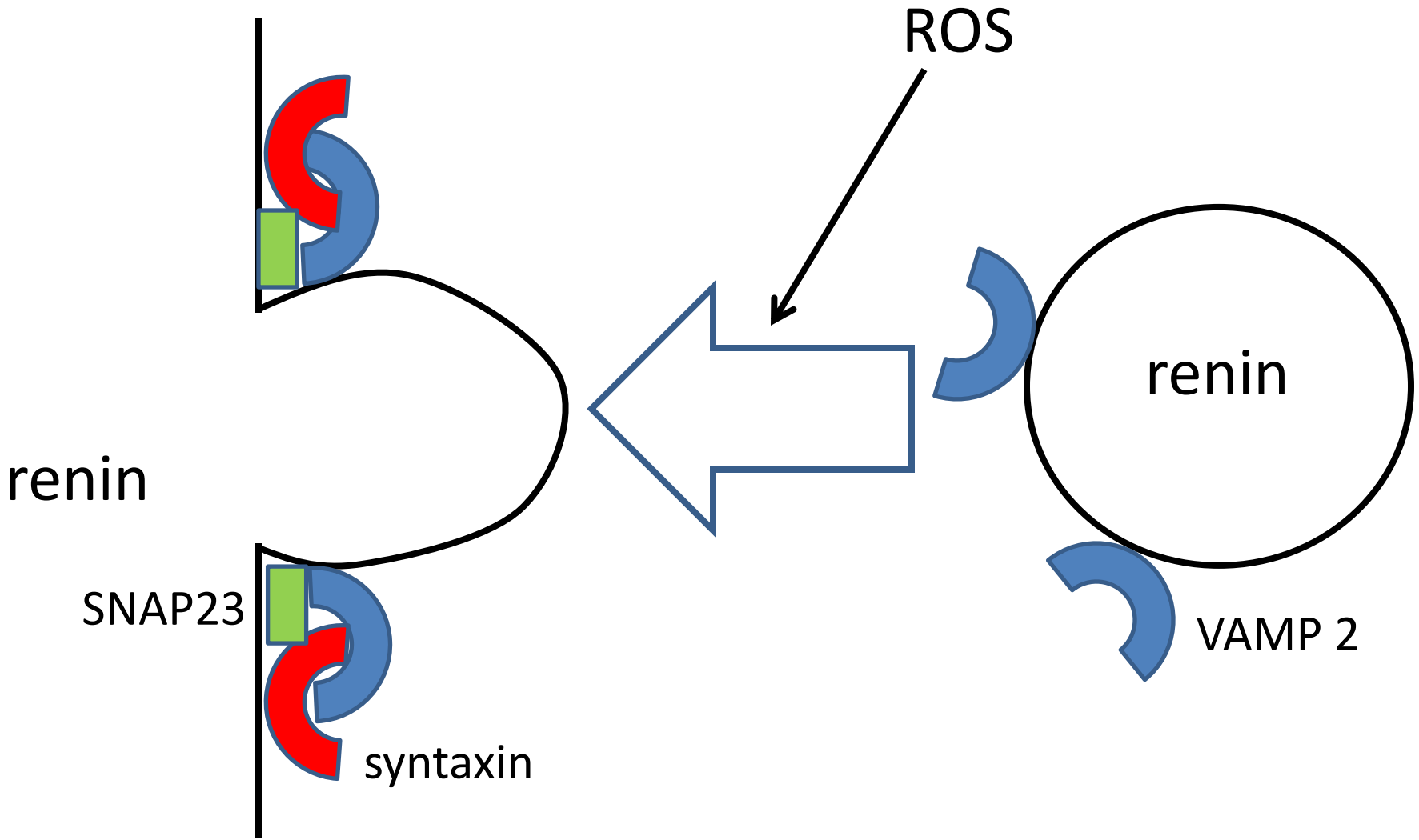
# The renal nephron



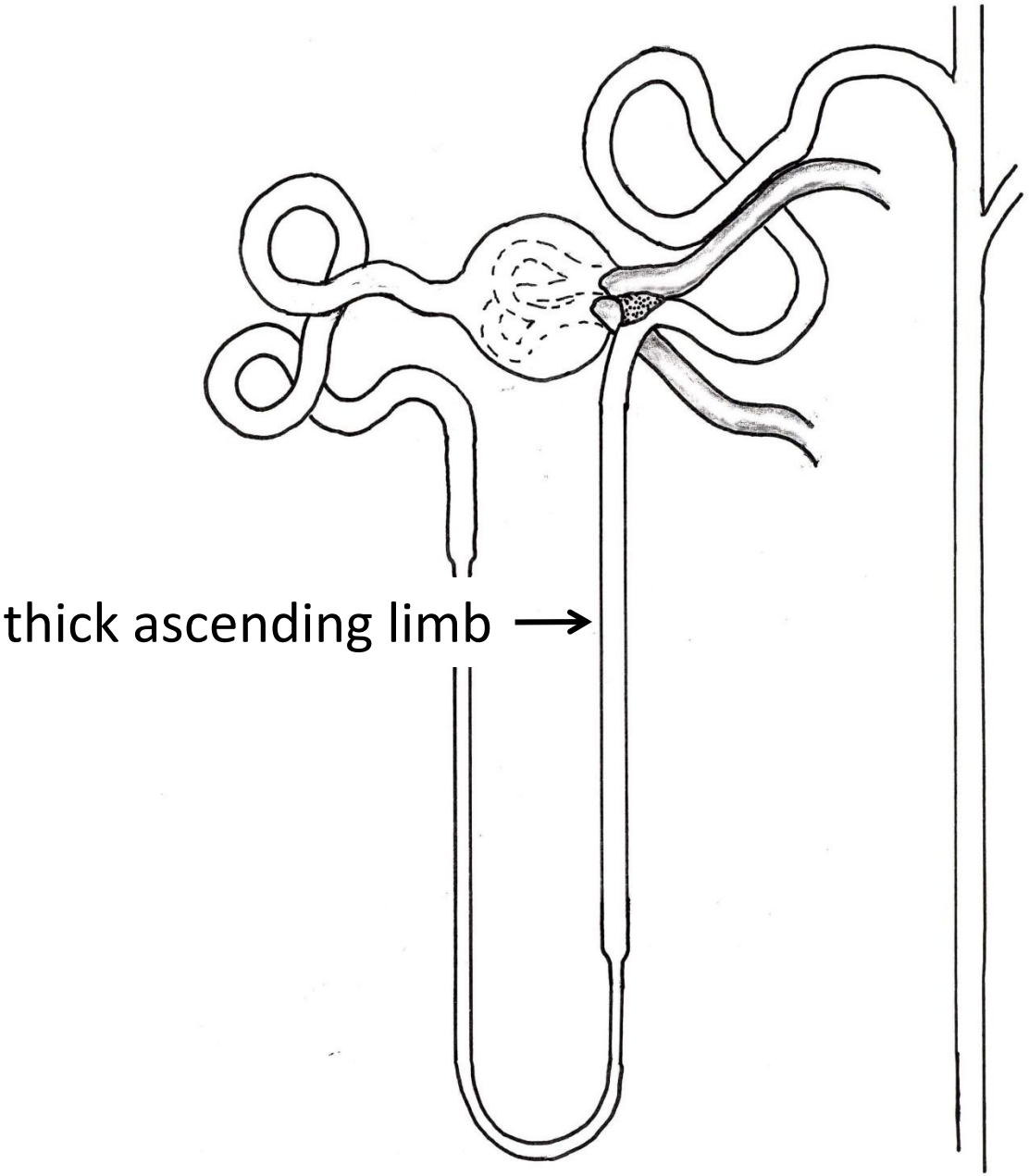
# William Beierwaltes: Calcium regulation of renin release



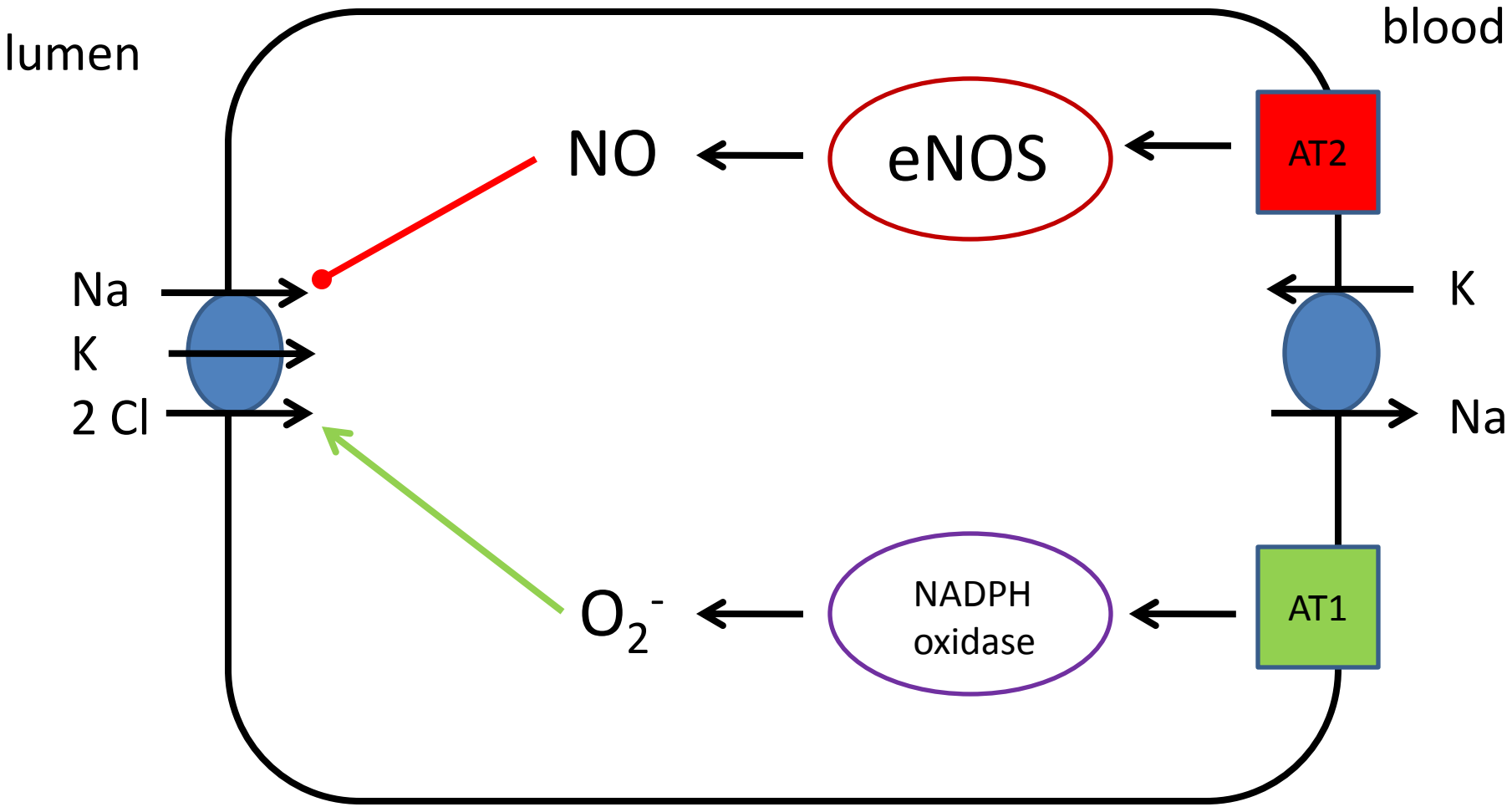
Mariela Mendez: Molecular mechanisms of renin release



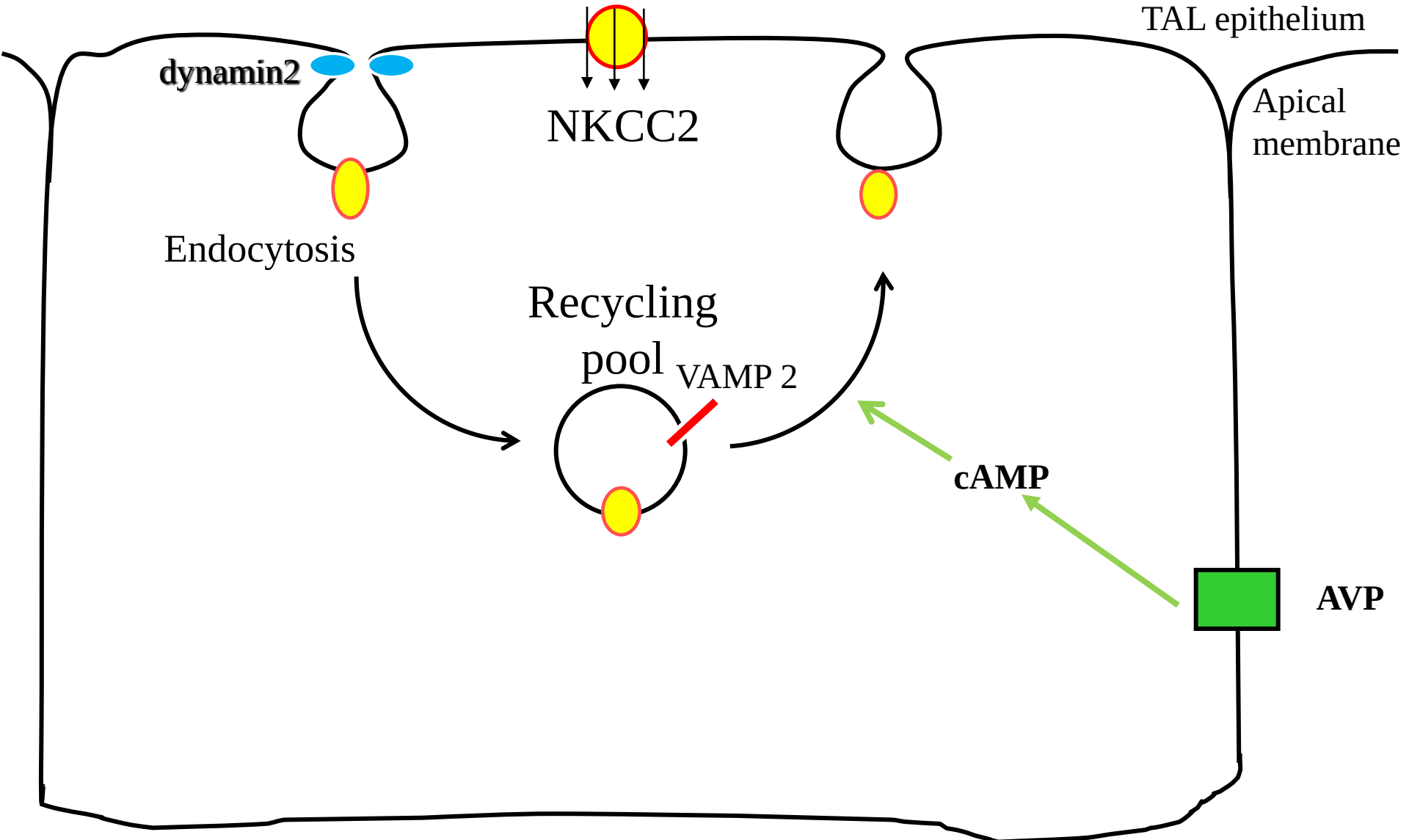
# The renal nephron



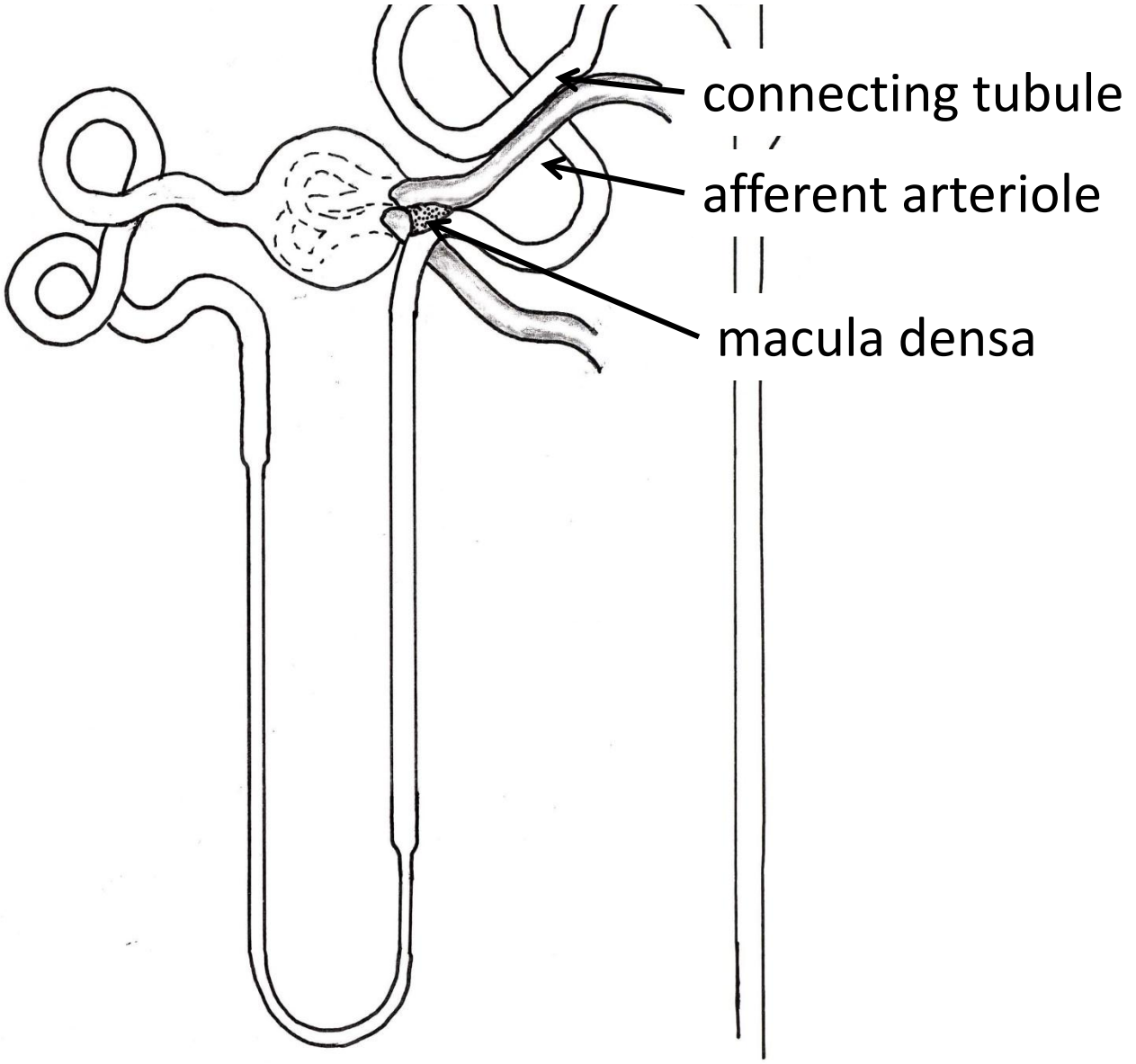
Jeffrey Garvin: Regulation of thick ascending limb transport by NO and $O_2^-$



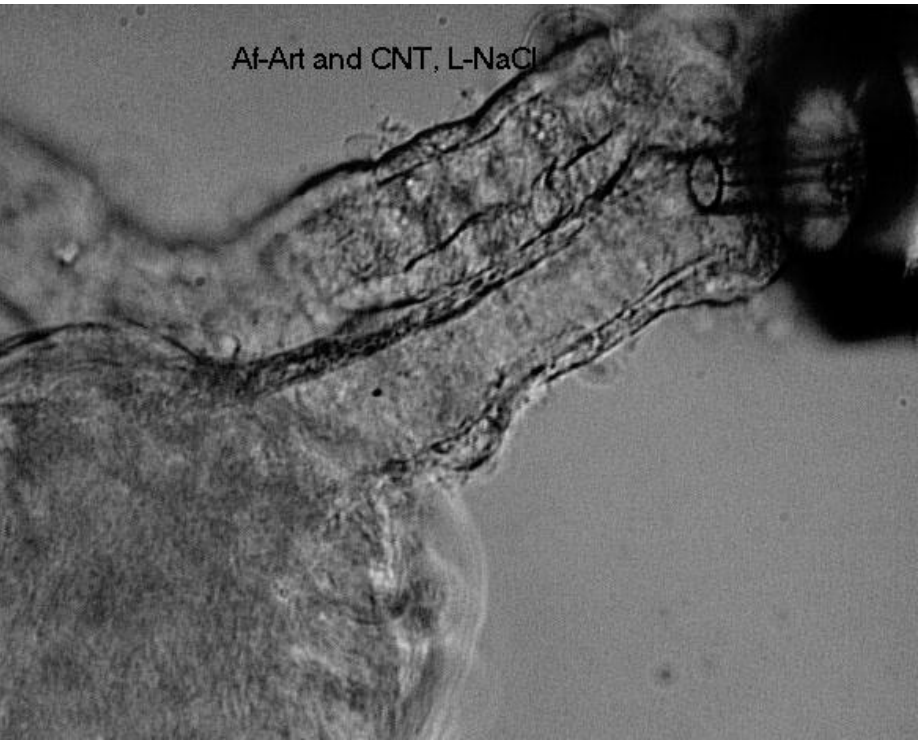
Pablo Ortiz: Trafficking of the Na/K/2 Cl cotransporter and changes caused by hypertension

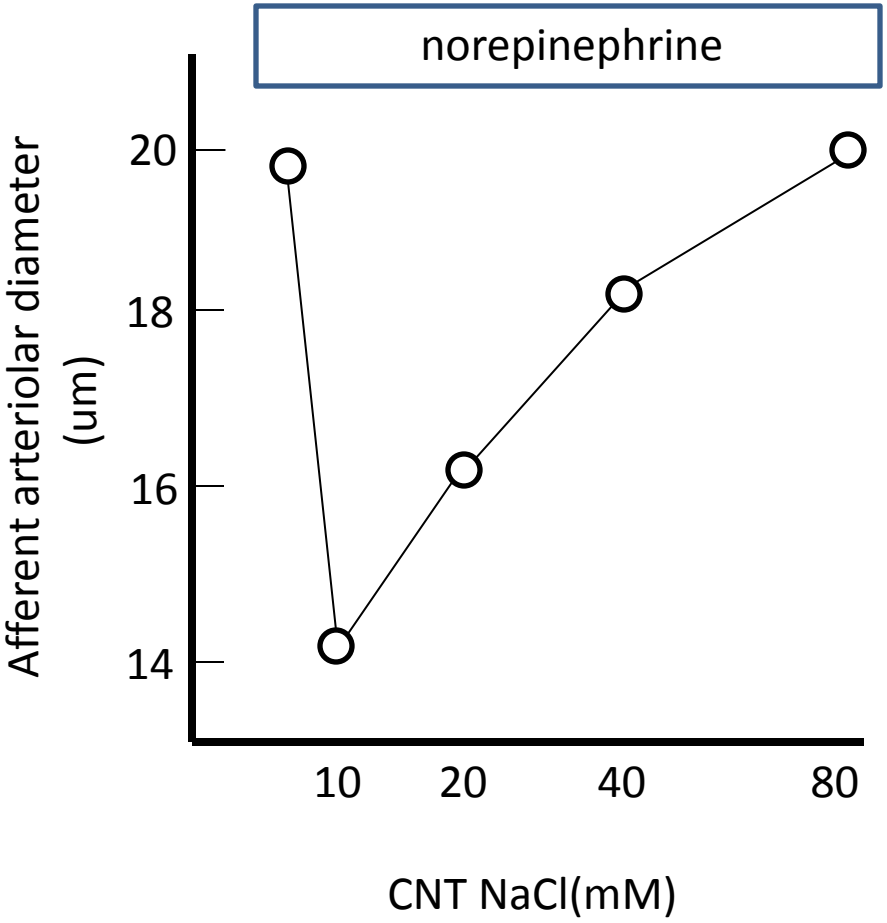


O. Carretero and J. Garvin: Regulation of the renal microvasculature by nephron NaCl absorption



# Connecting tubule glomerular feedback



End Organ Damage

# Oscar Carretero: Ac-SDKP reduces inflammation and end organ damage caused by hypertension

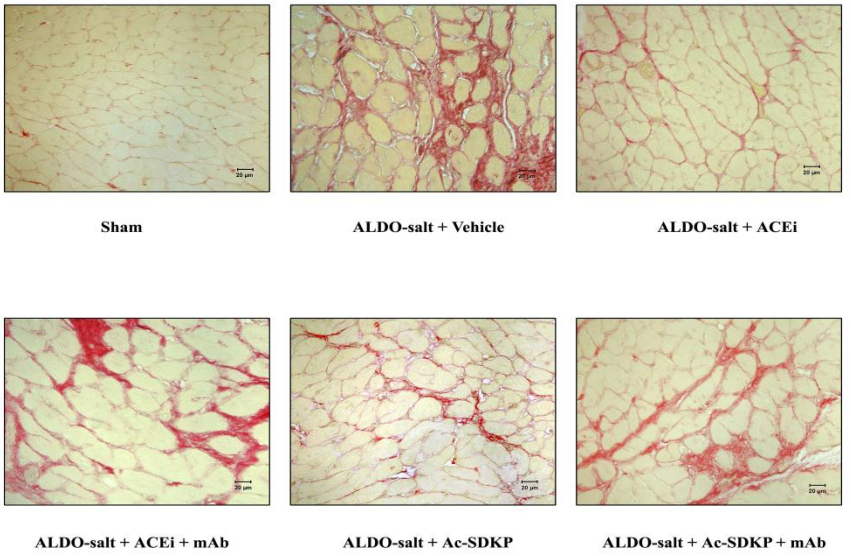
Hypertension

Thymosin β4

Ac-SDKP

Inflammation

Cardiac and renal fibrosis/dysfunction



# Nour-Eddine Rhaleb: Mechanism by which Ac-SDKP prevents end organ damage and identifying its receptor

Ac-SDKP

Receptor

?

Hypertension

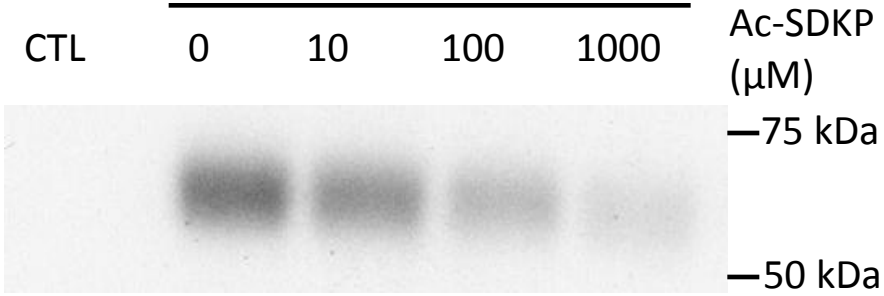
Inflammation

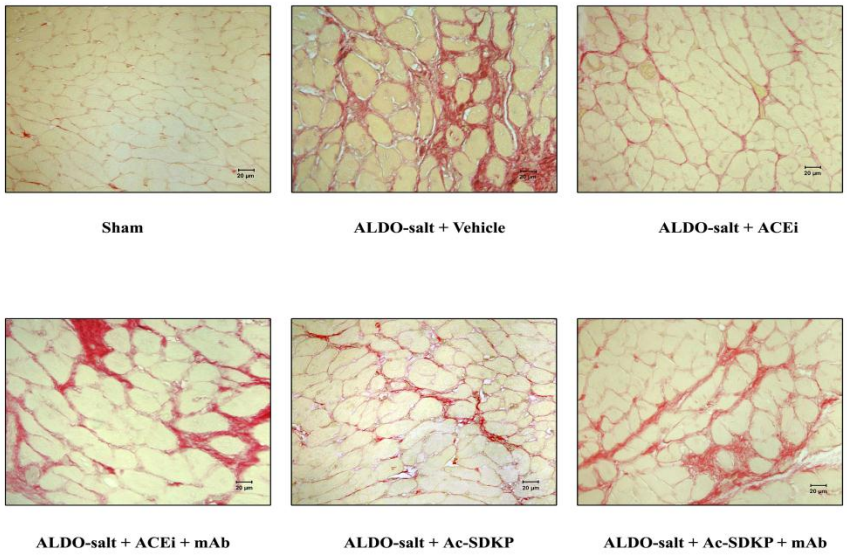
Fibrosis

Dysfunction

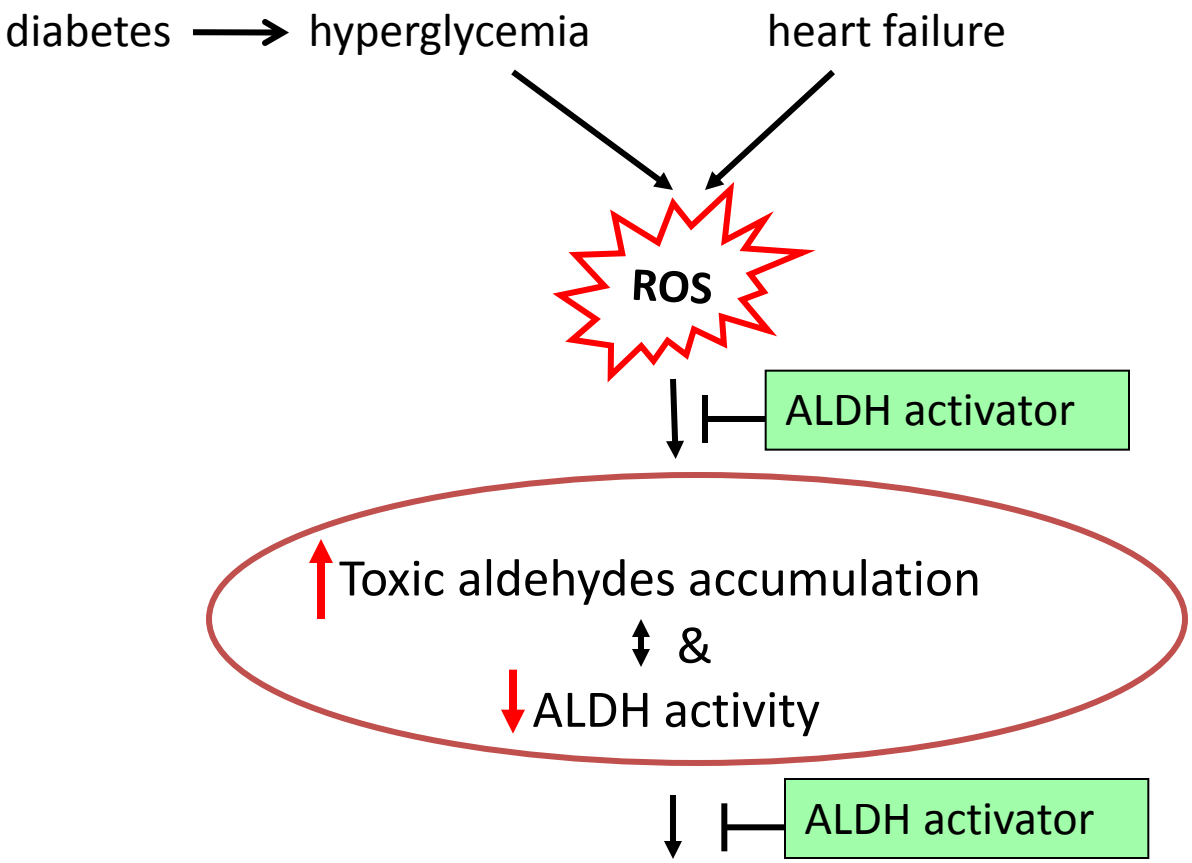
**Rat myocardium**

$^{125}$I-Hpp-Aca-SDKP (1 µM)



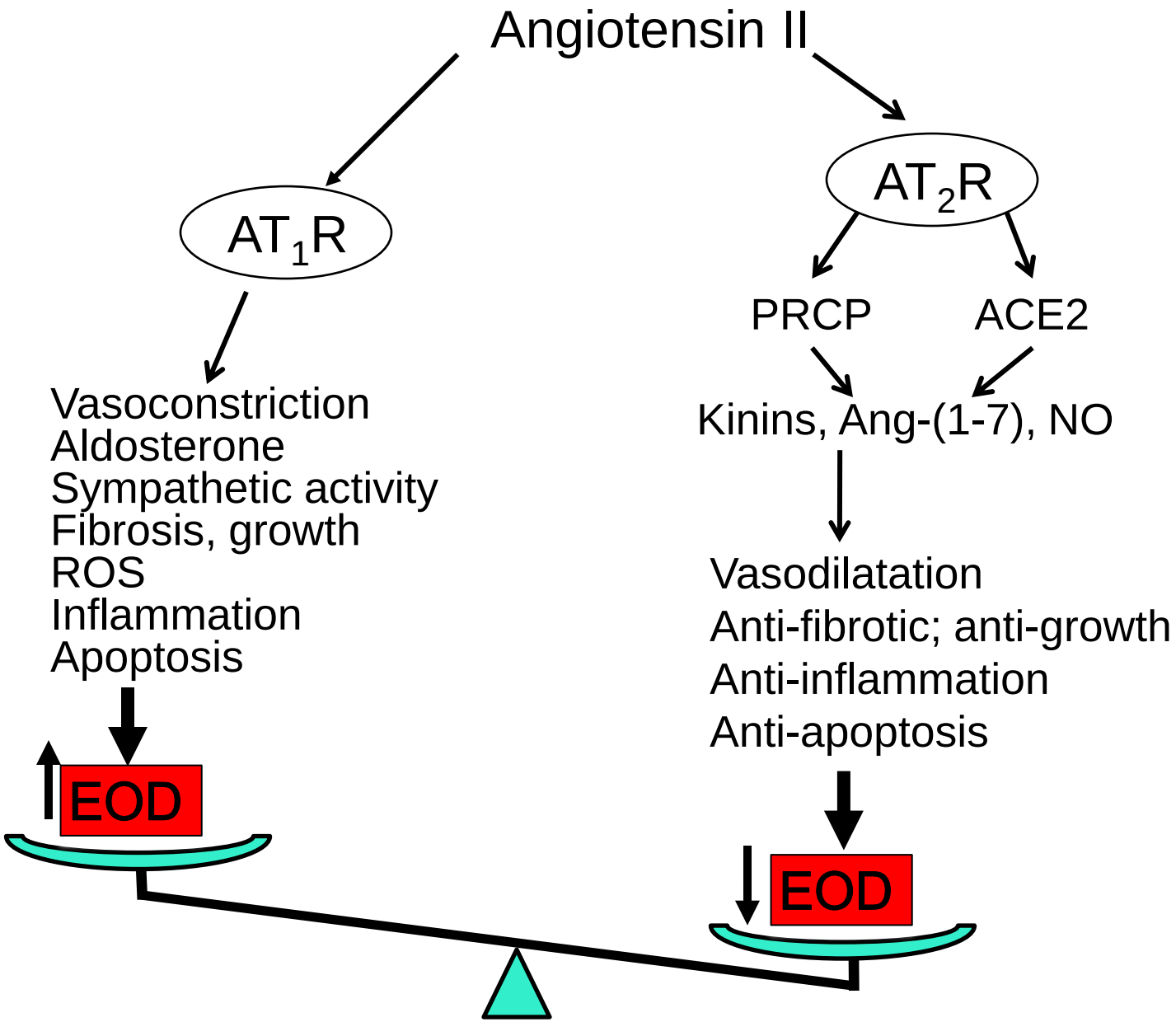



# Suresh Palaniyandi: Role of aldehyde dehydrogenase in protecting the heart from damage

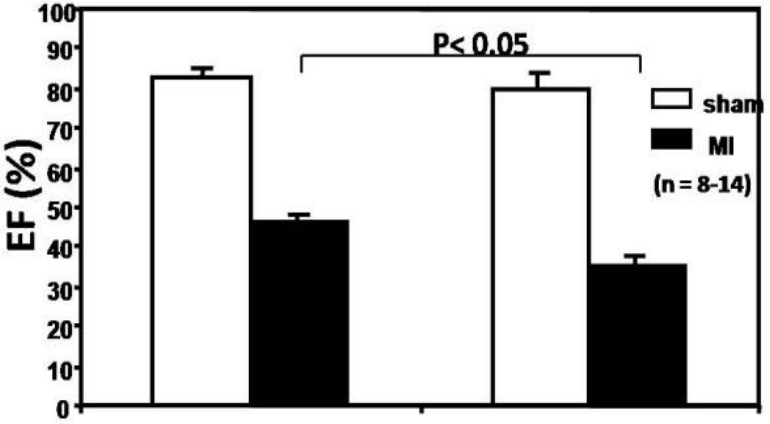


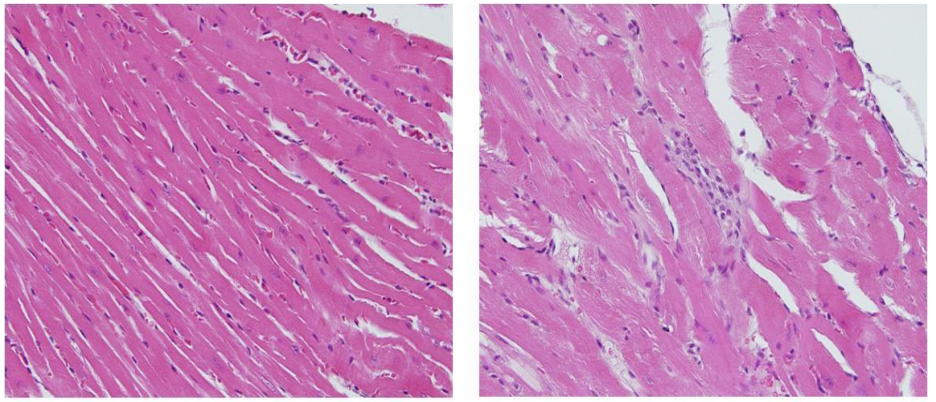

End Organ Damage

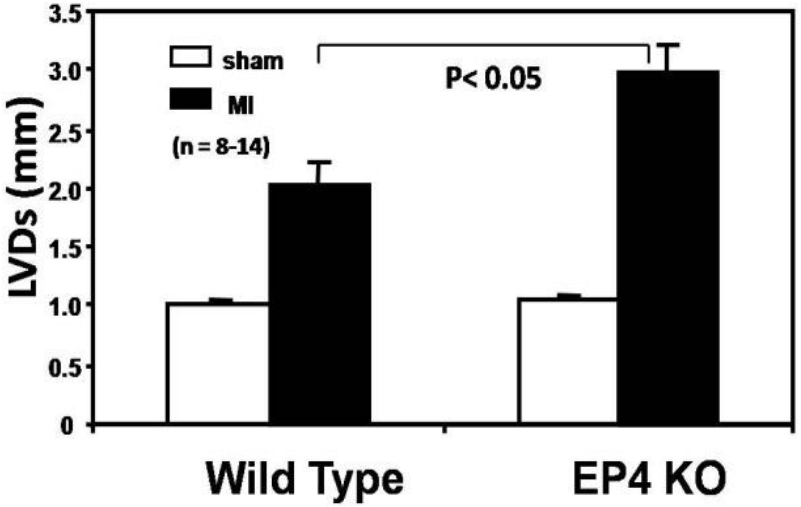
Xiao-Ping Yang: Role of AT2 receptors in cardiac organ damage

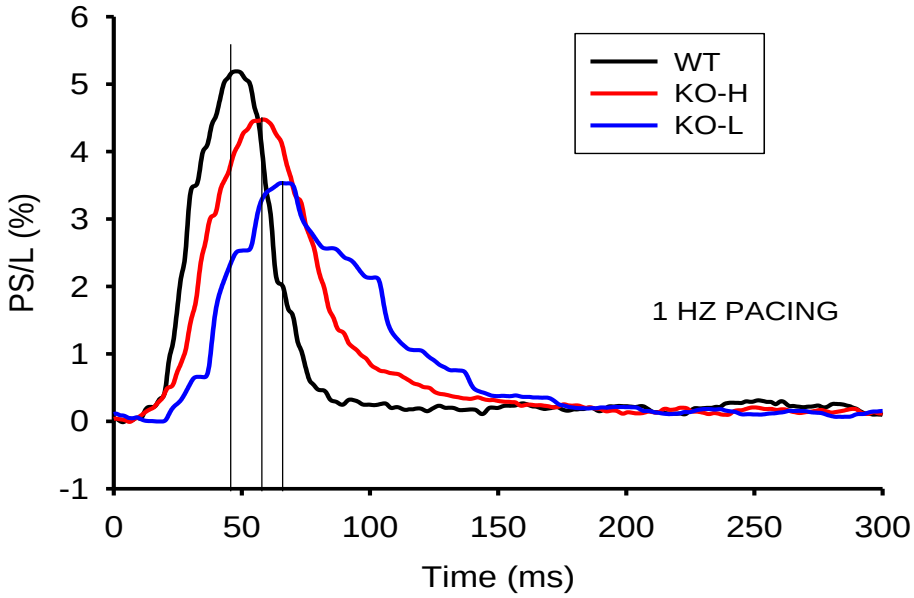


# Pamela Harding: Role of the EP4 receptor in protecting the heart

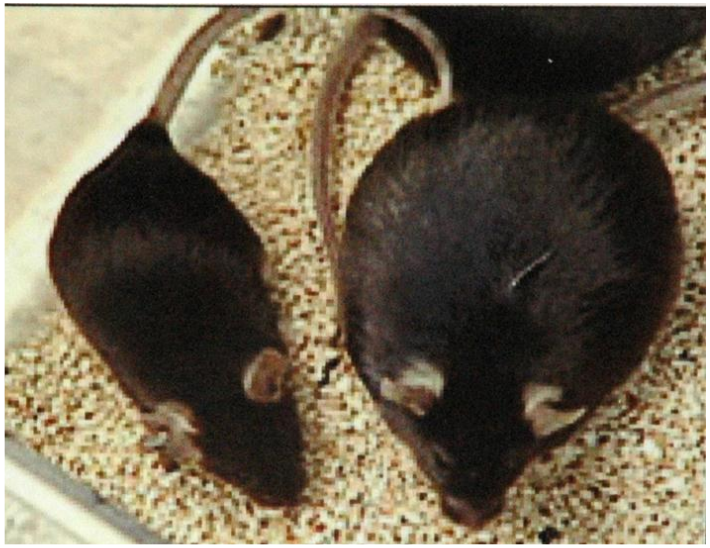


# Edward Shesely, Ph.D.
# Director Mutant Mouse Core



Current strains

AT2 -/y

B1 -/-

B2 -/-

CCCR2 -/-

Galectin 3 -/-

nNOS -/-

e,nNOS -/-

PGE synthase 1 -/-

EP4 -/- cardiac specific

VAMP 3 -/-

VAMP 8 -/-

NFκβ luciferase

# Funding

| NIH | Amount |
|---|---|
| J.L. Garvin | |
| Blood pressure regulation: Novel roles of the kidney | $10,271,900 |
| Salt-sensitive hypertension: Role of renal superoxide | $ 1,318,500 |
| O.A. Carretero | |
| Vasoactive autacoids in blood pressure regulation | $12,529,465 |
| Regulation of the renal microcirculation | $ 1, 174,500 |
| Mariela Mendez | |
| Molecular mechanism of renin release: Role of SNARES | $ 176,046 |
| | |
| American Heart Association | |
| Pablo Cabral | |
| TRPV4 channels mediate flow-induced NO production | $ 98,476 |
| Vanesa Ramseyer | |
| Effects of endothelin-1 on thick ascending limb transport | $ 52,000 |
| Paulo Caceres | |
| Role of VAMP2, SNAP-23 and syntaxin 3 on NKCC2 trafficking | $ 52,000 |
| | |
| Other Funding | $ 312,376 |