

Mecanismos Vasomotores

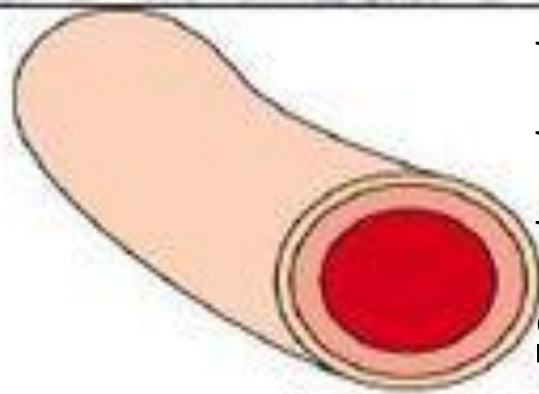
Prof. Dr. Mag. Rafael Porcile

**DEPARTAMENTO DE CARDIOLOGIA
CATEDRA DE FISIOLÓGIA**

Universidad Abierta Interamericana

VASOCONSTRICCIÓN Y VASODILATACIÓN SISTÉMICA

Normal arteriolar tone

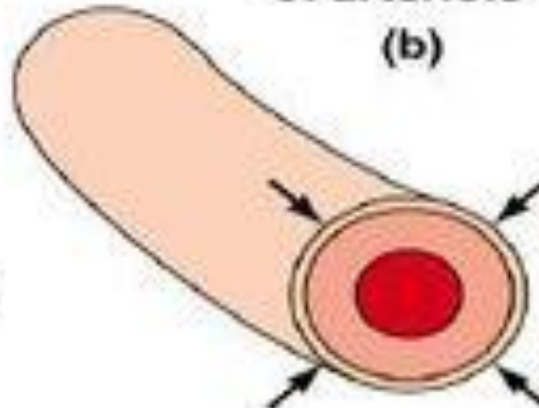


Cross section
of arteriole

(b)

Vasoconstriction

(increased contraction of circular smooth muscle in the arteriolar wall, which leads to increased resistance and decreased flow through the vessel)



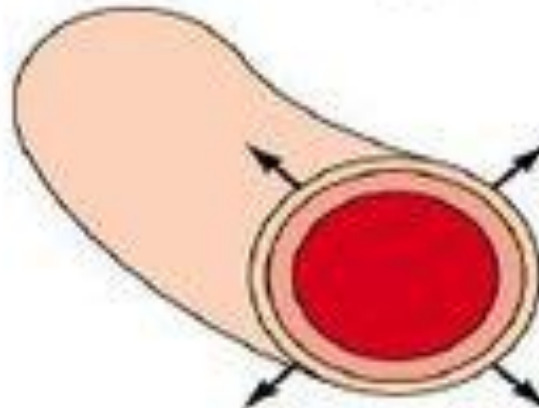
(c)

Caused by:

- ↓ Myogenic activity
- ↓ Oxygen (O_2)
- ↓ Carbon dioxide (CO_2) and other metabolites
- ↑ Sympathetic stimulation
- Vasopressin; angiotensin II
- Cold

Vasodilation

(decreased contraction of circular smooth muscle in the arteriolar wall, which leads to decreased resistance and increased flow through the vessel)



(d)

Caused by:

- ↓ Myogenic activity
- ↓ O_2
- ↑ CO_2 and other metabolites
- ↓ Sympathetic stimulation
- Histamine release
- Heat

Dos universos asociados

• **Endotelio**

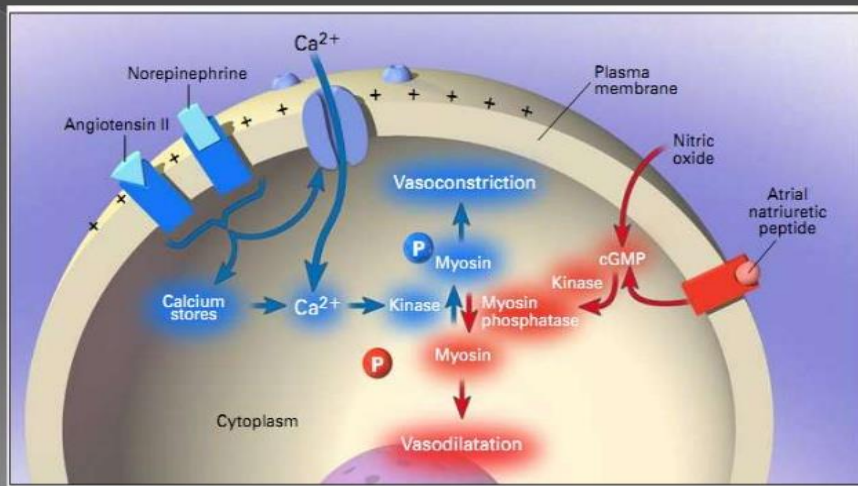
• **Musculo vascular**

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GMPc

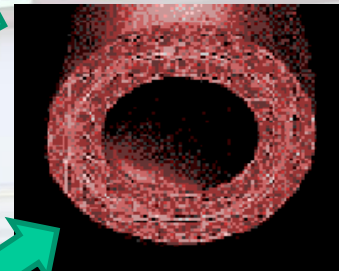
Calcio



AMP c

**Fosforilación
Catalítica cadena
liviana miosina**

α



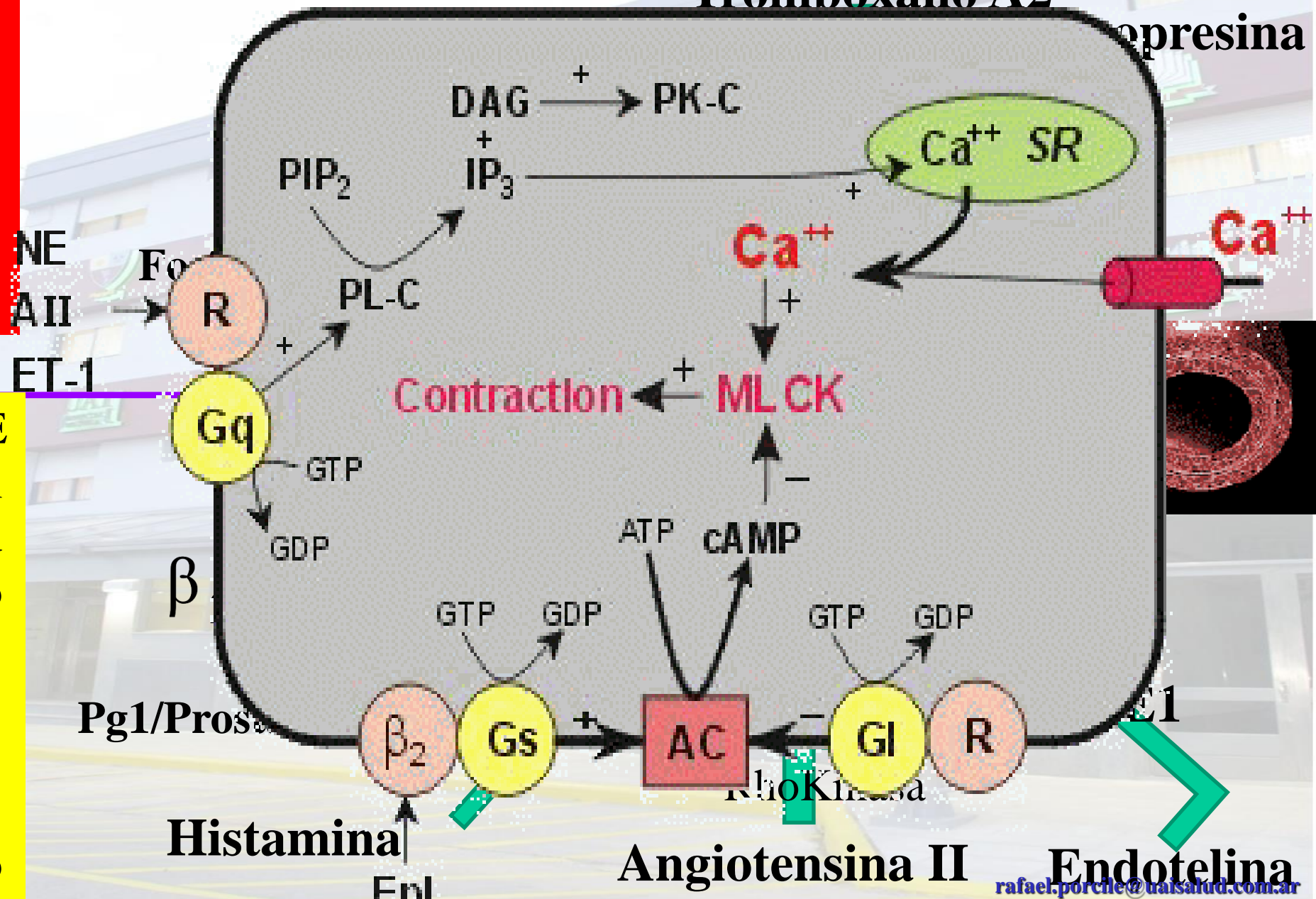
Angiotensina II Tromboxano A2

Oxido Nítrico

opresina

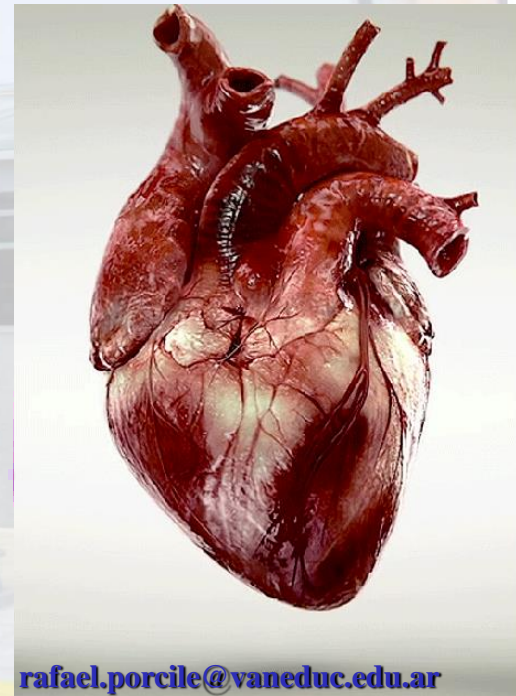
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Bases moleculares de la contracción

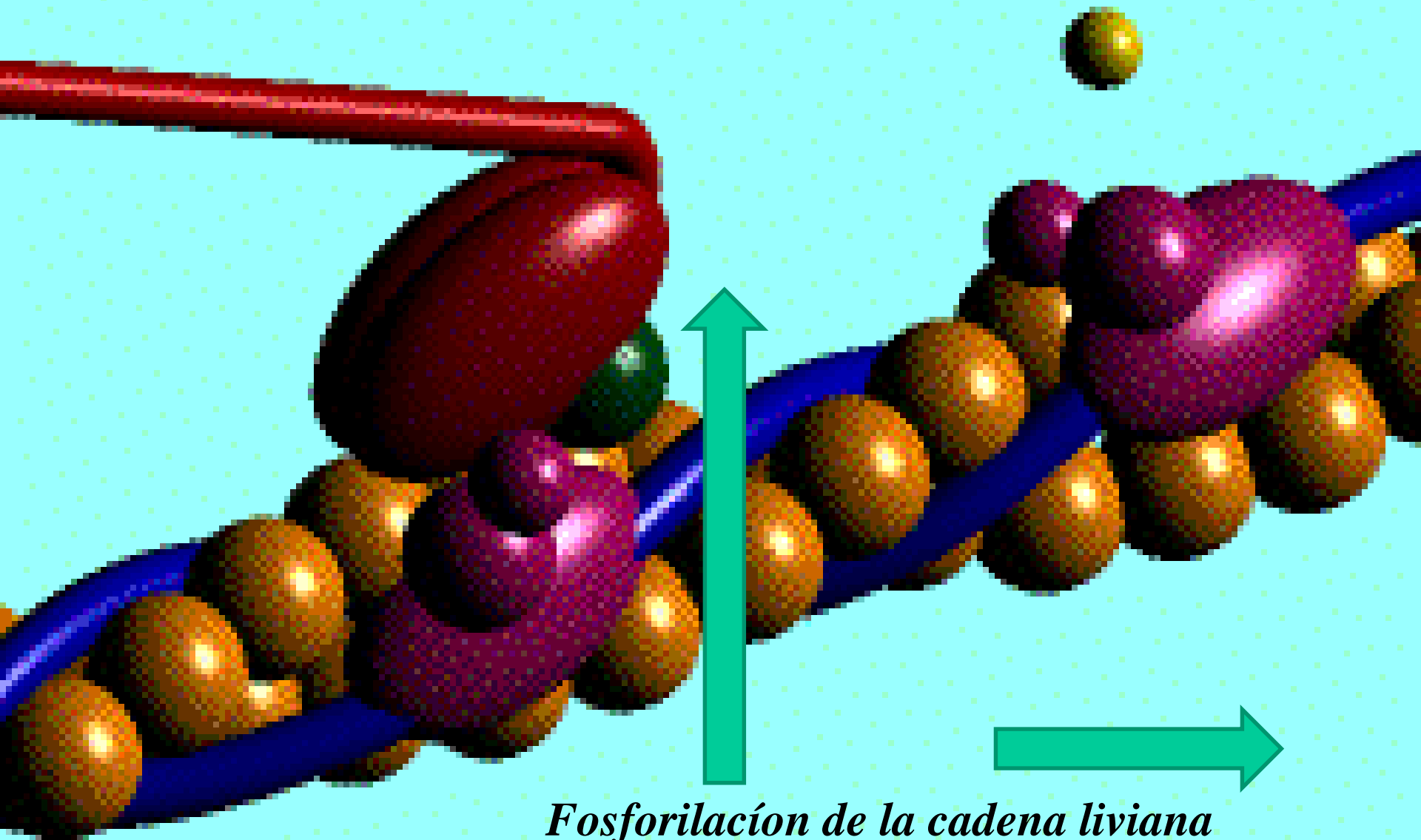
- Liberación de Ca de las cisternas al sarcoplasma
- Unión del Ca a la troponina c



Bases moleculares de la contracción

CAMBIO DE LA CONFORMACIÓN DE LA
ESTRUCTURA TERCIARIA
DE LA ACTINA DESCUBRIENDO
EL SITIO DE PUENTE

Ca = Twist de la actina



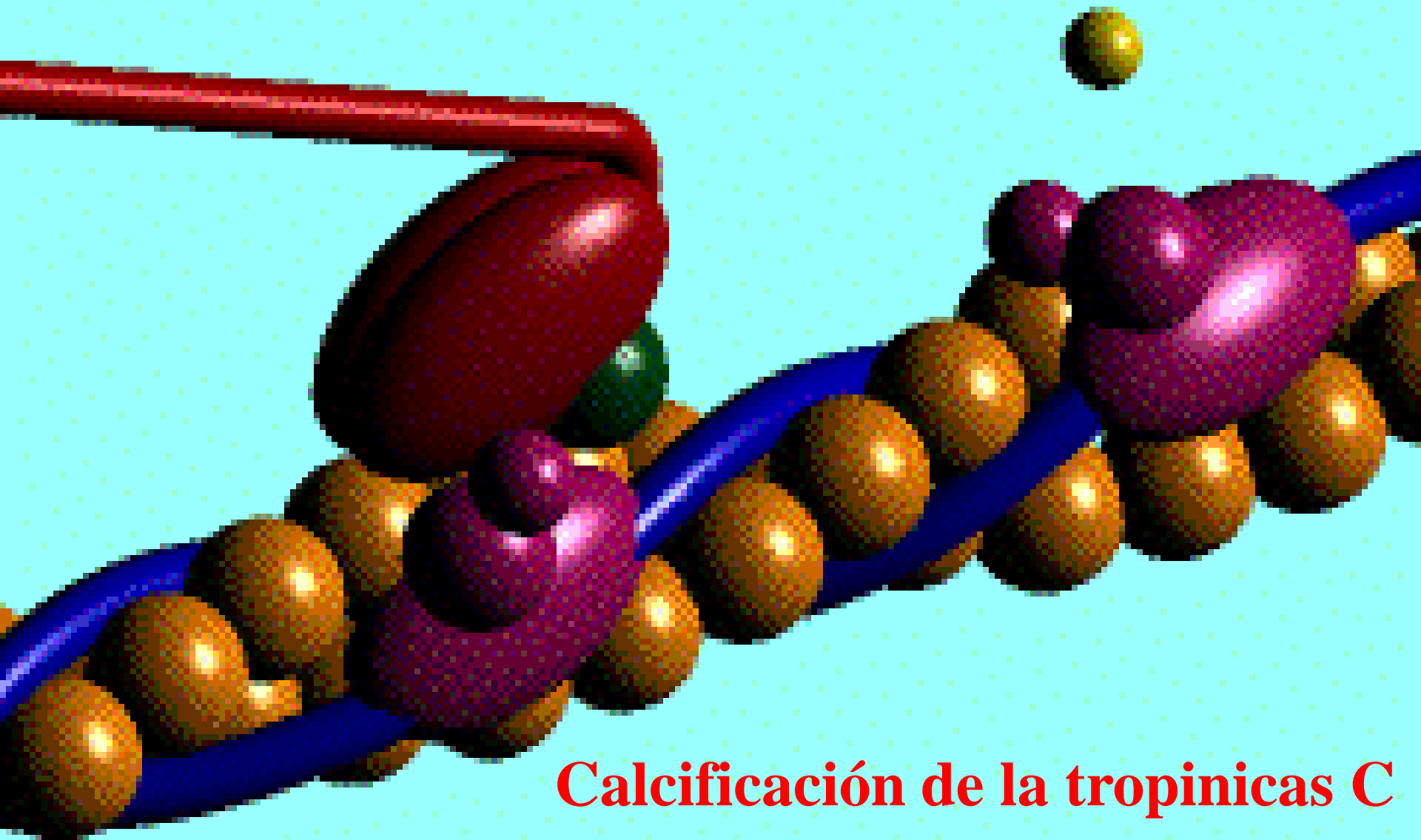
*Fosforilación de la cadena liviana
de la miosina*

Bases moleculares de la
contracción

Fosforilación de la
cadena liviana de la
miosina

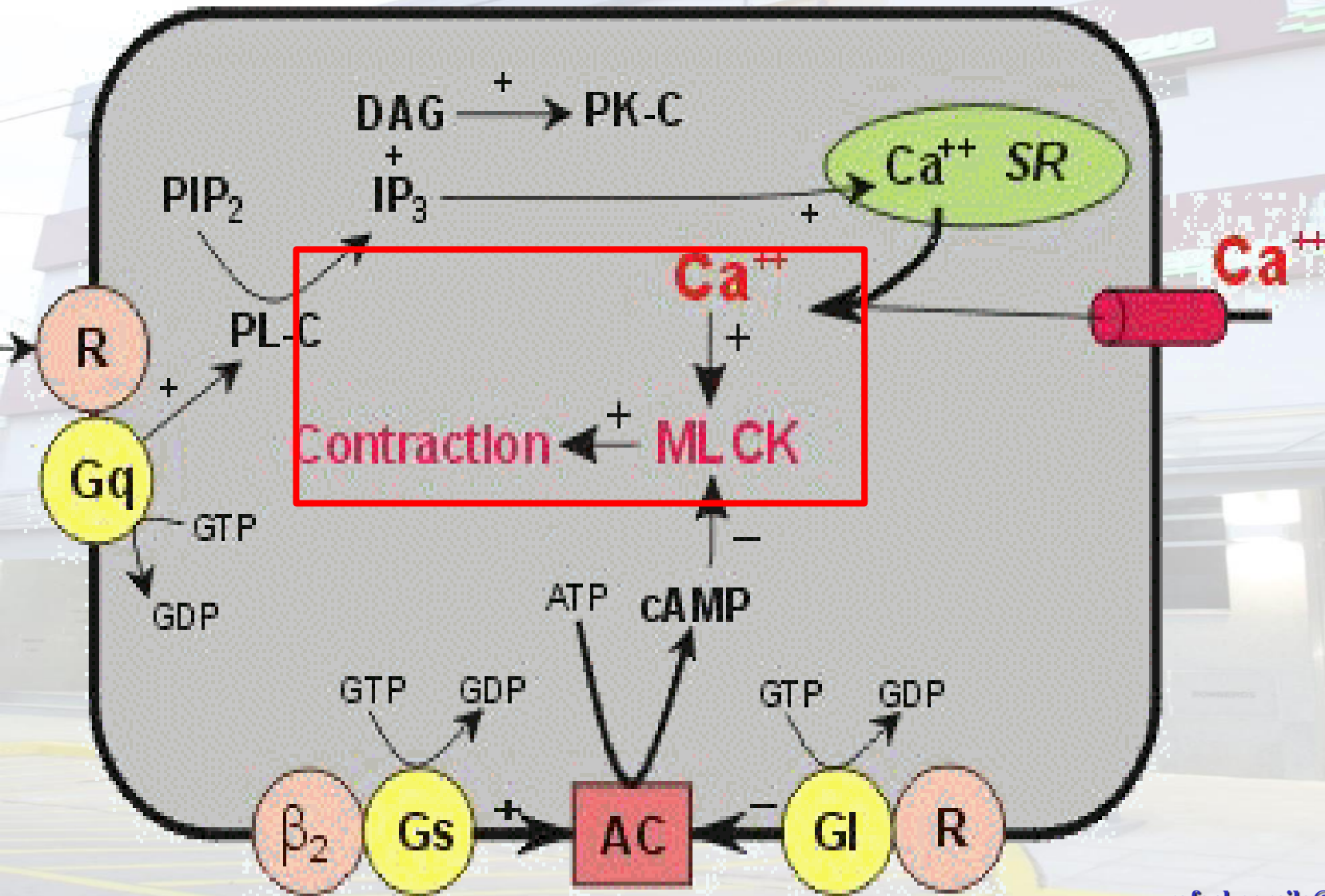
P = Twist de la Miosina

Fosforilación de la miosina

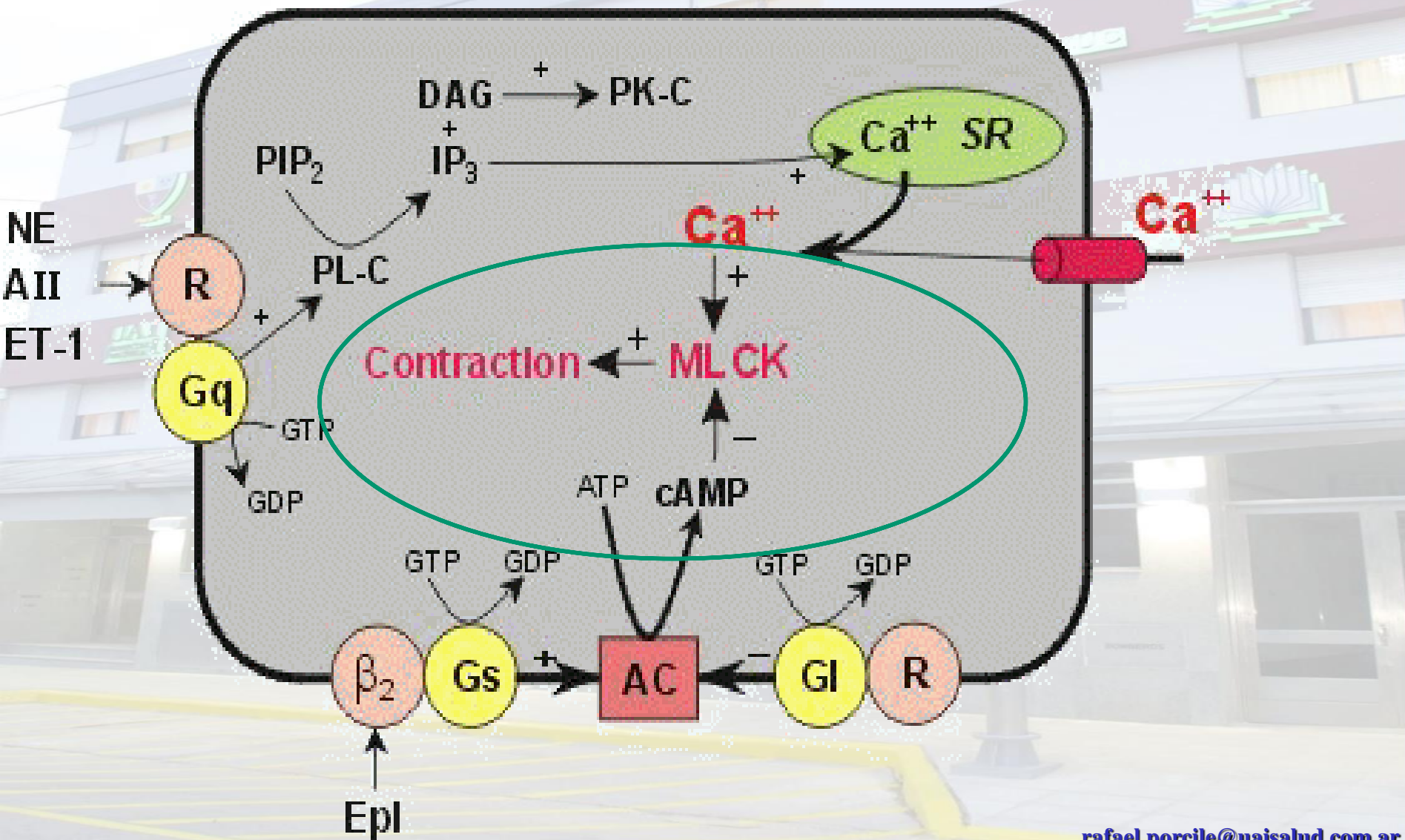


Calcificación de la tropinicas C

Mas Calcio mas actividad e la cadena liviana de la miosina

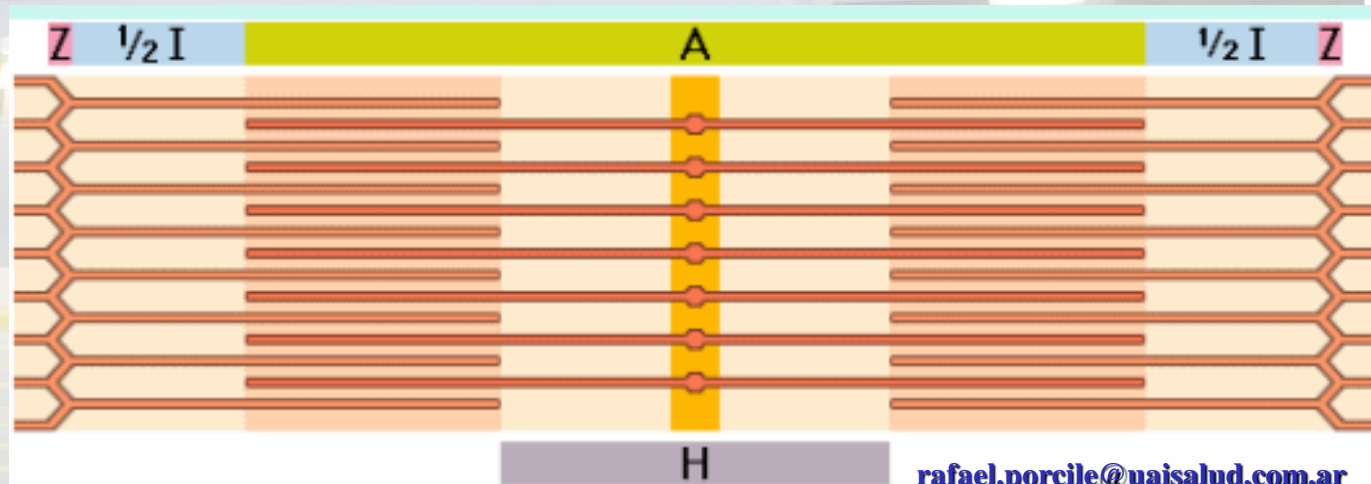


Fosforilación de la Kinasa de cadena liviana de la miosina



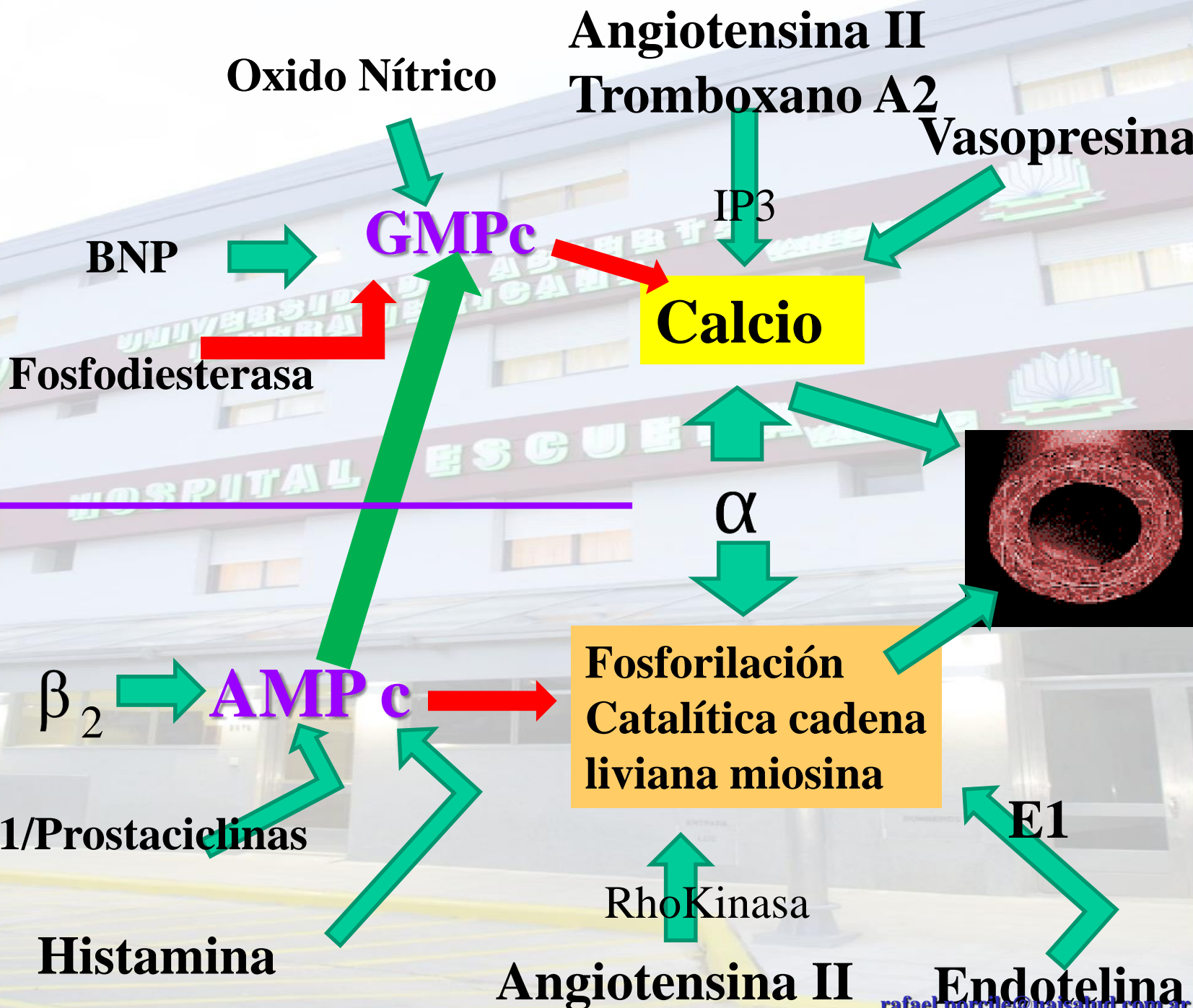
¿Como condicionar la fisiología contracción muscular?

- Regulando el calcio citoplasmático
- Regulando la fosforilación de la cadena de miosina

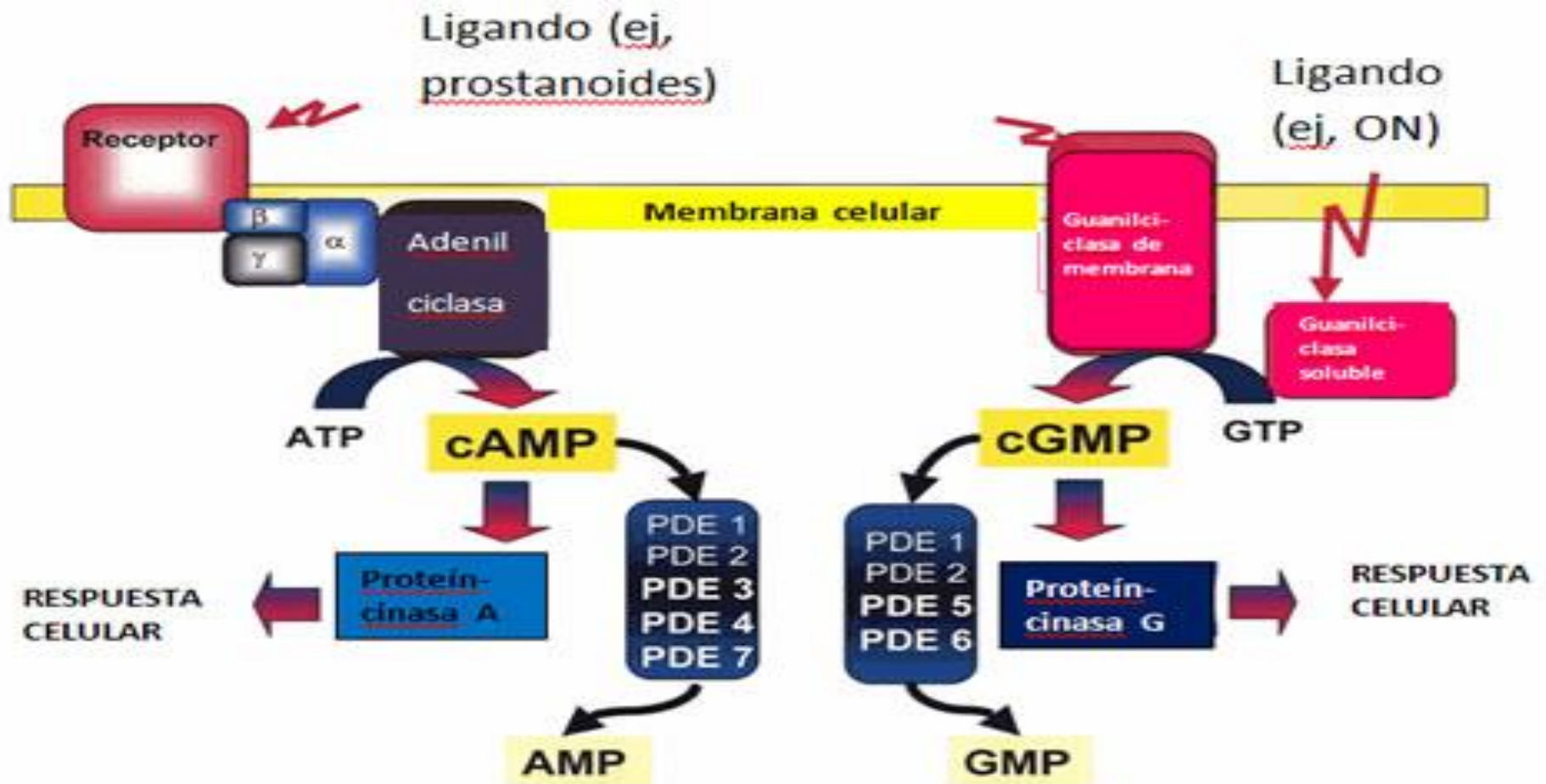


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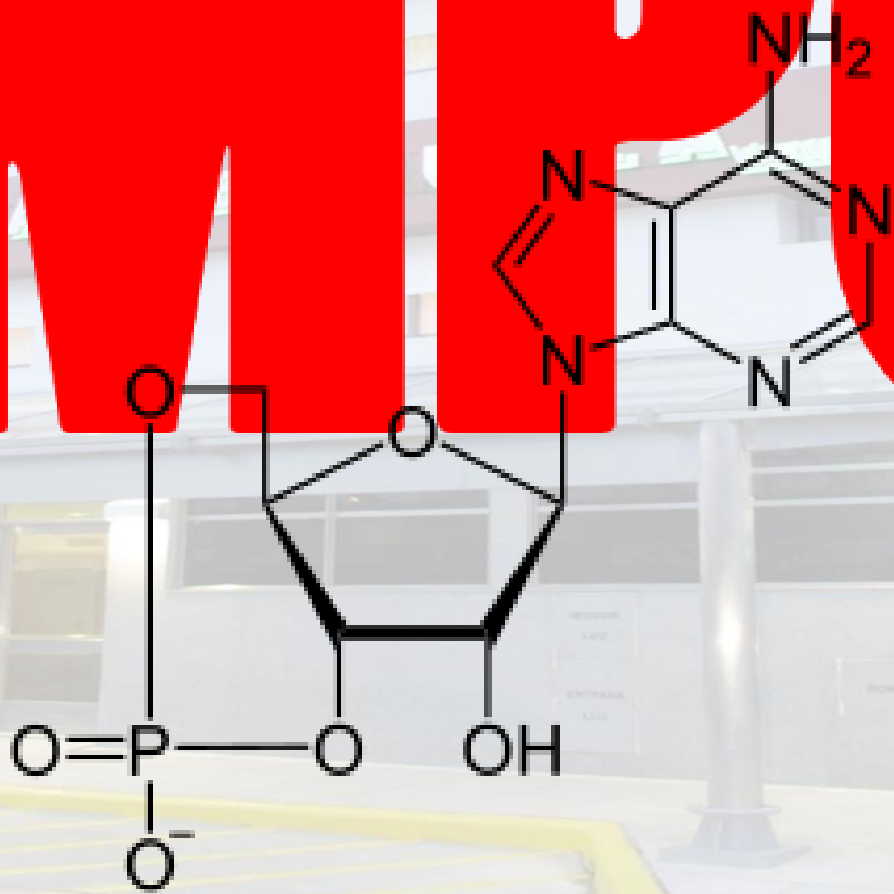
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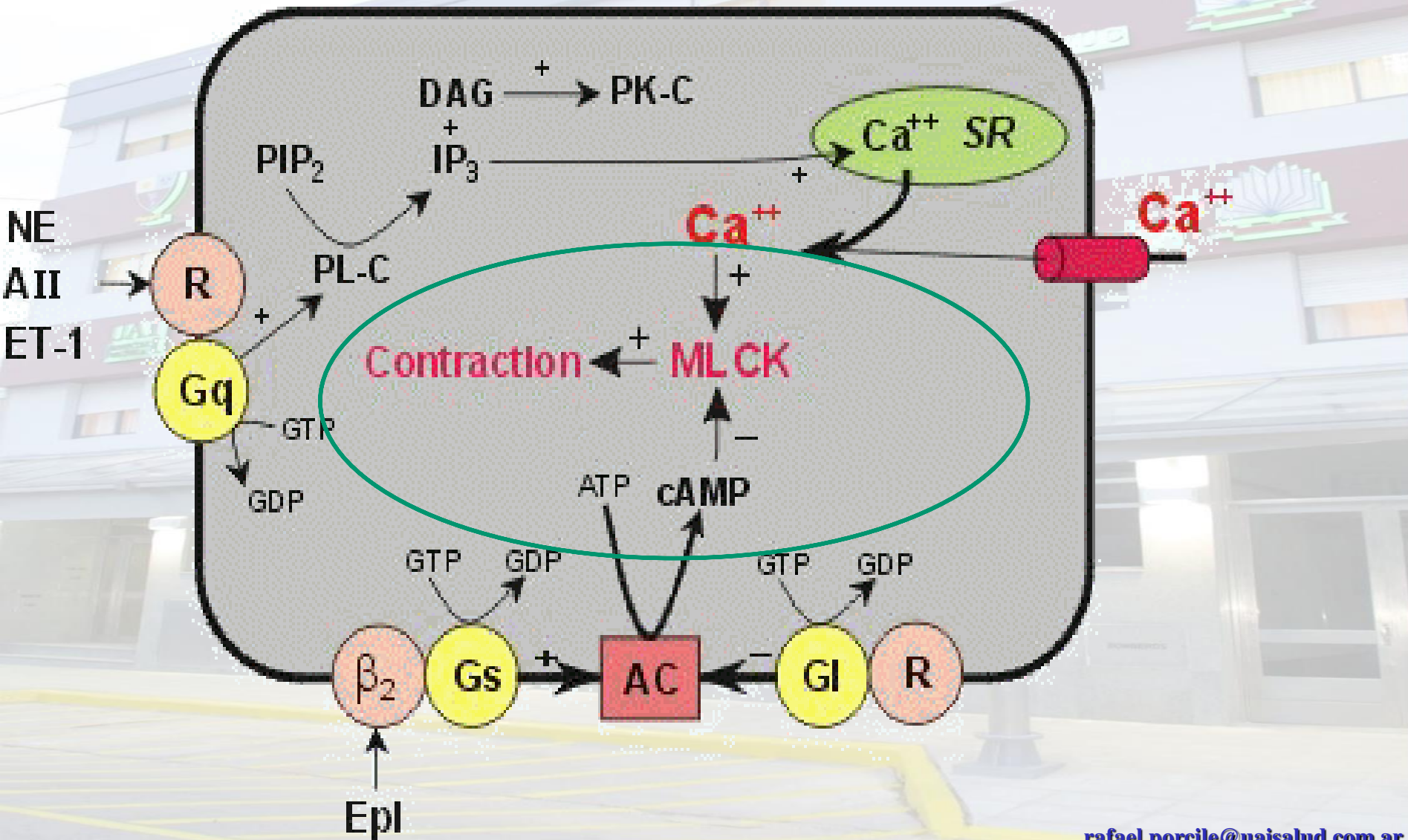
AMPC y GMPc : control del tono del músculo liso vascular Aquellos agentes que incrementan los niveles intracelulares de AMPC o de GMPc relajan los anillos de arteriales previamente contraídos con agonistas

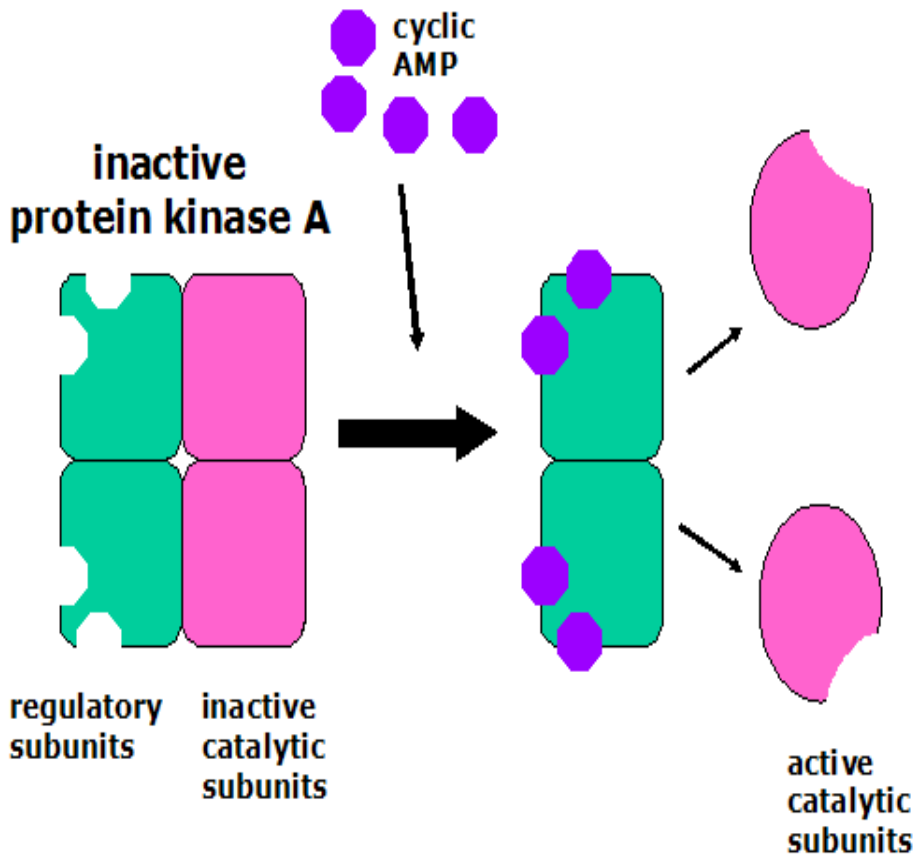


AMP

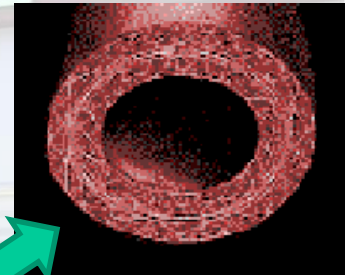


Fosforilación de la Kinasa de cadena liviana de la miosina





**AMPc inactiva
la cadena
liviana de la
miosina**



**Cadena
liviana miosina**

β_2 → **AMP c** →

Pg1/Prostaciclina

Histamina

Inductores de AMP cíclico

- B2

- Prostaglandinas

- Histamina

PROSTAGLANDINAS

PGI 2



ADENILATOCICLASA



ATP



AMPc



Fosforilacion de Kinasas de cadena liviana de miosina



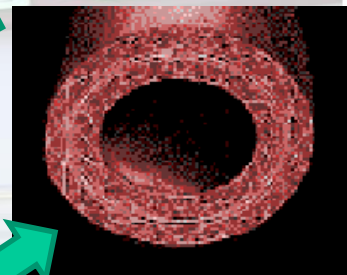
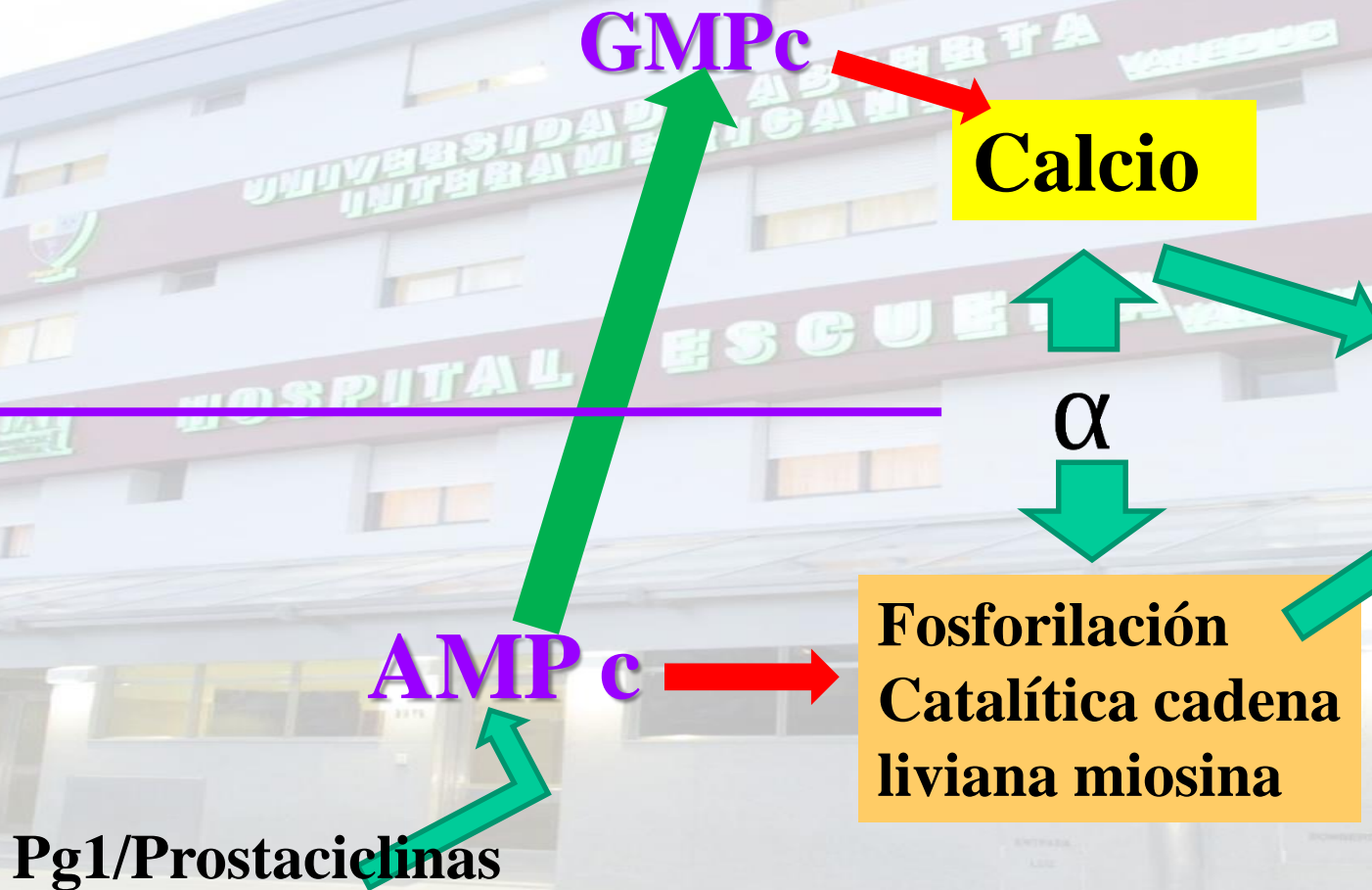
MIORRELAJACION



VASODILATACION

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Histamina

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Histamina

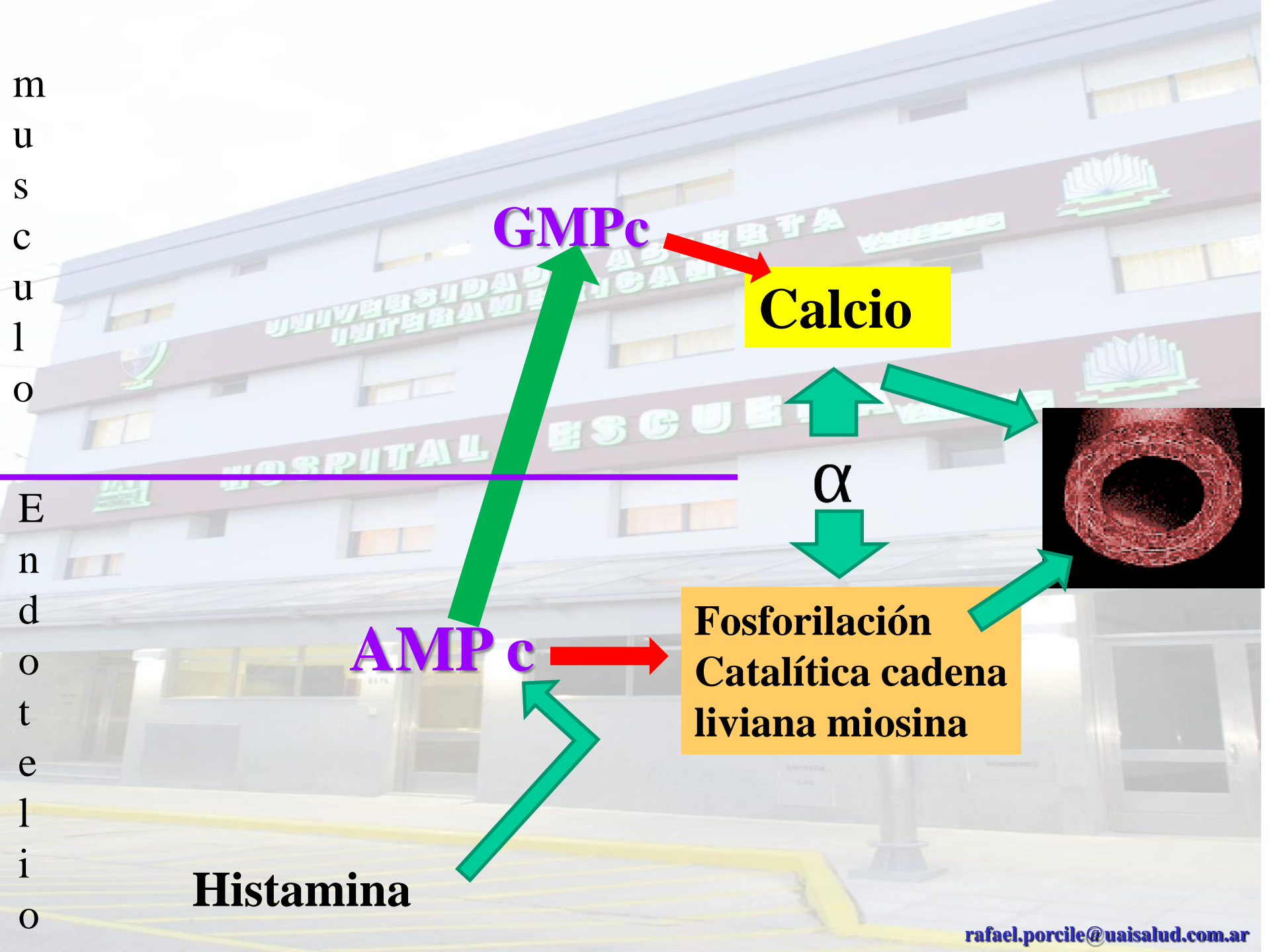
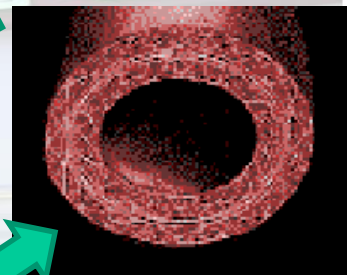
AMP c

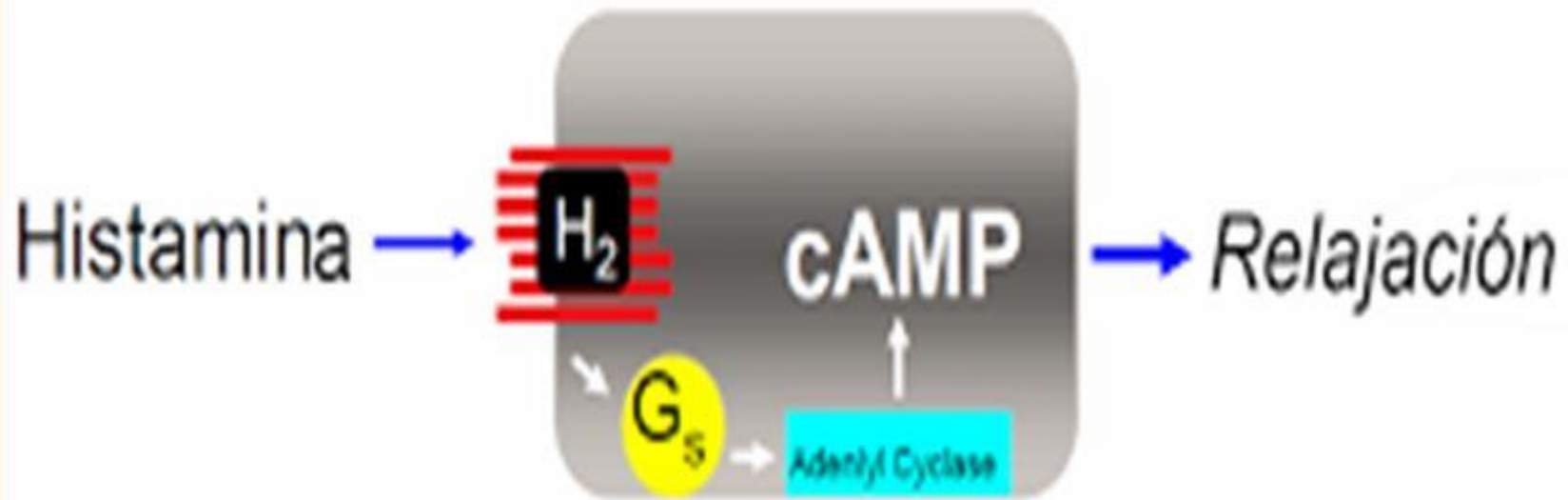
GMPc

Calcio

**Fosforilación
Catalítica cadena
liviana miosina**

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Histamina

Músculo Liso Vasos Sanguíneos (H1)

Asociado Proteína «G_s» - Activa Adenilato Ciclasa

Aumento AMPc

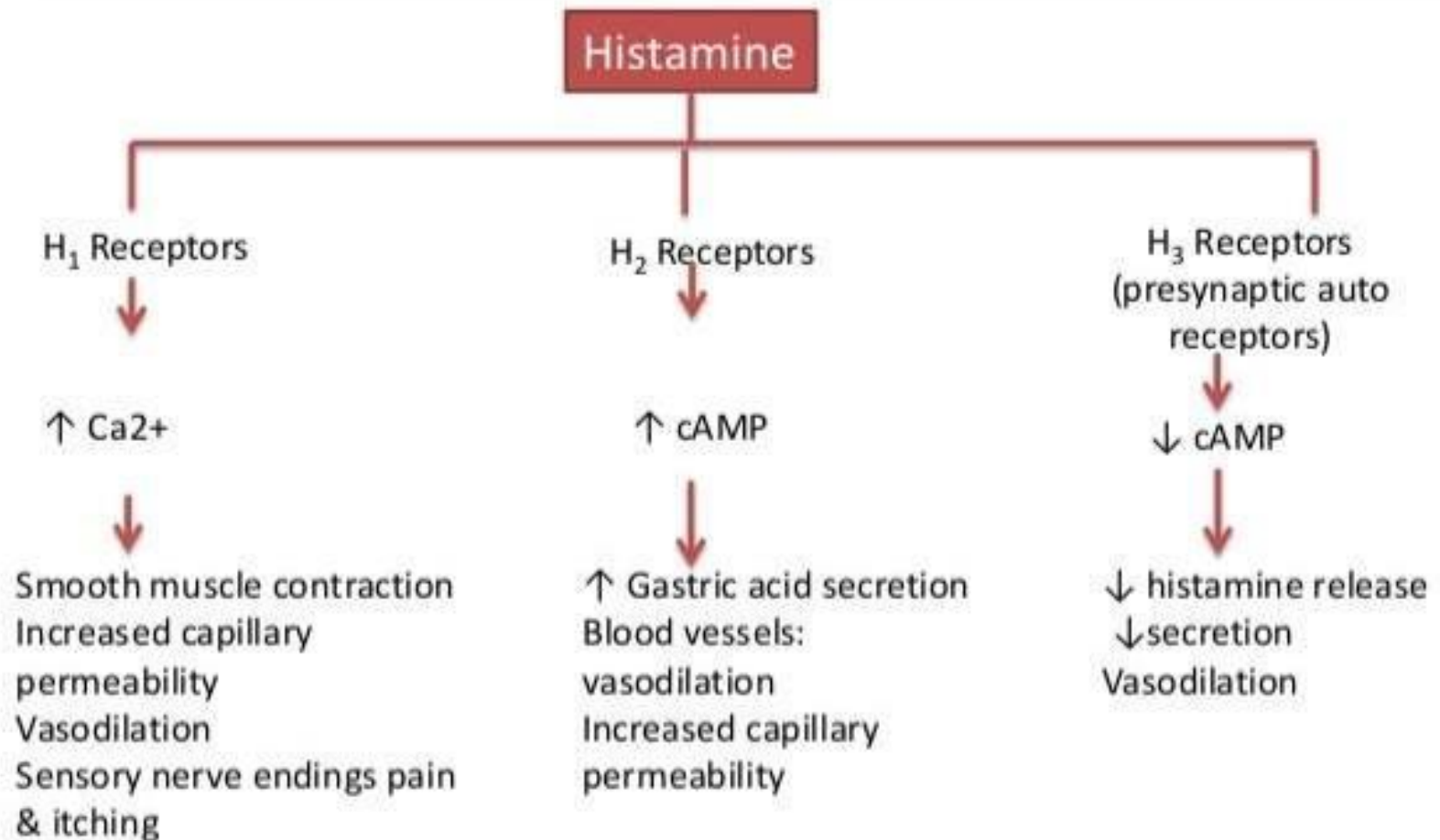
Relajación Músculo:

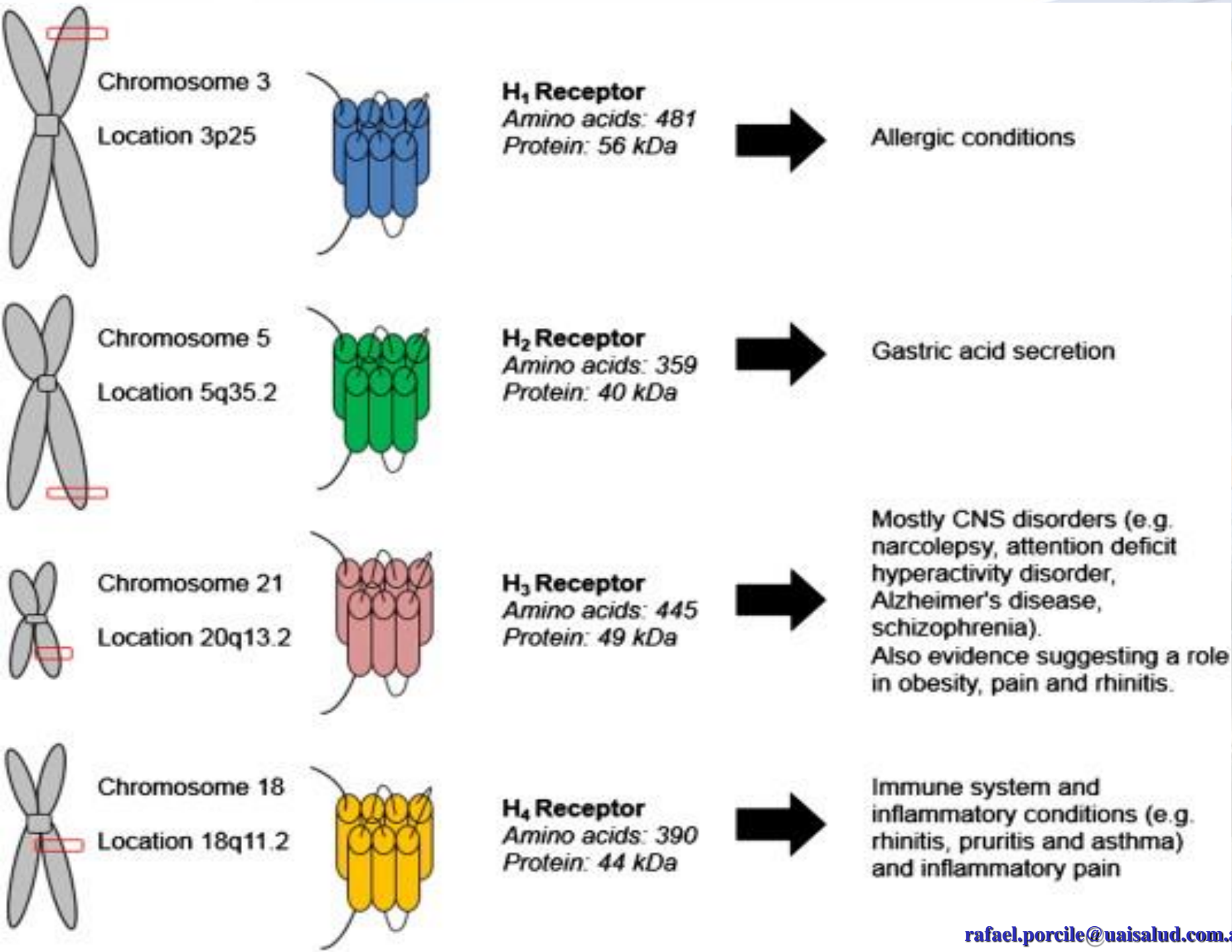
Vasodilatación

Receptores de HISTAMINA (SUBTIPOS)

Subtipo Receptor	Distribución	Mecanismo Post-Receptor
H1	Musculo liso, endotelio y cerebro.	↑ IP3, DAG
H2	Mucosa gastrica, musculo cardiaco, mastocitos y cerebro	↑ cAMP
H3	Presinapticos: Cerebro, plexo mienterico y otras neuronas	Proteína G

Mechanism of Action of Histamine



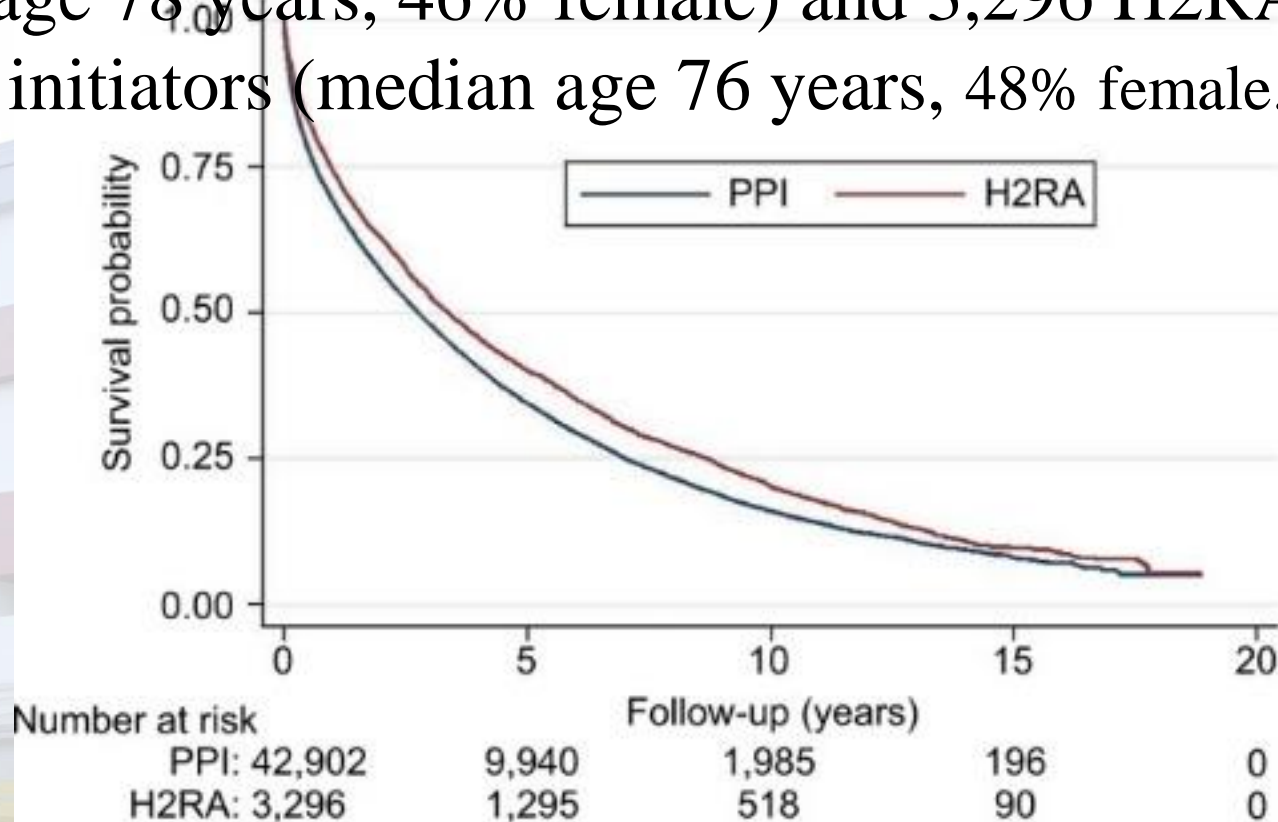


Use of histamine H₂ receptor antagonists and outcomes in patients with heart failure: a nationwide population-based cohort study.

Clin Epidemiol. 2018 May 7;10:521-530. doi: 10.2147/CLEP.S162909. eCollection 2018

We examined the association between H₂RA initiation and all-cause mortality among patients with heart failure. Using Danish medical registries, we conducted a nationwide population-based active-comparator cohort study of new users of H₂RAs and proton pump inhibitors (PPIs) after first-time hospitalization for heart failure during the period 1995-2014.

Our analysis included 42,902 PPI initiators (median age 78 years, 46% female) and 3,296 H2RA initiators (median age 76 years, 48% female).

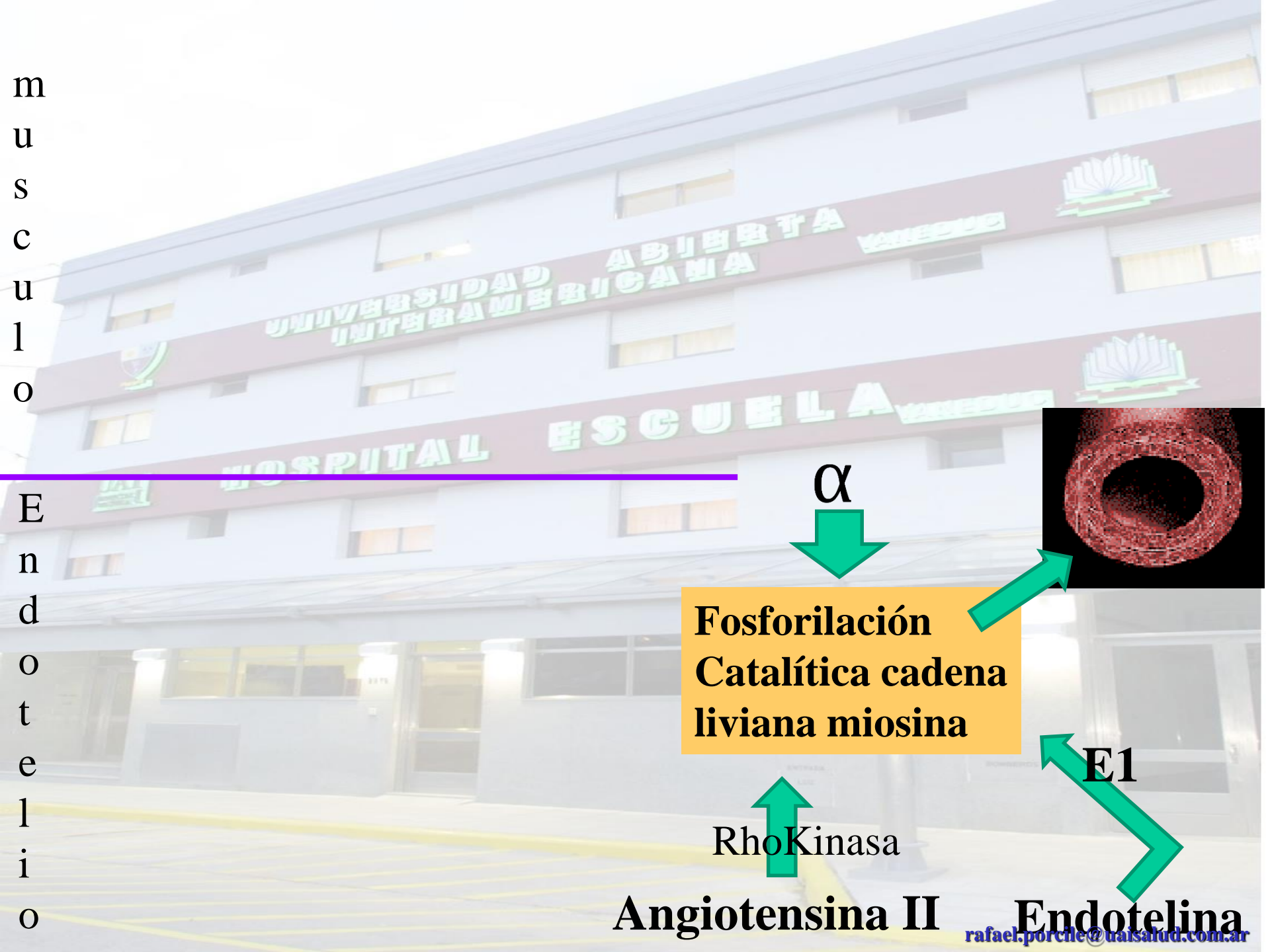


In patients with heart failure, H2RA initiation was associated with 15%-20% lower mortality than PPI initiation

Inductores de la fosforilación de la miosina

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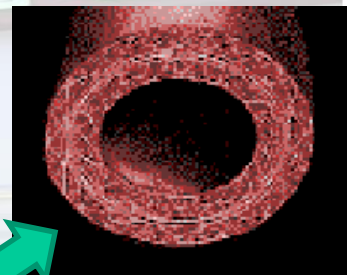
UNIVERSIDAD AMERICANA

HOSPITAL ESCUELA AMERICANA

α



**Fosforilación
Catalítica cadena
liviana miosina**



RhoKinasa



Angiotensina II

E1

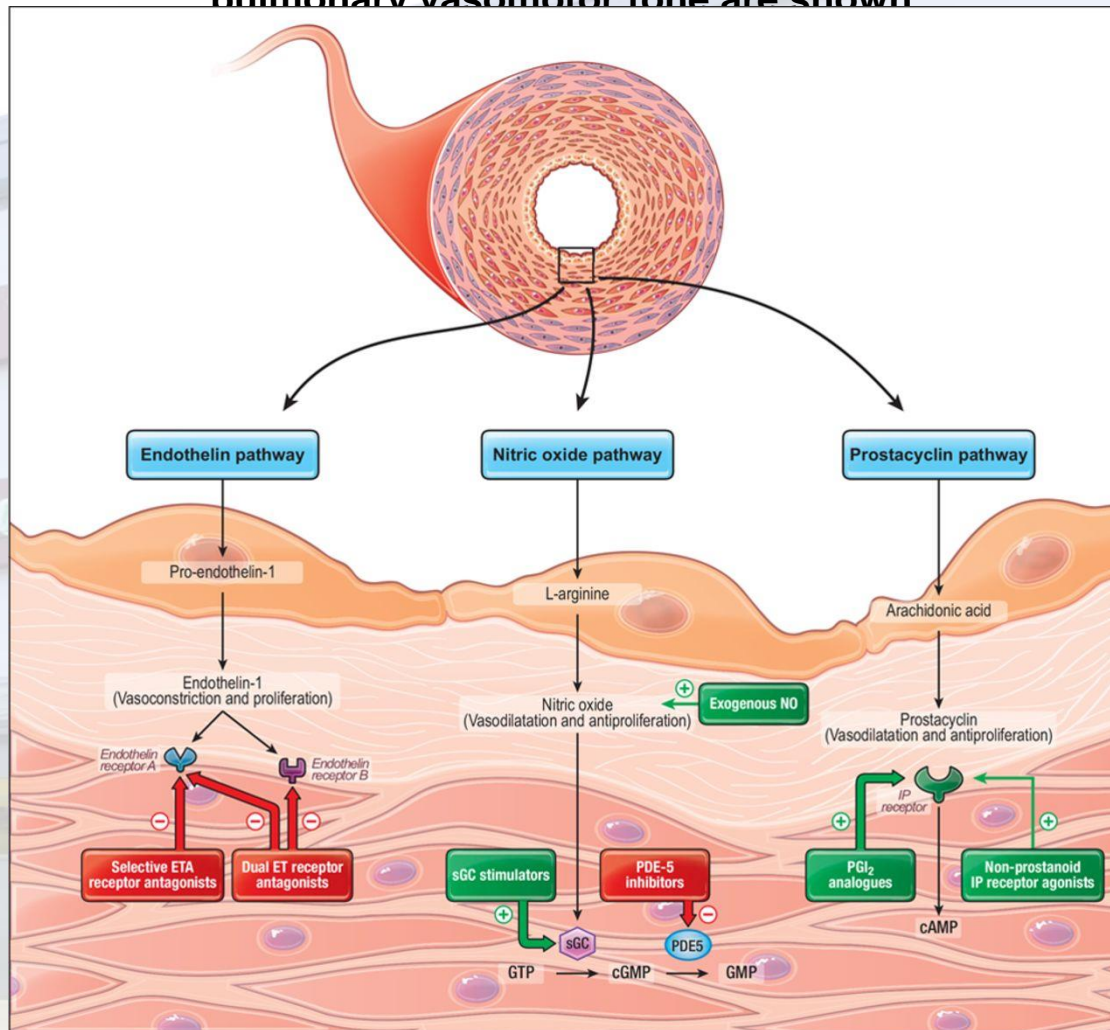


Endotelina

The background image shows the exterior of a modern hospital building. The facade is light-colored with a prominent red horizontal band. On this band, the text 'UNIVERSIDAD AMERICANA' is written in Spanish, and 'HOSPITAL' is written in English. There are also logos of the university and hospital. The building has several windows and a glass entrance area at the bottom. The overall scene is brightly lit, suggesting daytime.

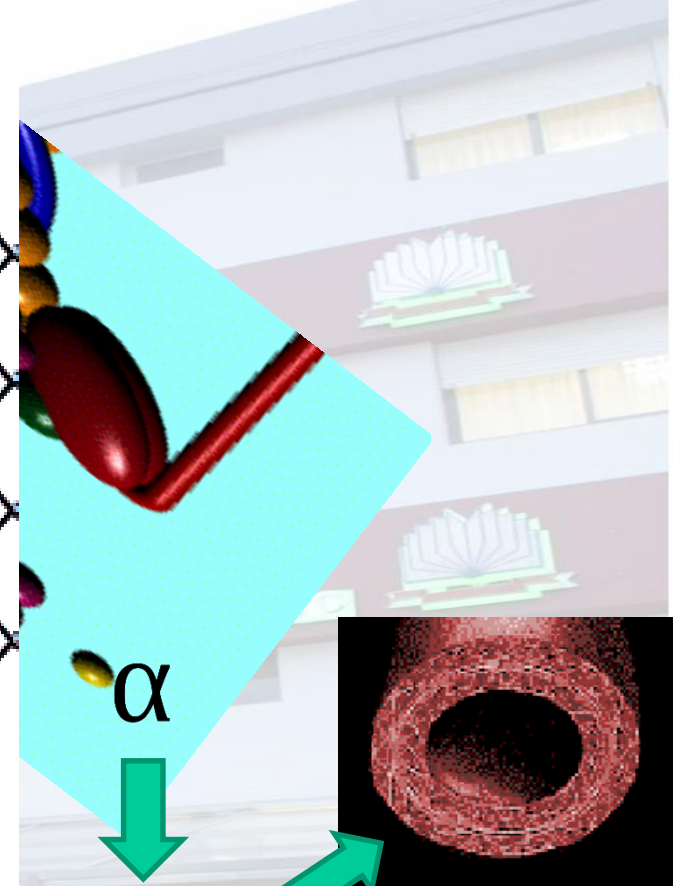
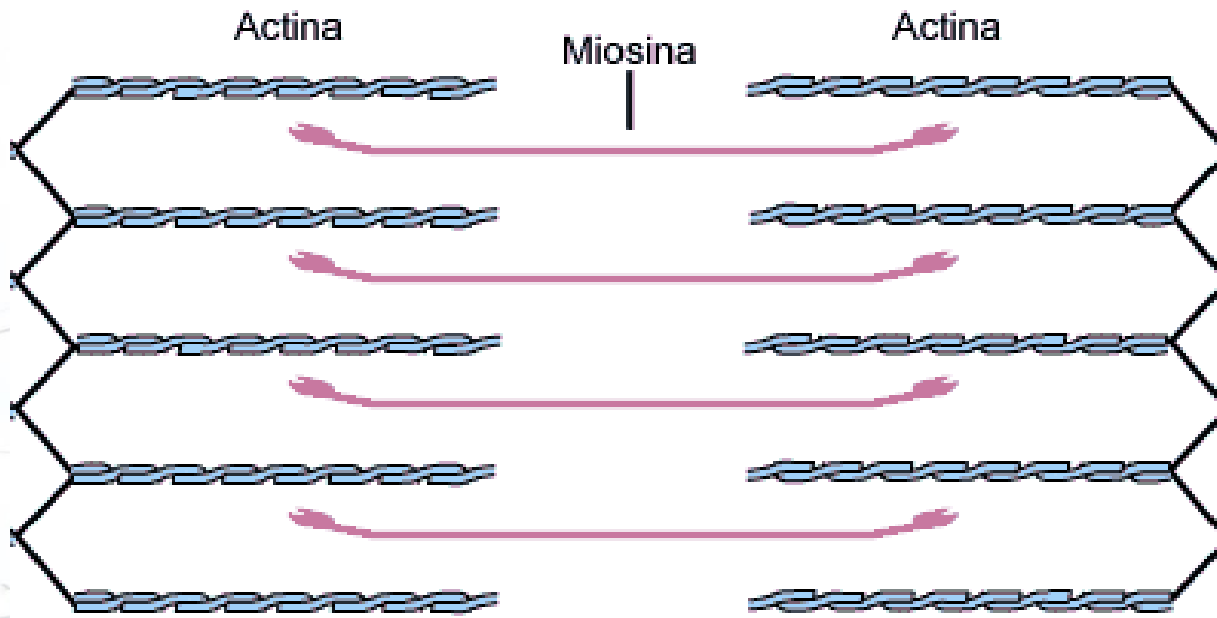
Las endotelinas Angiotensina II

Established vasomotor pathways targeted by current and emerging therapies in PAH. The 3 major pathways (endothelin-1, nitric oxide, and prostacyclin) involved in the regulation of pulmonary vasomotor tone are shown



Humbert M et al. *Circulation*. 2014;130:2189-2208

Contracción - Relajación

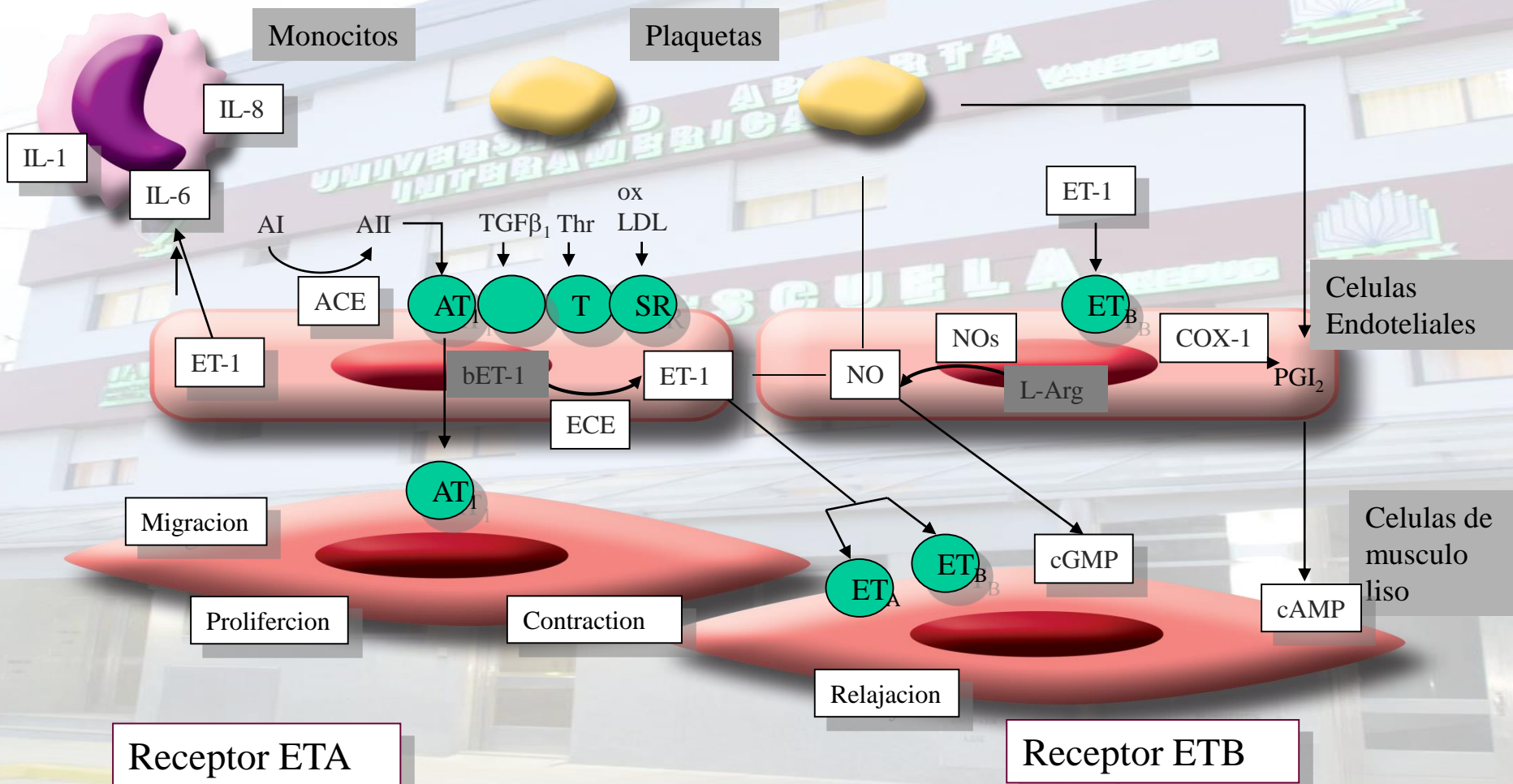


Los receptores alfa y la endotelina catalizan enzimáticamente a la cadena liviana de la miosina

Cadena liviana miosina

E1

Endotelina



Vasoconstricción
SMC migración + proliferación

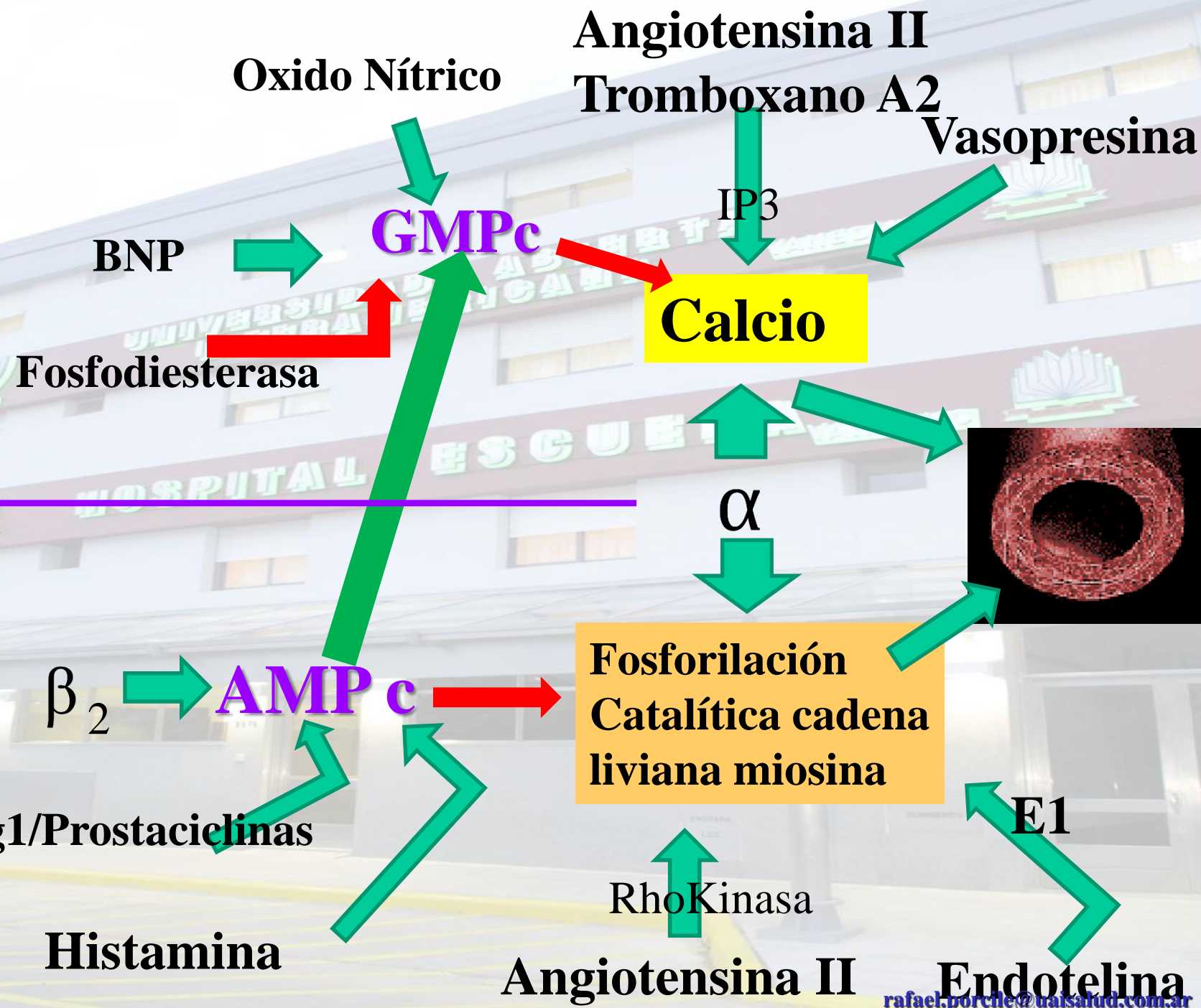
ET-1 clearance
Vasodilatación/antiproliferativo

The image shows the exterior of a multi-story building, identified as the Hospital Social de la Universidad Interamericana. The building has a light-colored facade with a prominent red horizontal band. On this band, the name 'UNIVERSIDAD INTERAMERICANA' is written in large, green, stylized letters. Below this, the word 'HOSPITAL' is also visible in green. To the right of the name, there is a logo consisting of a stylized green and white flower or fan shape. The building has several windows with white frames and a covered entrance area with glass doors and pillars. The foreground shows a paved area with yellow parking lines.

Inductores del Calcio

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Angiotensina II

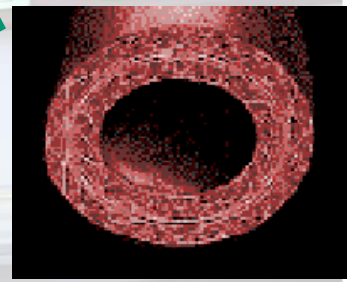
Tromboxano A2

Vasopresina

IP3

Calcio

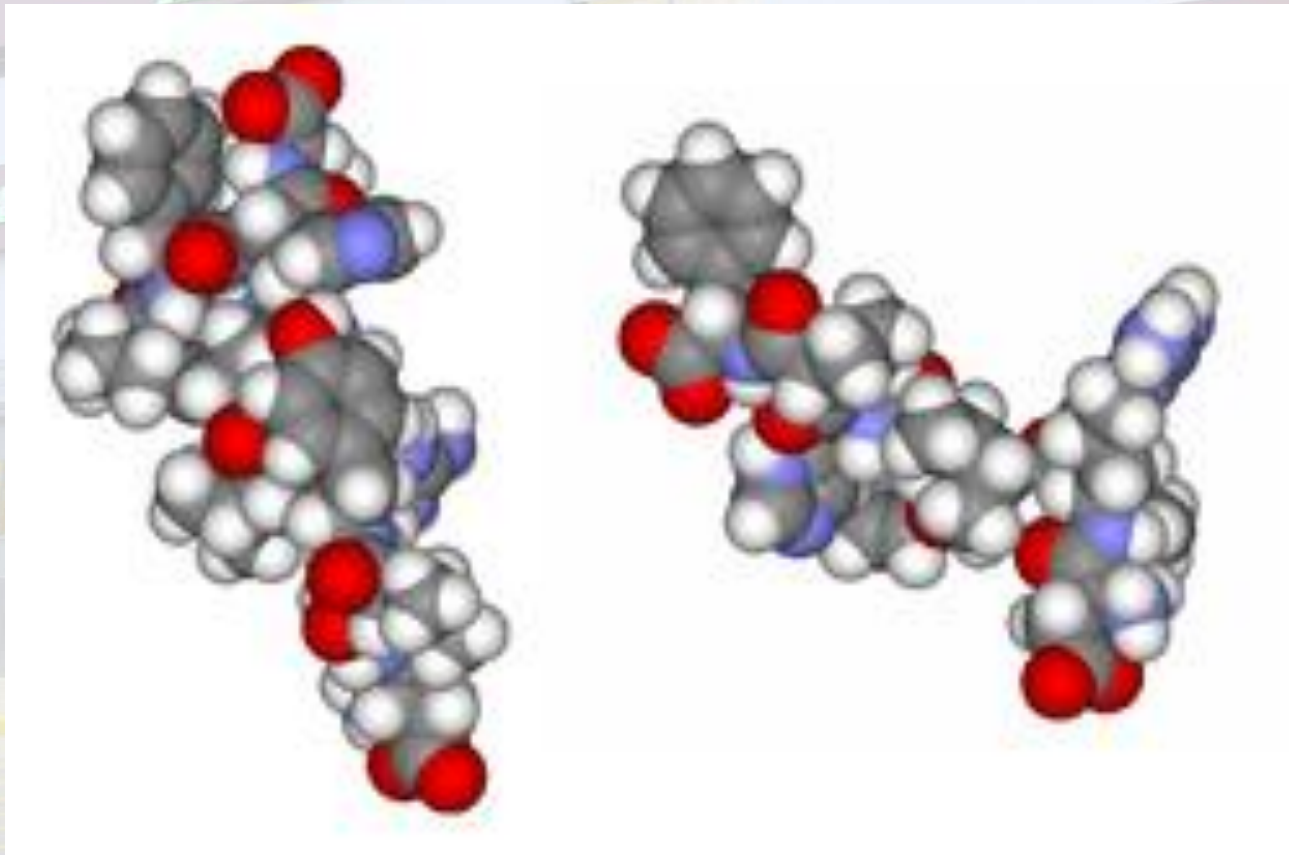
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Angiotensina II



Acción mixta

- Inhibición de la miosin fopsfatasa

- Inducción del calcio

Angiotensina II

IP3

Calcio

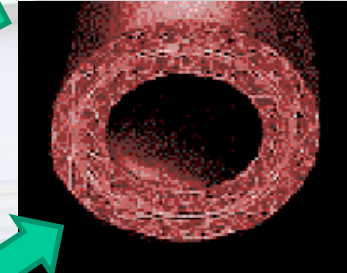
Vía IP3

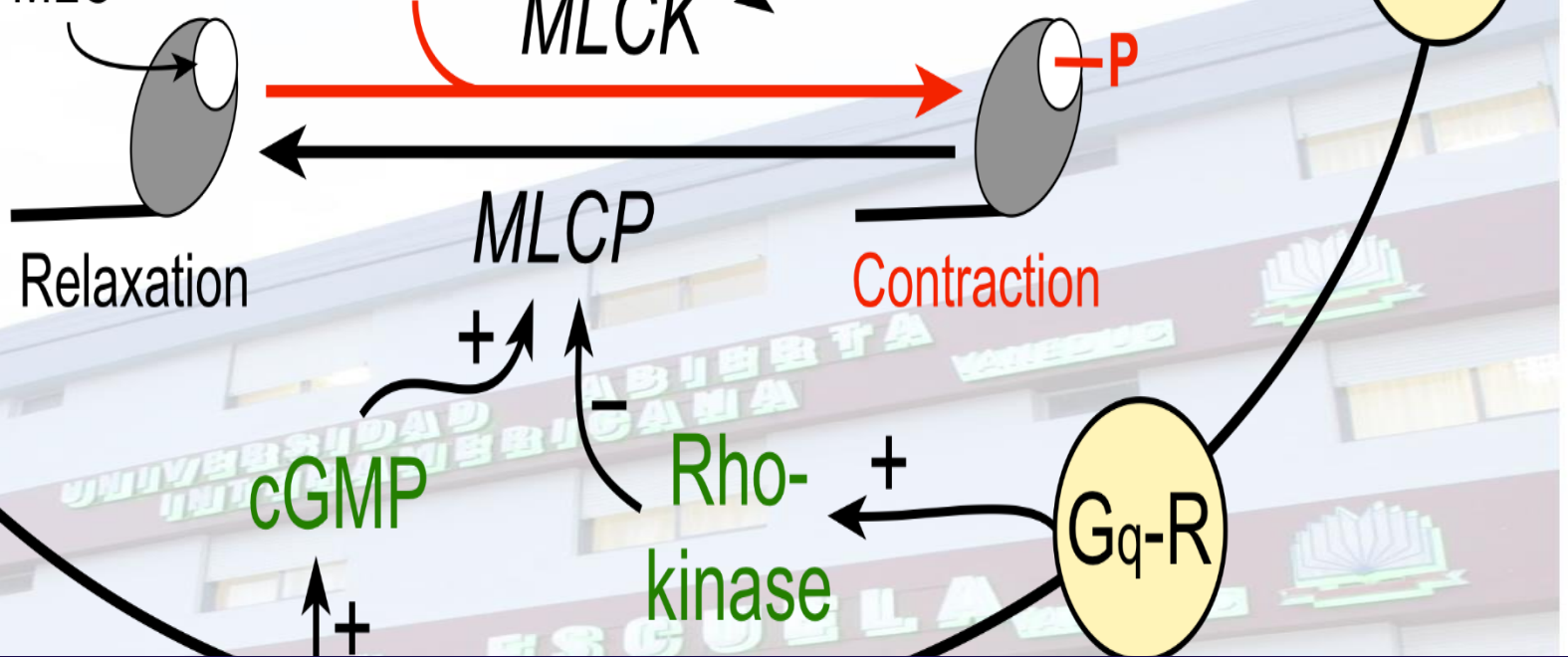
Vía de la RHO

**Fosforilación
Catalítica cadena
liviana miosina**

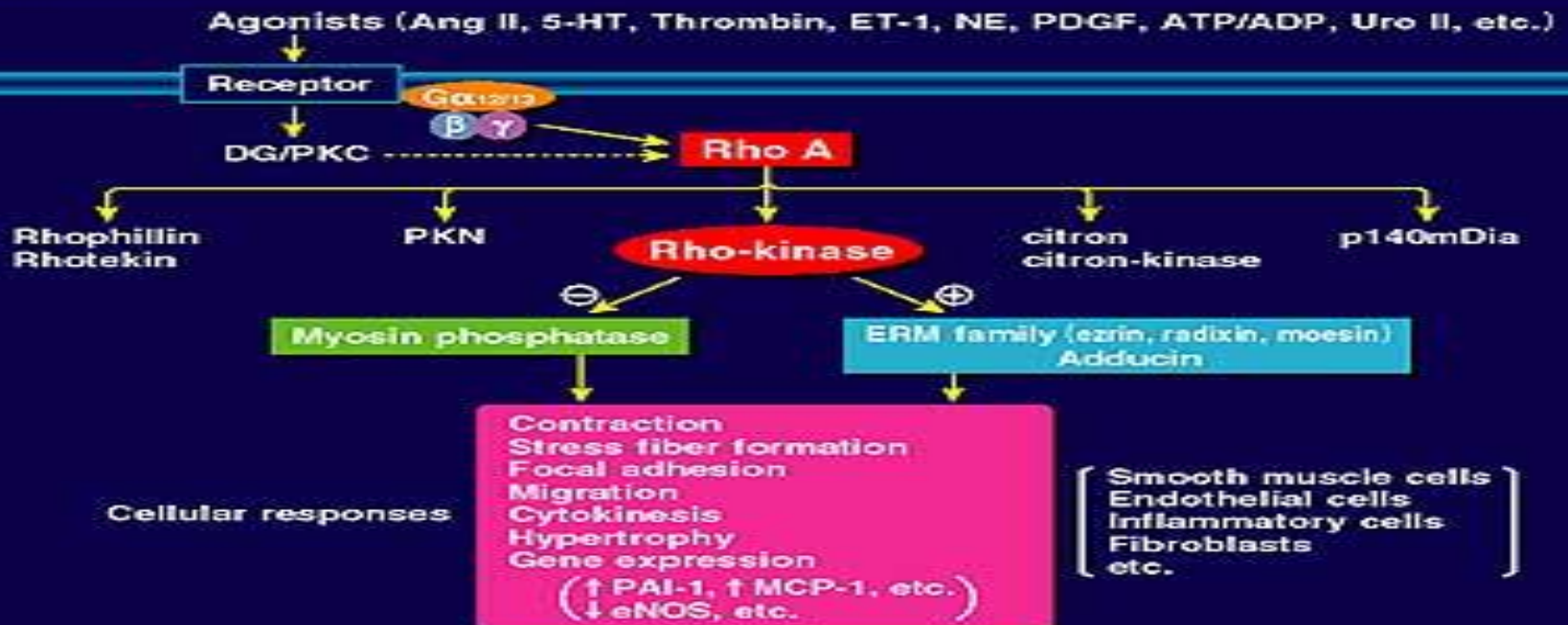
RhoKinasa

Angiotensina II



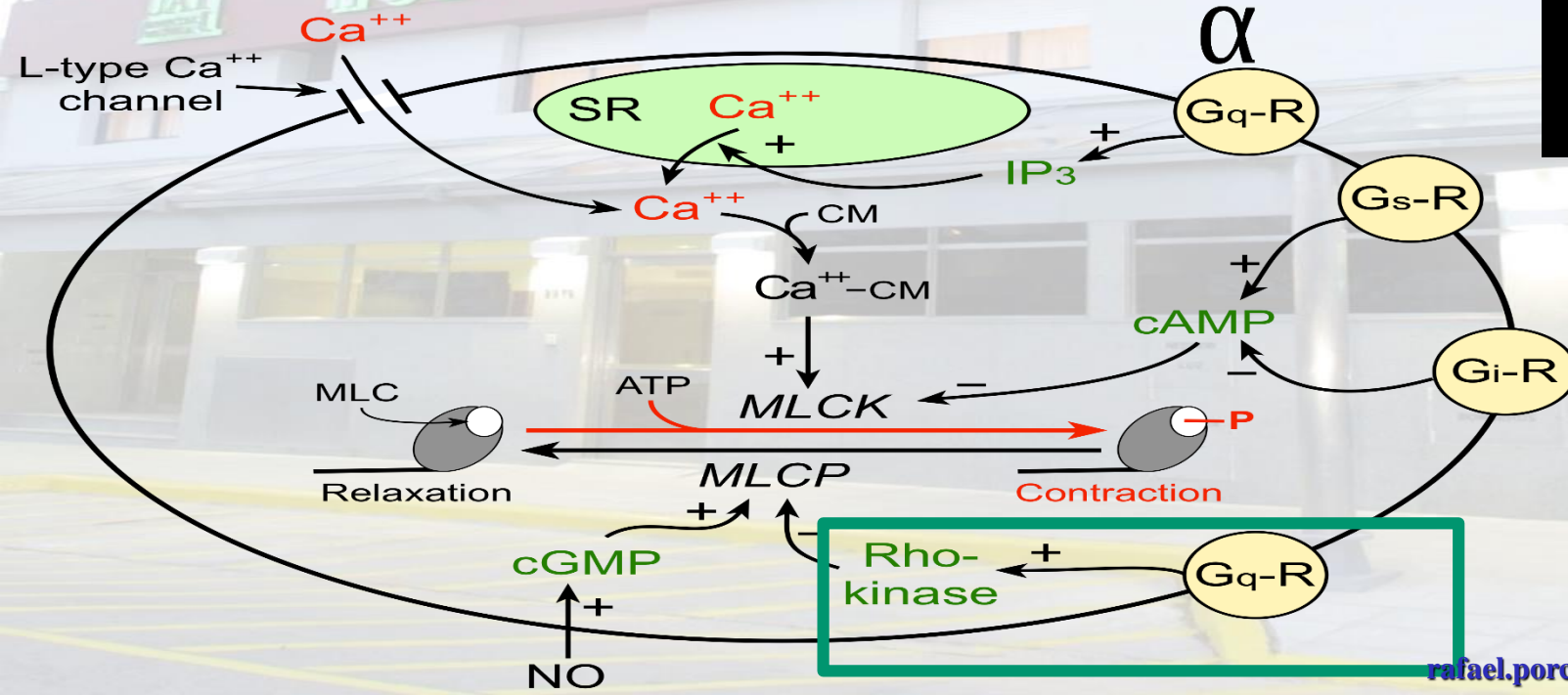
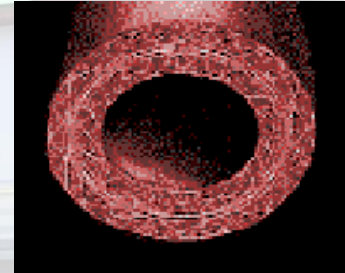


Role of Rho/Rho-kinase-mediated Pathway in the Pathogenesis of Cardiovascular Diseases



Angiotensina II

Calcio

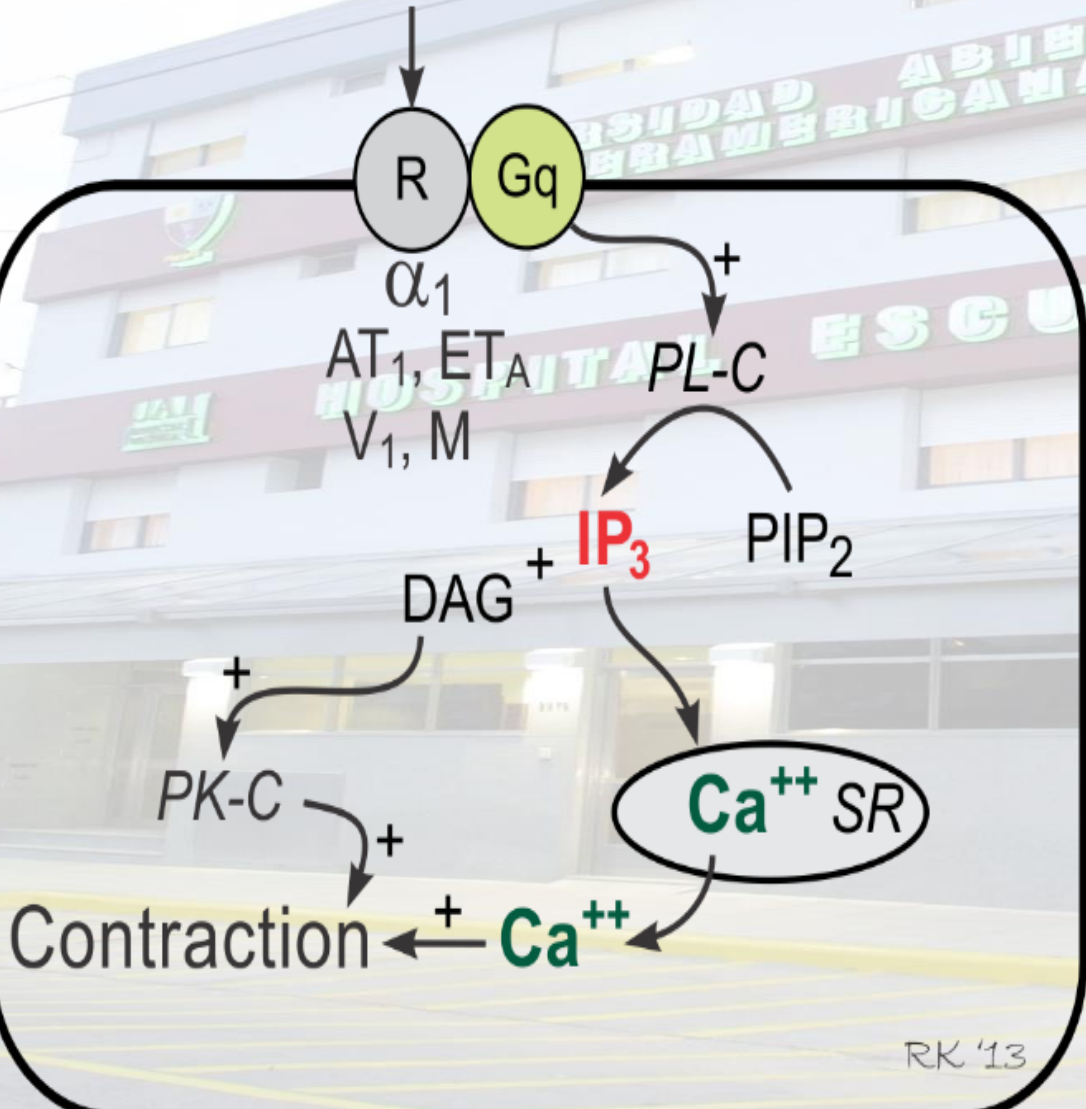
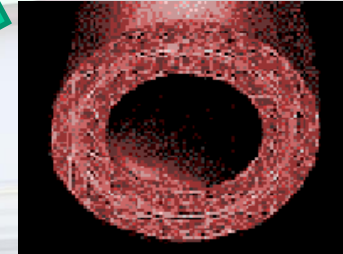


Angiotensina II Tromboxano A2

NE, EPI
AII, ET-1
AVP, ACh

IP₃

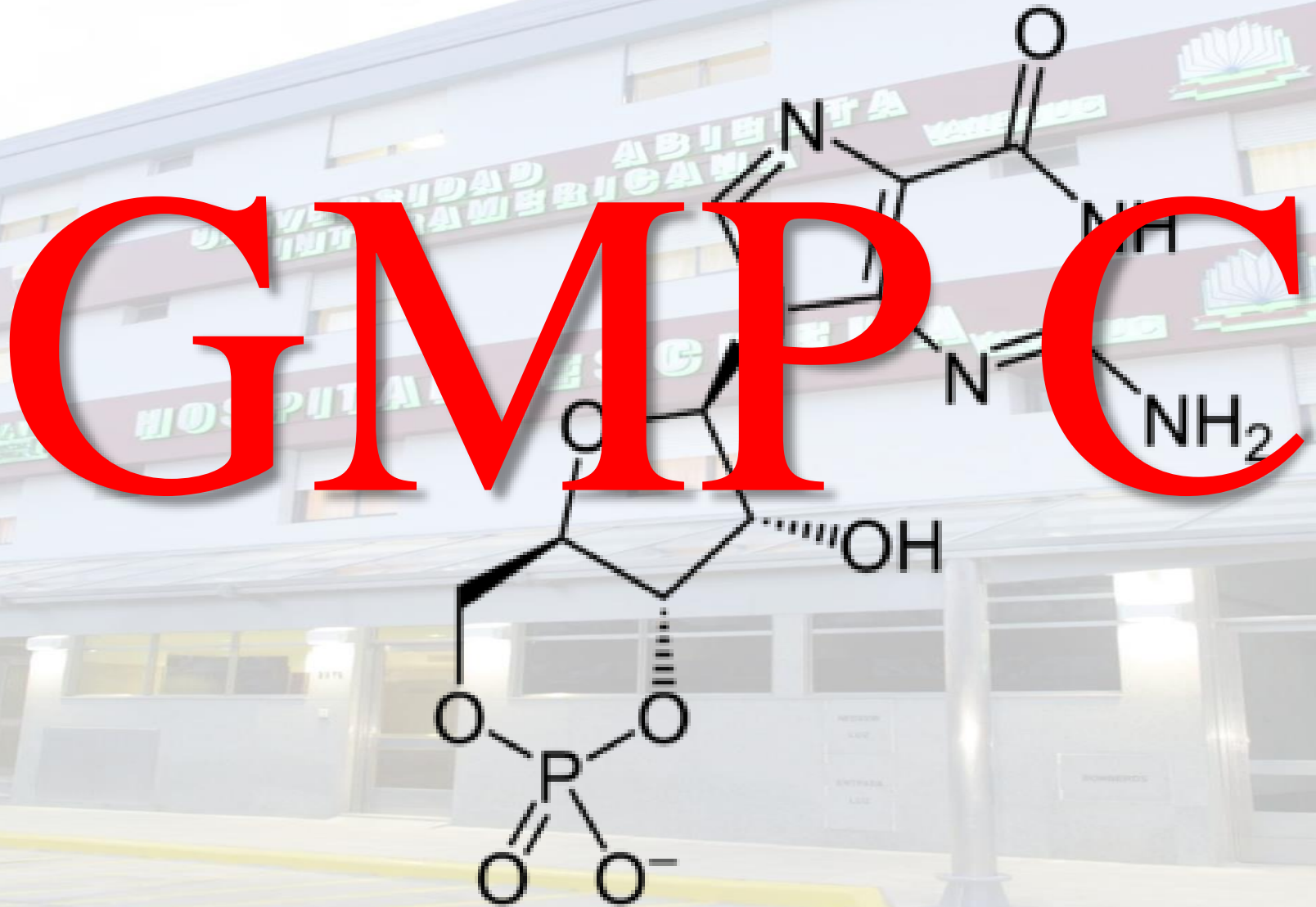
Calcio



Algunas proteínas G usan como segundos mensajeros

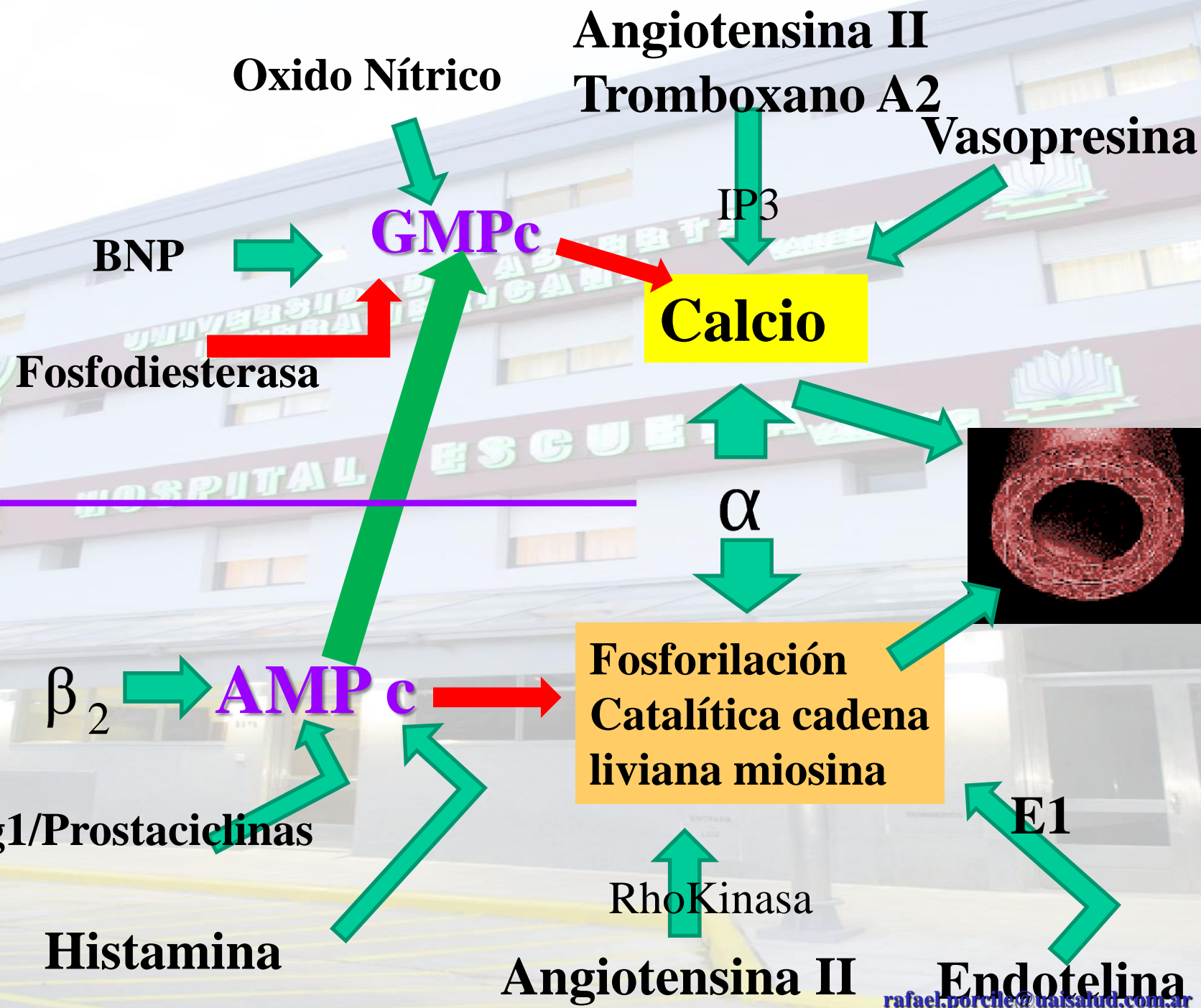
- Trifosfato de inositol (IP₃)
- Diacil glicerol (DAG)s

Síntesis a partir del fosfatidil inositol por la fosfolipasa C (fosfolípido de la membrana)



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Acetilcolina

Oxido Nítrico

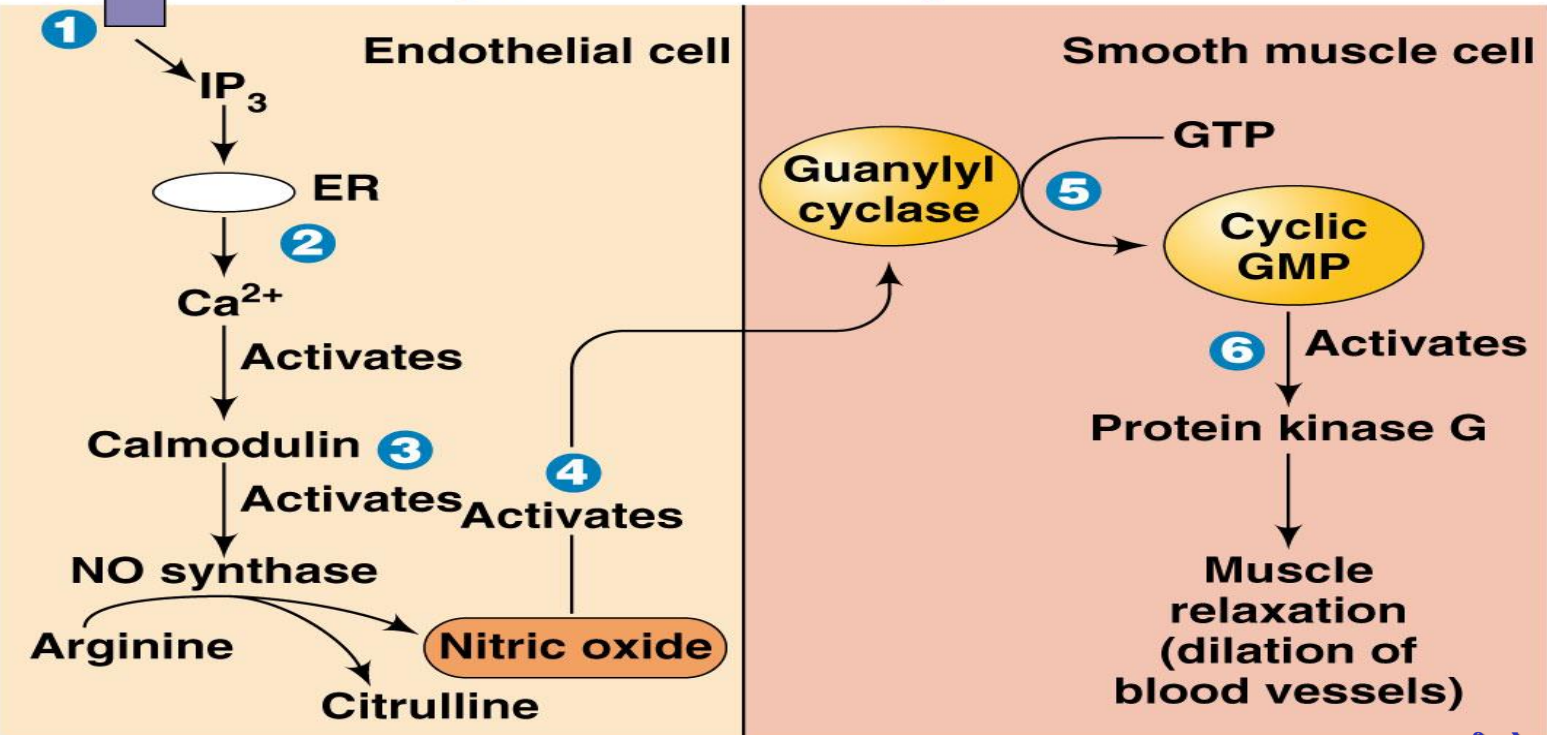
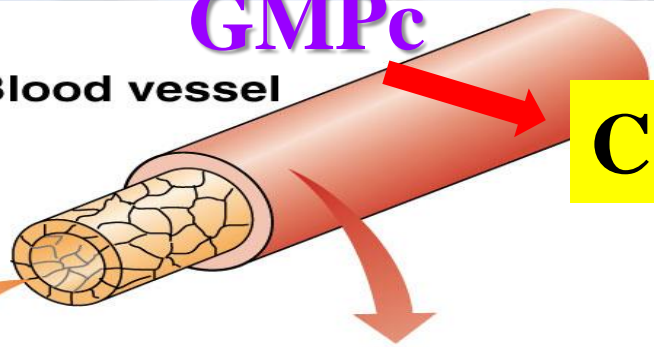
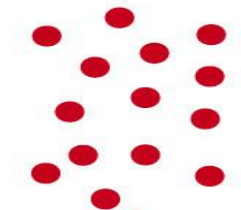
GMPc

Calcio

Acetylcholine

G protein-linked receptor

Blood vessel



12
Mg

24.305

20

Ca

40.08

21
Sc

44.9559

38

Oxido Nítrico

Angiotensina II

Tromboxano A2

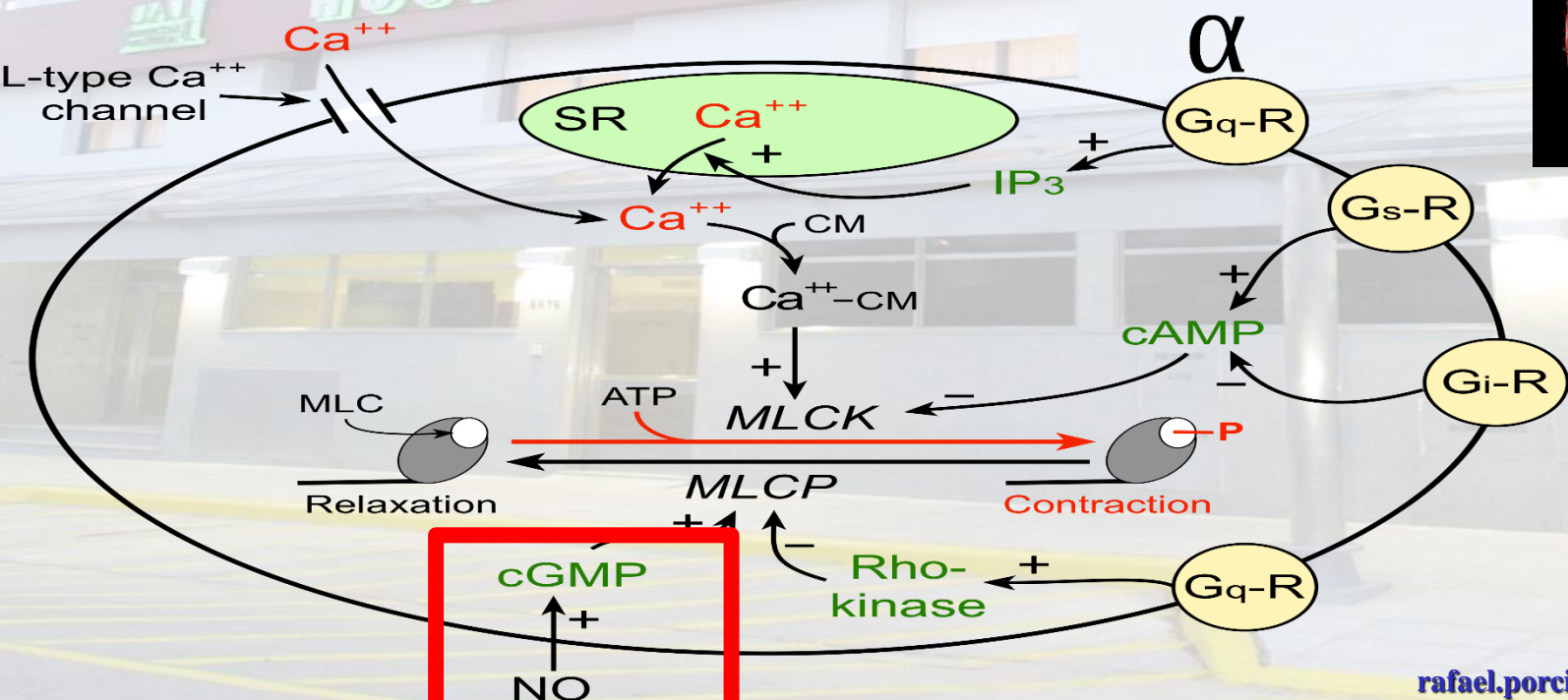
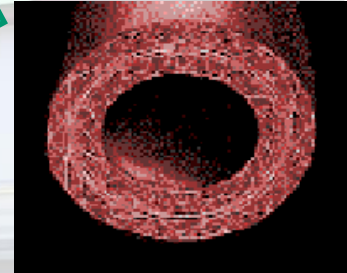
Vasopresina

BNP

GMPc

Calcio

Fosfodiesterasa



Oxido Nítrico

Angiotensina II

Vasopresina

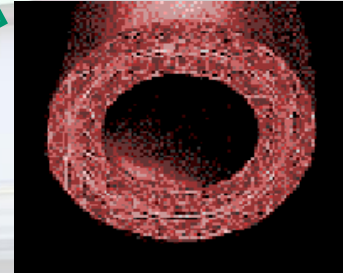
BNP

GMPc

Calcio

Fosfodiesterasa

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L-type calcium-channel blockers

Potassium-channel openers

α -adrenoc...
antag...

Nitro

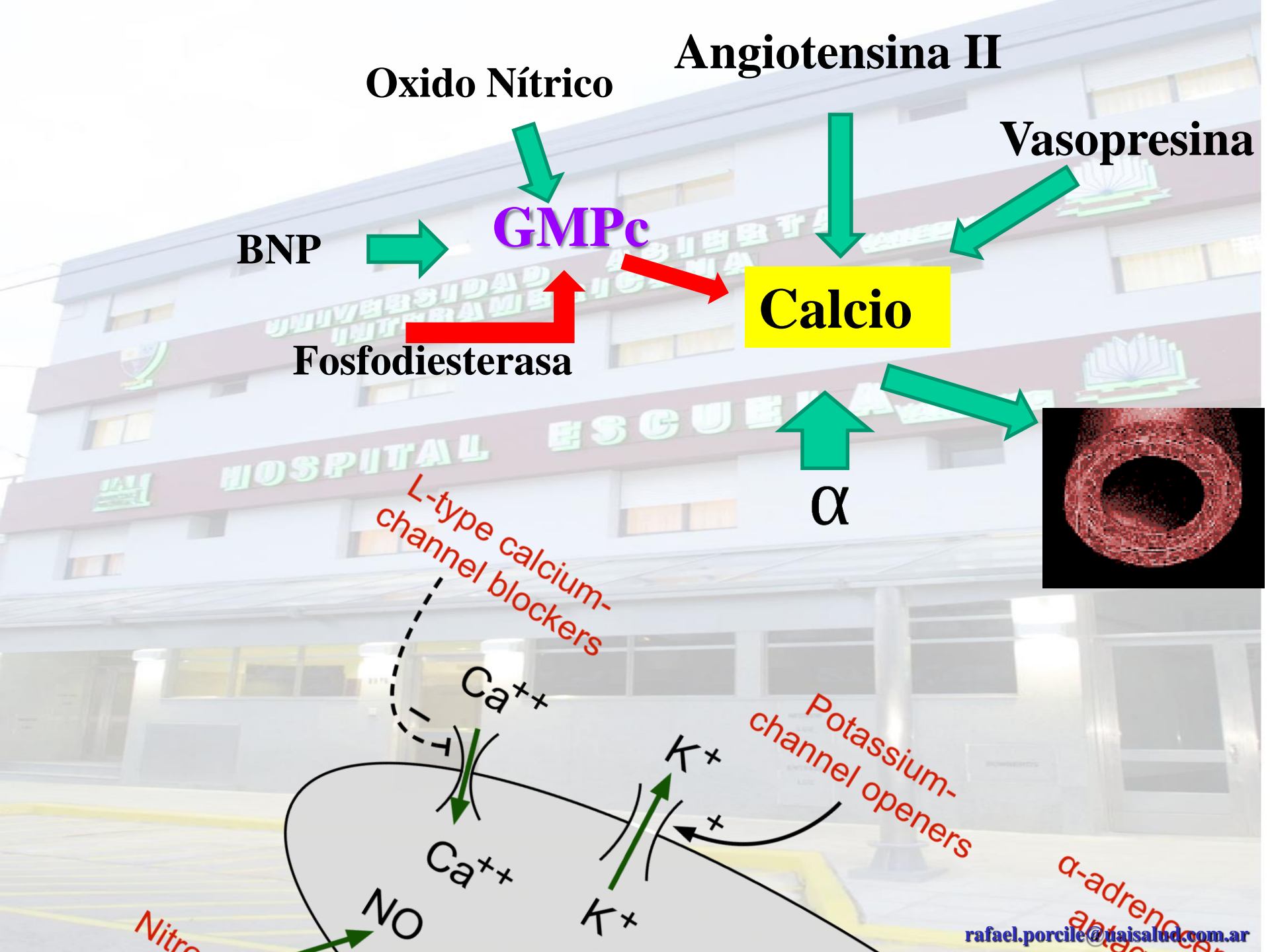
NO

Ca^{++}

Ca^{++}

K^{+}

K^{+}





Todo es un
problema de
receptores

Sympathetic Receptors

Alpha

Located in peripheral arteries

Vasoconstriction

Increase in arterial pressure

Beta 1

Located in the heart

Increase in heart rate

Increases contractility, conduction, and irritability

Beta 2

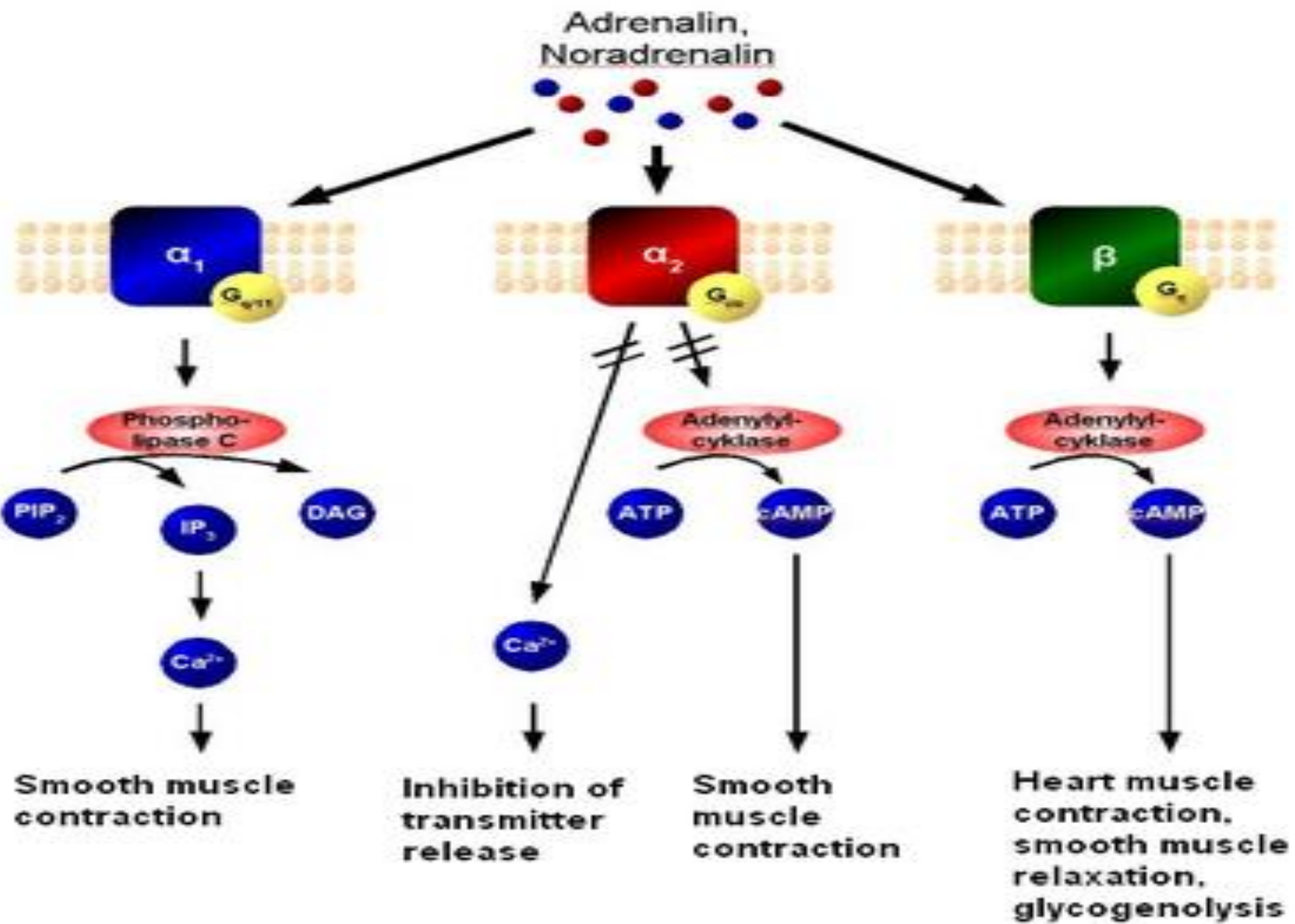
Located in the lungs and arterial walls

Bronchiolar dilation
arterial vasodilation

Dopaminergic

Located in coronary arteries, renal & mesenteric blood vessels

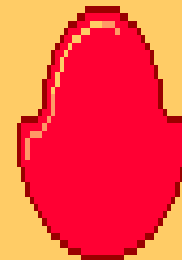
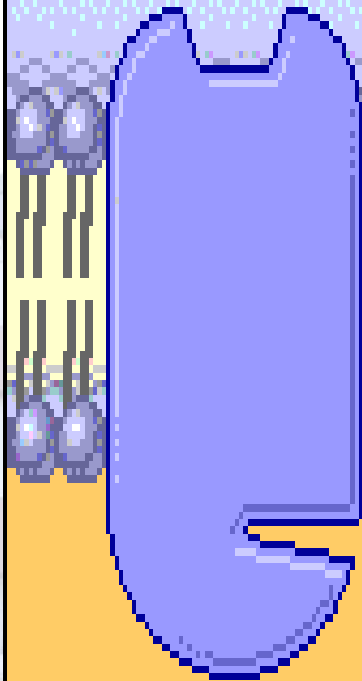
Dilation
Kidneys
Mesenteric





**¿QUE
DIFERENCIA A
LOS
RECEPTORES
ADRENERGICOS?**

Fluido extracelular



Dentro de la célula



The image shows the exterior of a multi-story building with a light blue facade and a dark red horizontal band. The band contains the text 'UNIVERSIDAD AMERICANA' in Spanish and 'AMERICAN UNIVERSITY' in English, along with a logo of an open book. Below this, the text 'HOSPITAL ESCUELA' is visible. The building has several windows and a covered entrance area with glass doors and pillars. A yellow curb is visible in the foreground.

¿Qué hace cada tipo de proteína G?

Proteínas G Heterotriméricas

**Proteínas
Gs**

Estimuladoras
de la
Adenilciclasa

**Proteínas
Gi**

Inhibidoras
de la
Adenilciclasa

**Proteínas
Gq**

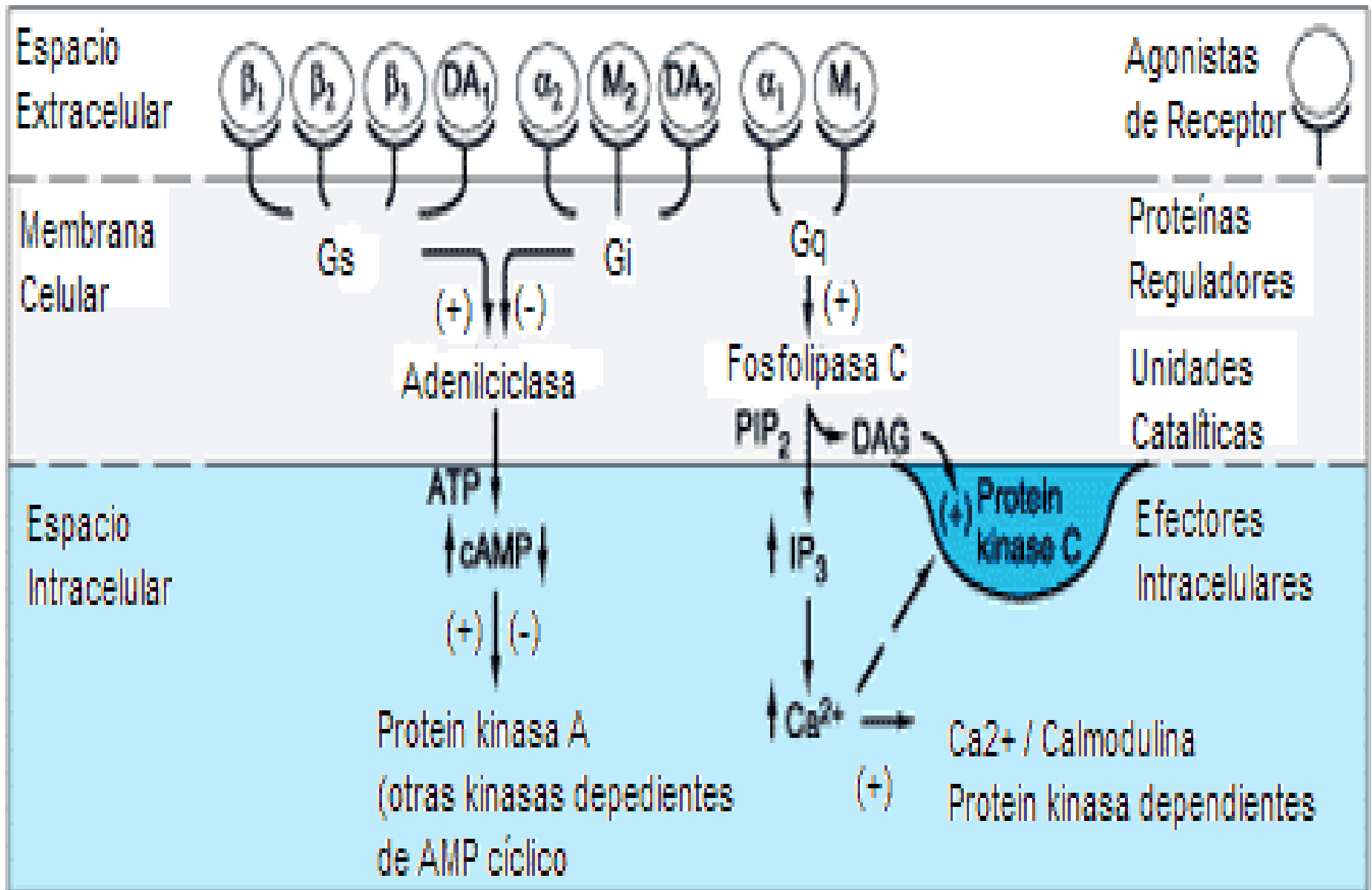
Activa la
Fosfolipasa C

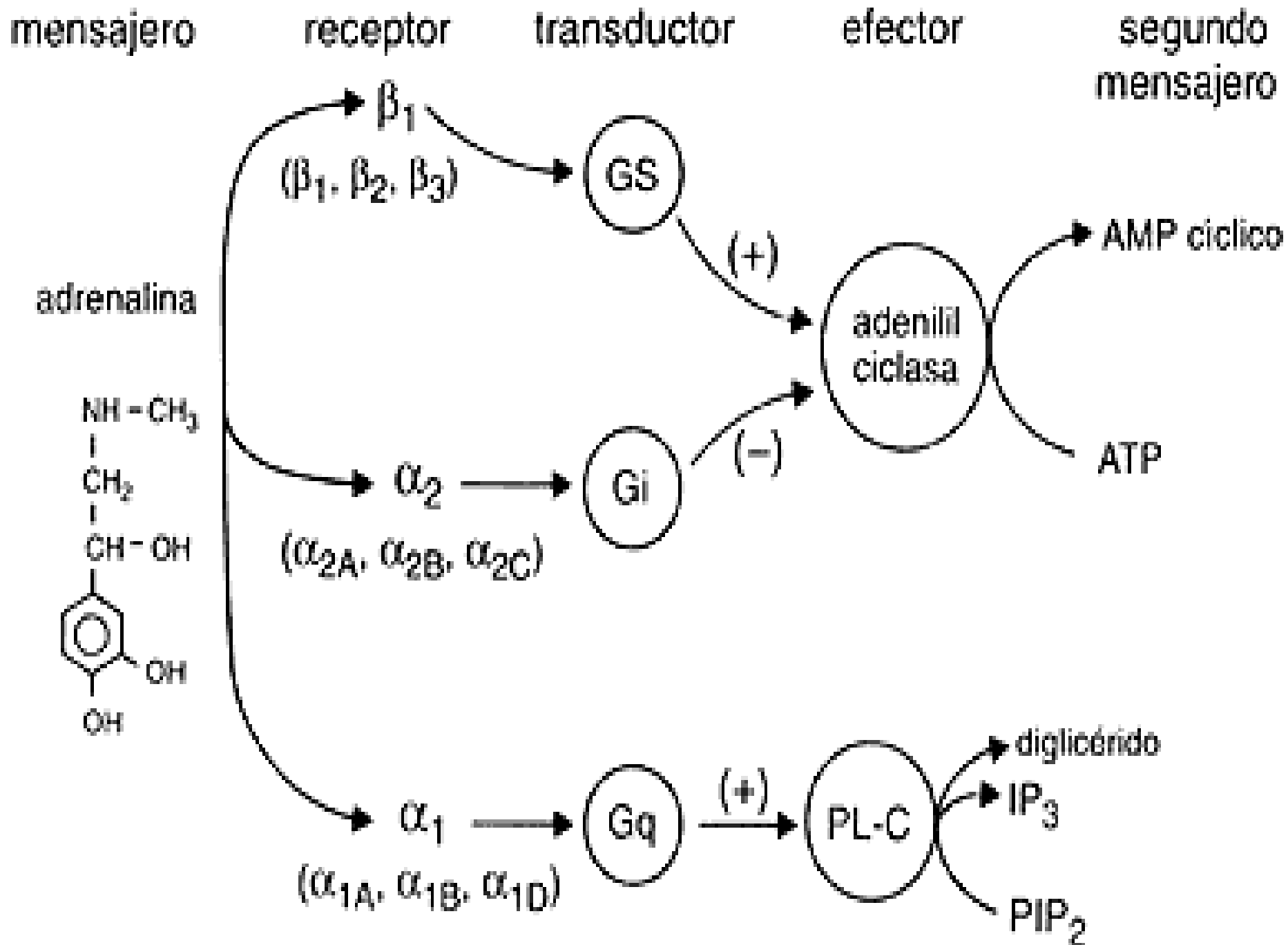
**La proteína G es una
molécula de
membrana**

**Los mediadores
citoplasmáticos de la
misma son el amp y
GMP cíclico**

G-protein Linked Vascular Receptors and their Biological Agonists

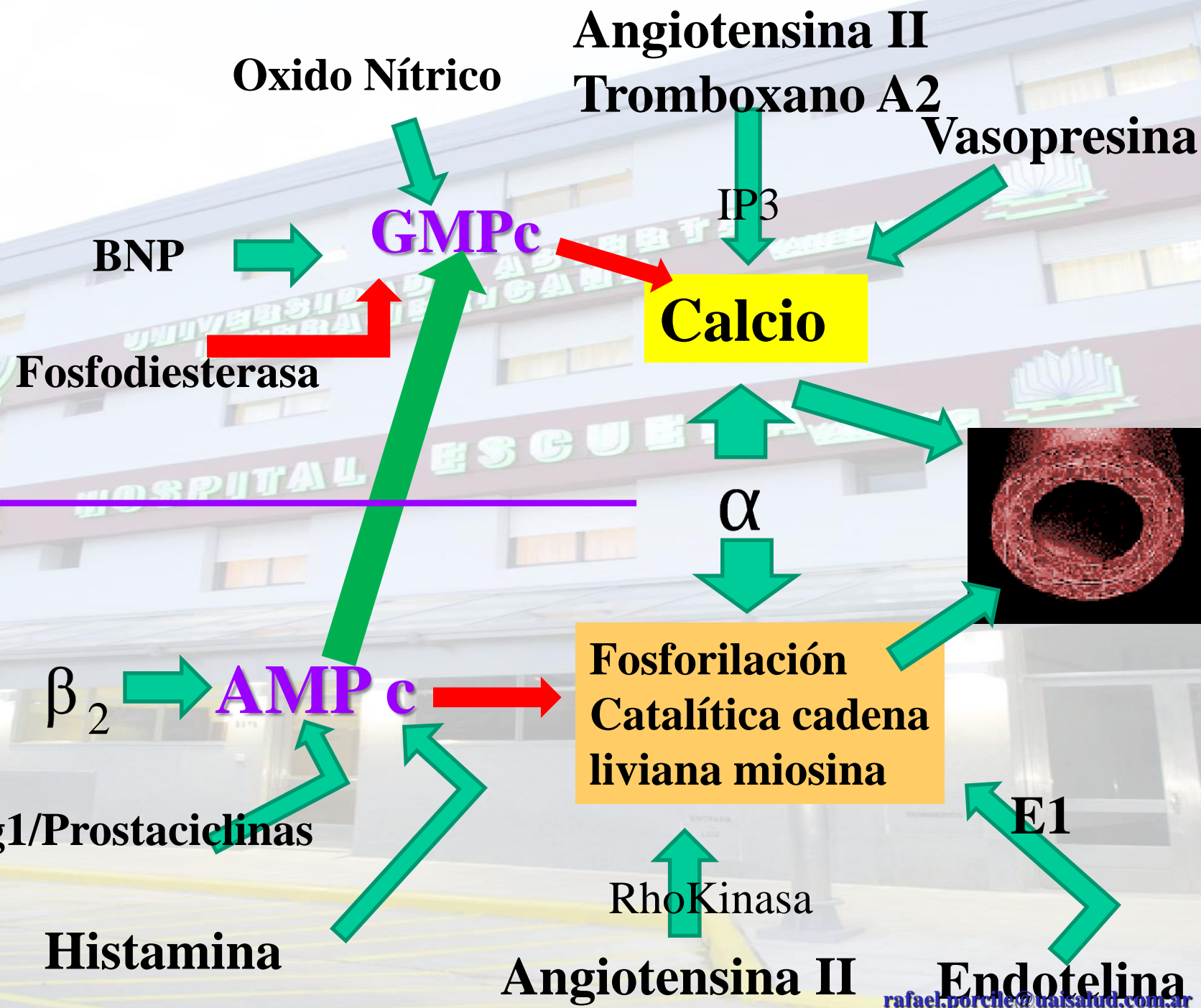
G-protein	2nd Messenger	Receptor	Biological Agonist
Gs	↑ cAMP	β_2	Epinephrine
		A ₂	Adenosine
		IP	Prostacyclin
Gi	↓ cAMP	α_2	Norepinephrine/ Epinephrine
Gq	↑ IP ₃ & ↑ Rho-kinase	α_1	Norepinephrine/ Epinephrine
		ET _A	Endothelin-1
		AT ₁	Angiotensin II
		V ₁	Vasopressin



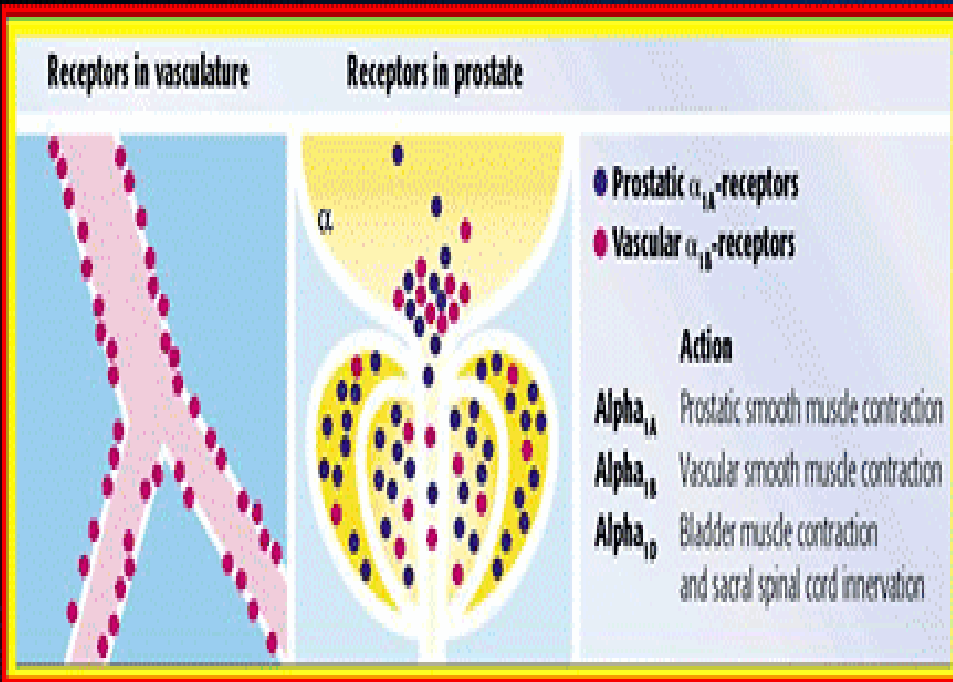


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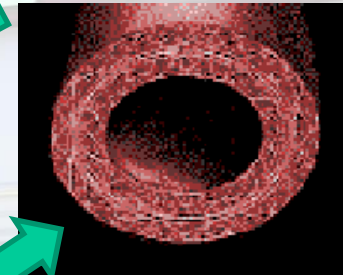
α -Receptor Subtypes



Calcio

α

Fosforilación
Catalítica cadena
liviana miosina



Folgar R, et al. *Eur J Pharmacol.* 1995;288:201-207.
Hatano A, et al. *Br J Pharmacol.* 1994;113:723-728.
Schwinn DA, et al. *BJU Int.* 2000;85(suppl 2):6-11.

Alpha receptors

Alpha 1 receptors

Alpha 1 agonists

Treatment of nasal congestion and ophthalmic hyperemia

Alpha 1 blockers

Hypertension treatment

Treatment of benign prostatic hyperplasia

Alpha 2 receptors

Alpha 2 agonists

Hypertension treatment

Alpha 2 blockers

Yohimbine

Alpha 2 receptors
(presynaptic actions)

Autonomic
neuromodulation

Inhibition of
norepinephrine release
(Inhibitory autoreceptors)

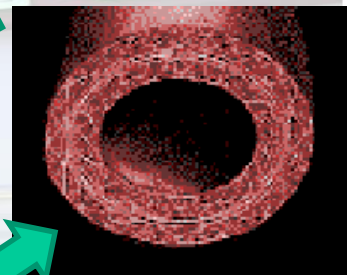
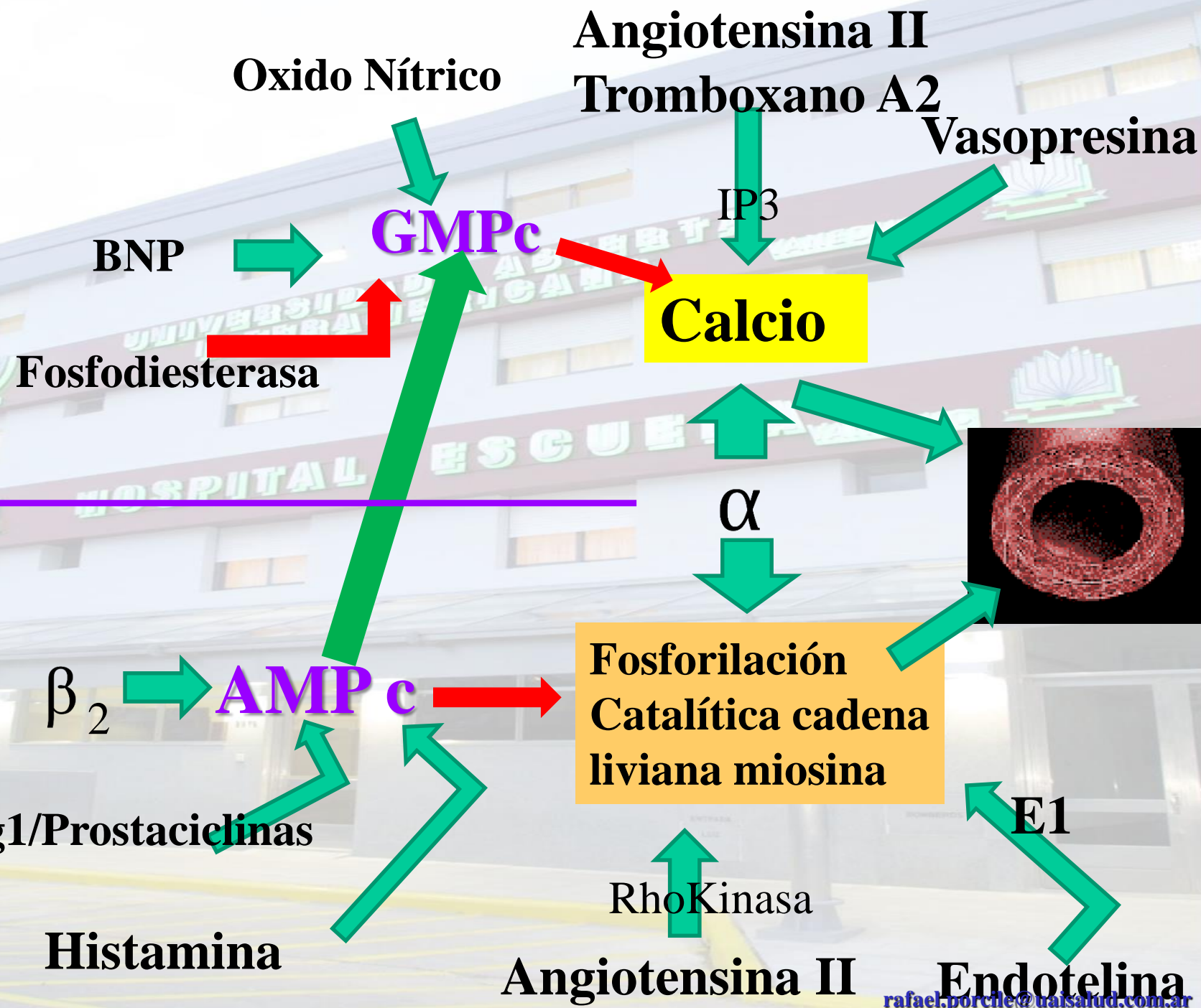
Inhibition of
acetylcholine release
(Inhibitory
heteroreceptors)

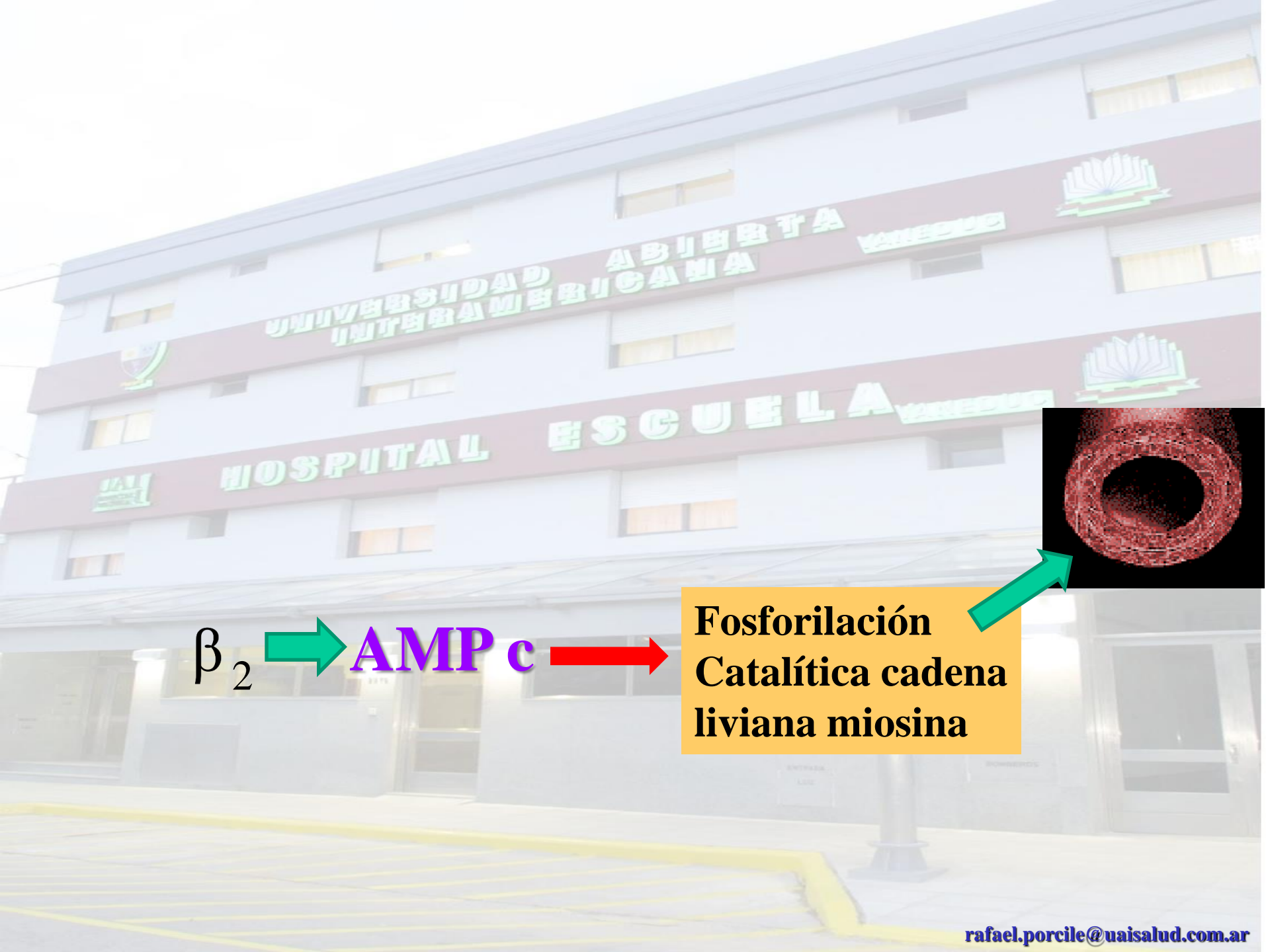
Pancreatic β cell

Inhibition of
insulin release

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UNIVERSIDAD INTERAMERICANA DE VENEZUELA



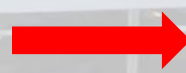
HOSPITAL ESCUELA



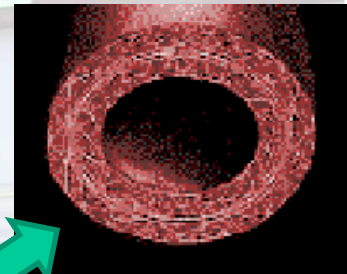
β_2



AMPc



Fosforilación Catalítica cadena liviana miosina

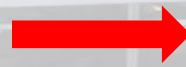




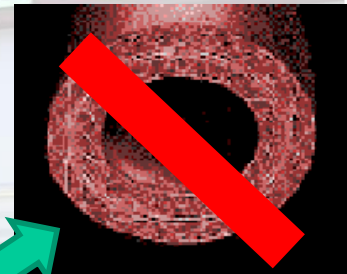
β_2



AMPc

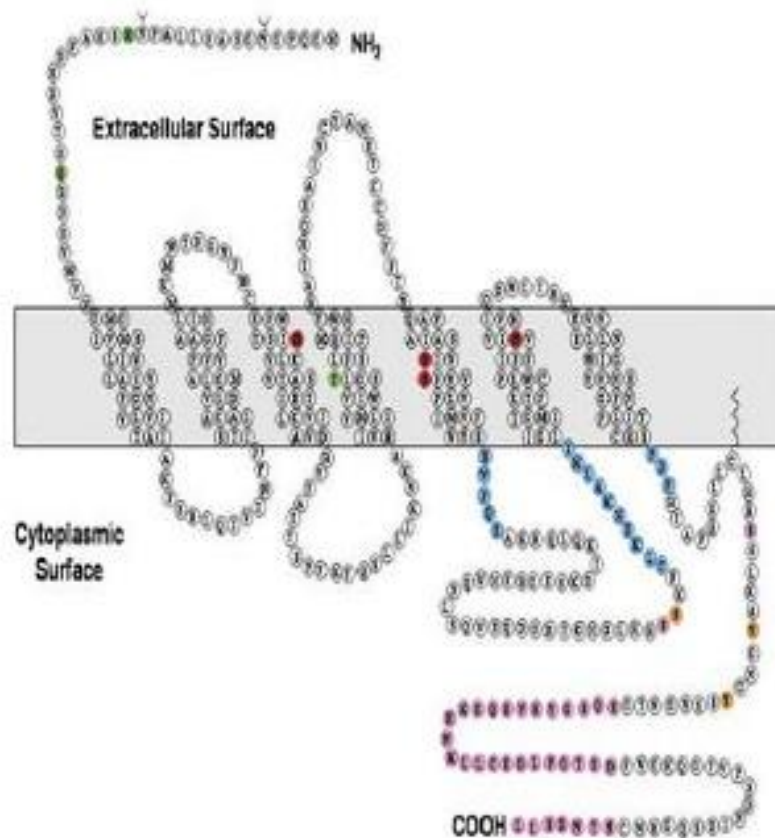


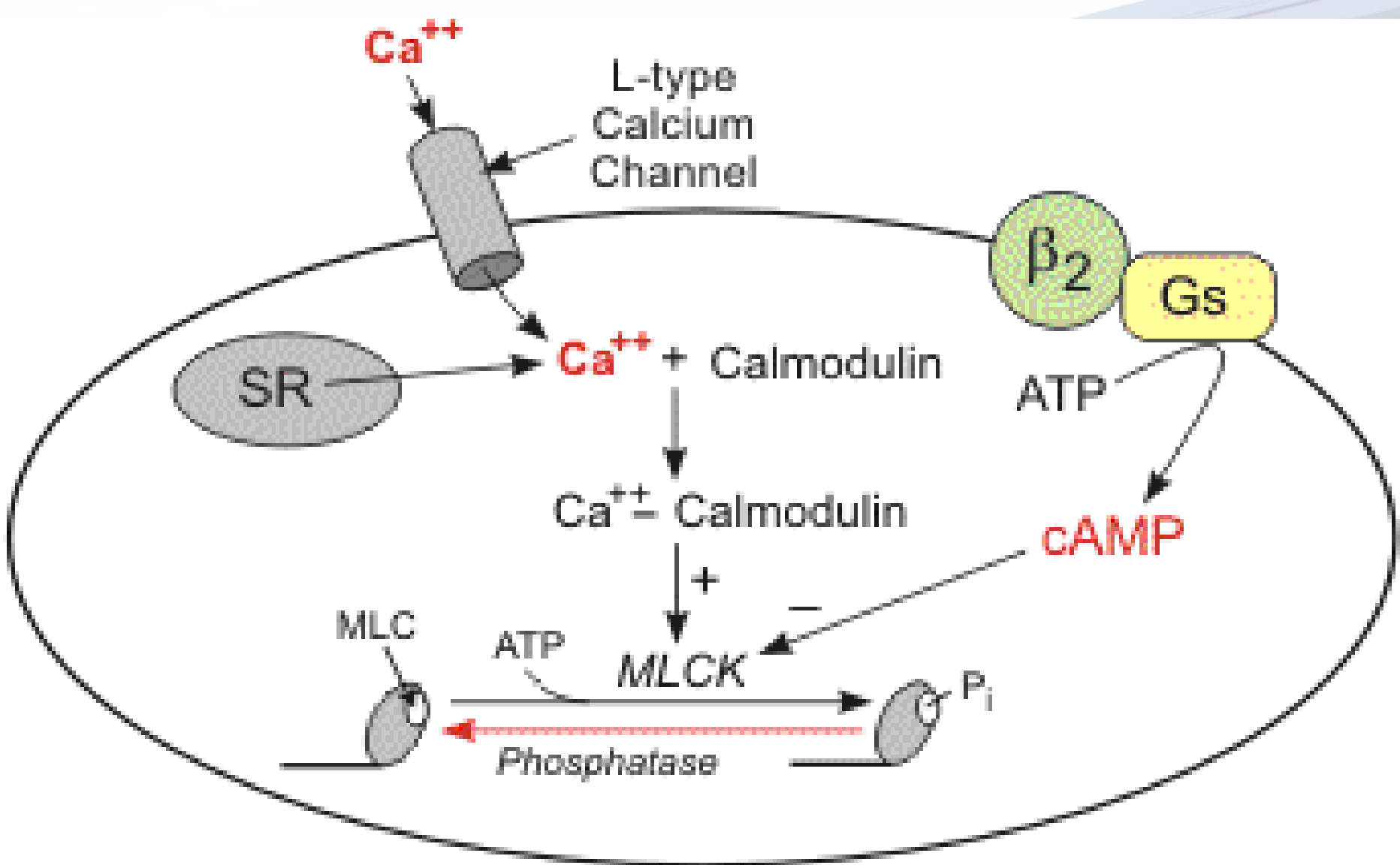
**Fosforilación
Catalítica cadena
liviana miosina**



β_2 -adrenoreceptor

- Long arm of chromosome 5
- G protein-coupled receptors
- Distribution
 - Widely distributed in lung, with high levels in central lung and alveolar region
 - Airway smooth muscle, epithelial cells, endothelial cells, type II cells
 - Mast cell, eosinophil, monocyte, alveolar macrophage, dendritic cells





Abbreviations: SR, sarcoplasmic reticulum; Gq, Gs-protein; MLC, myosin light chain; MLCK, myosin light chain kinase; P_i, myosin phosphorylation

Calcium Channel

musculo liso vascular periférico y bronquial

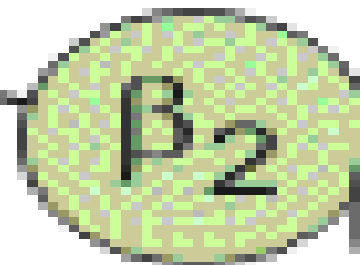
Ca^{++} + Calmodulin

Ca^{++} - Calmodulin

MLCK

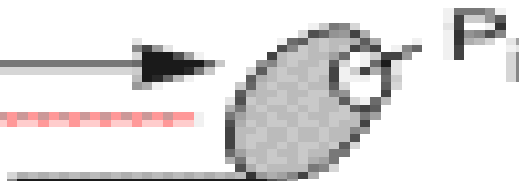
ATP

Phosphatase



ATP

cAMP



β -1 receptors



Increased chronotropy and inotropy

Increased AV-node conduction velocity

Increased renin release

β -2 receptors

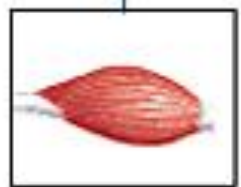


Bronchodilation



Uterine relaxation (tocolysis)

β -3 receptors



BETA

3

Targeting β_3 -Adrenergic Receptors in the Heart: Selective Agonism and β -Blockade

J Cardiovasc Pharmacol 2017;69:71–78

β_3 ARs are present in the

cardiovascular system, mainly in myocardium and endothelium, where they have a prominent role **in modulating cardiac function and angiogenesis, respectively**

For these reasons, the β_3 AR leads to effects that are either comparable or opposite to those elicited by β_1 - and β_2 AR stimulation.

Targeting β_3 -Adrenergic Receptors in the Heart: Selective Agonism and β -Blockade

J Cardiovasc Pharmacol 2017;69:71–78

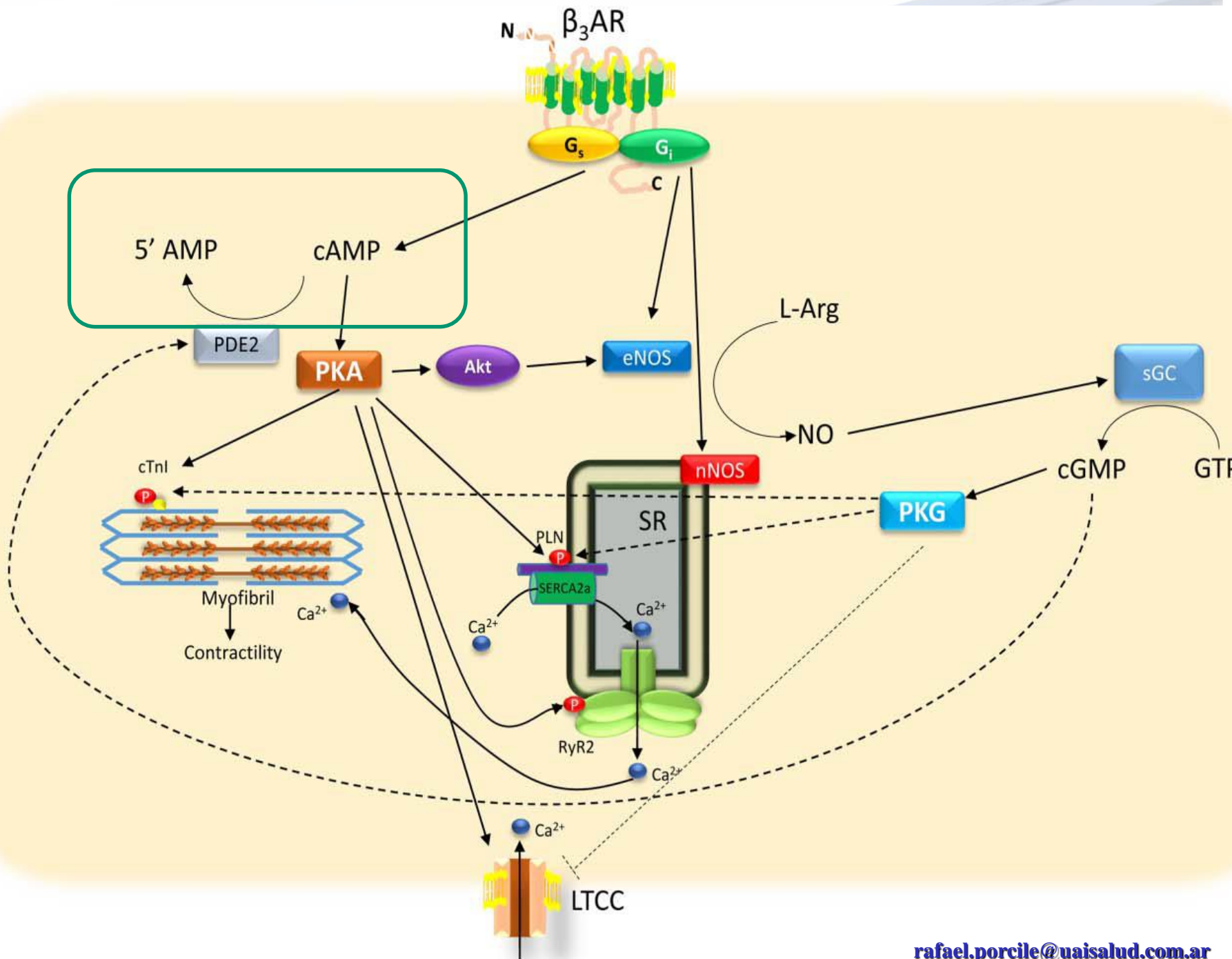
In fact, stimulation of β_3 AR, through Gas activation, increases the generation of cyclic AMP (cAMP)

However, because β_3 ARs are also coupled with Gai, they can act as a brake to prevent β_1 and β_2 ARs overactivation, and this has been proposed as a mechanism in the heart

Targeting β_3 -Adrenergic Receptors in the Heart: Selective Agonism and β -Blockade

J Cardiovasc Pharmacol 2017;69:71–78

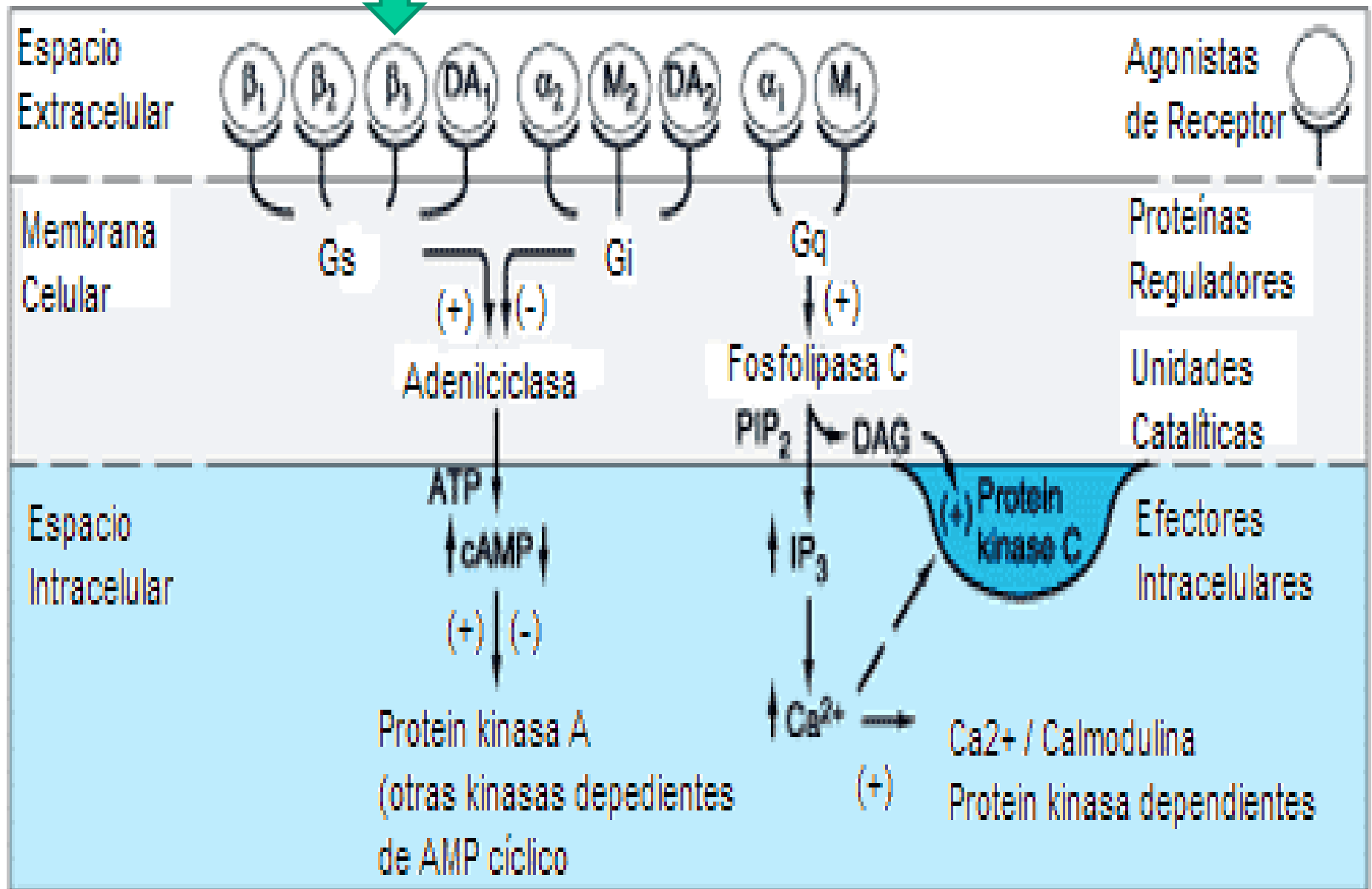
Moreover, in the heart, the stimulation of β_3 ARs leads to increased endothelial nitric oxide (NO) synthase (eNOS)₂ or neuronal (nNOS) activation



Targeting β_3 -Adrenergic Receptors in the Heart: Selective Agonism and β -Blockade

J Cardiovasc Pharmacol 2017;69:71–78

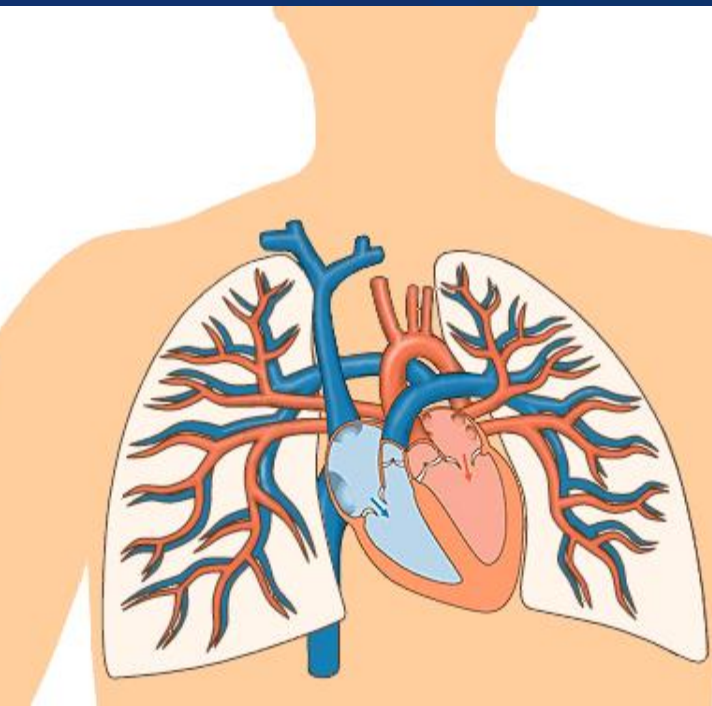
In line with the notion that β_3 AR activation overexpression or persistent activation of β_3 AR is cardioprotective and can attenuate pathological LV hypertrophy induced by continuous infusion of isoproterenol and angiotensin II, or by transaortic constriction, in mice





LA CIRCULACIÓN PULMONAR

Circulación pulmonar



FLUJO SANGUINEO PULMONAR

CIRCULACION BRONQUIAL

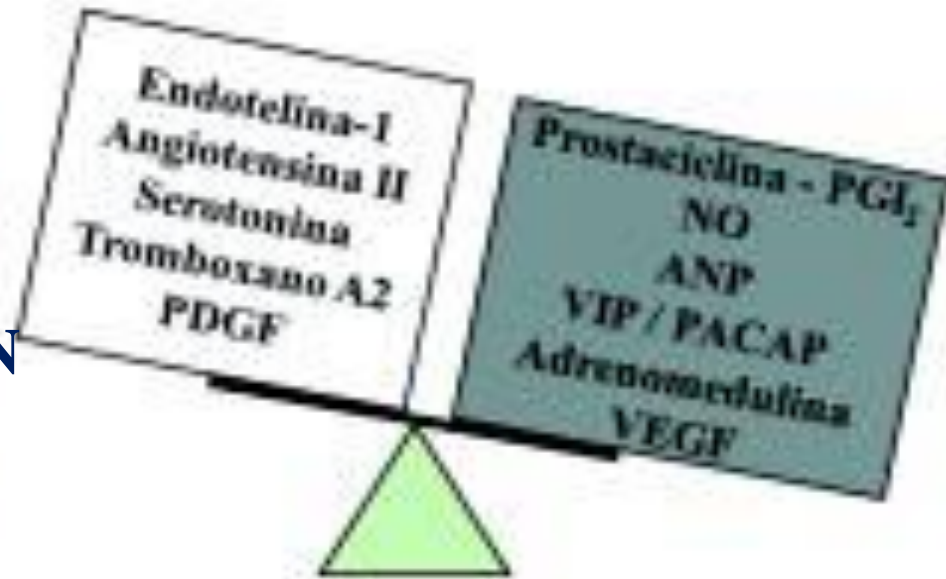
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VI: CIRCULACION SIST.
ARBOL TRAQUEO
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CIRCULACION PULMONAR

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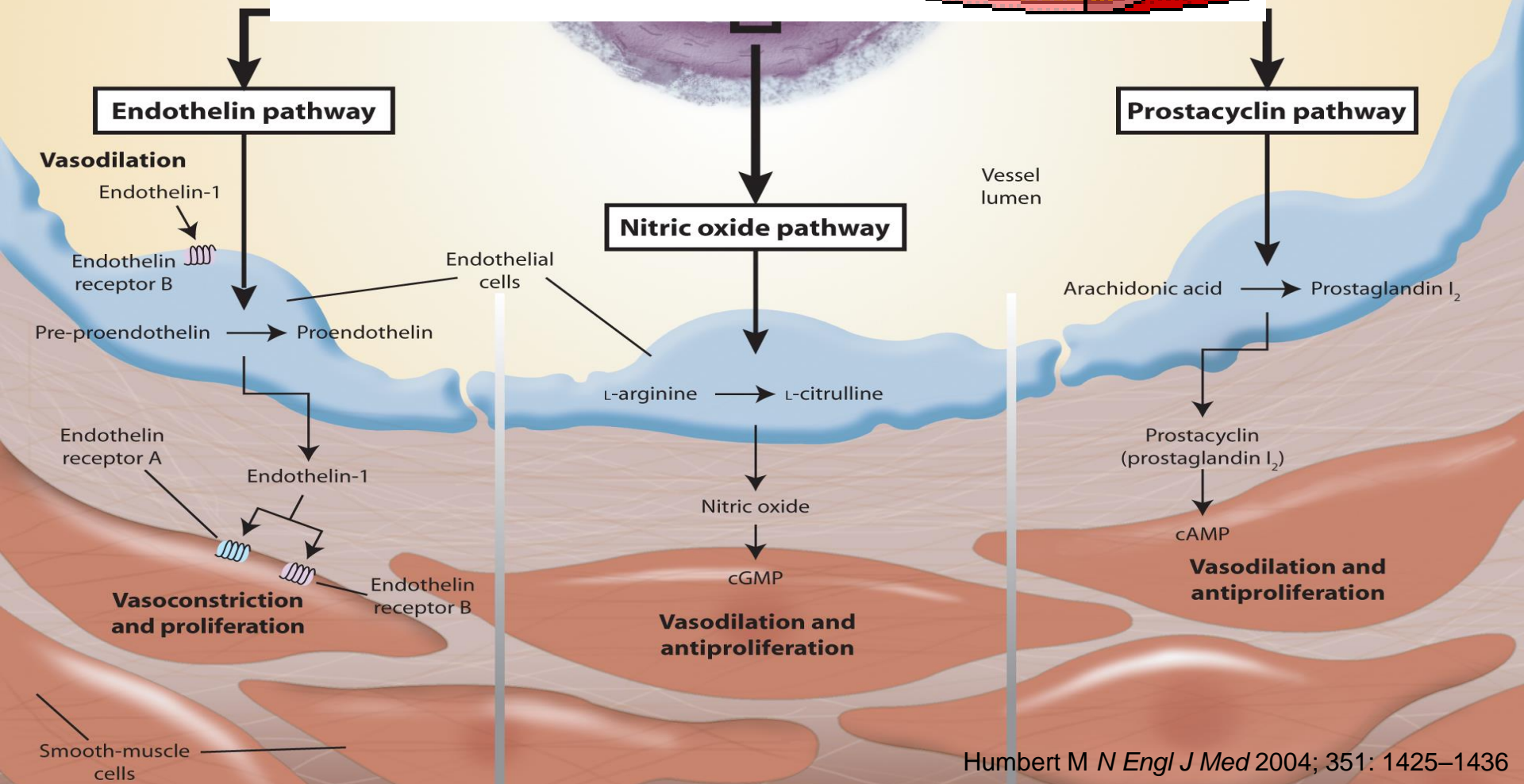
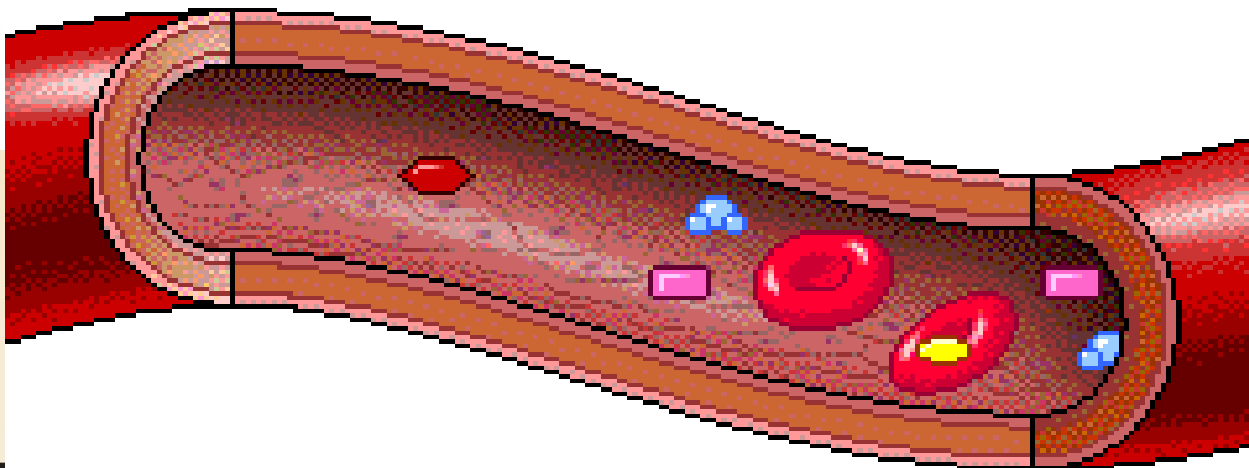


VASOCONSTRICCIÓN



VASODILATACION







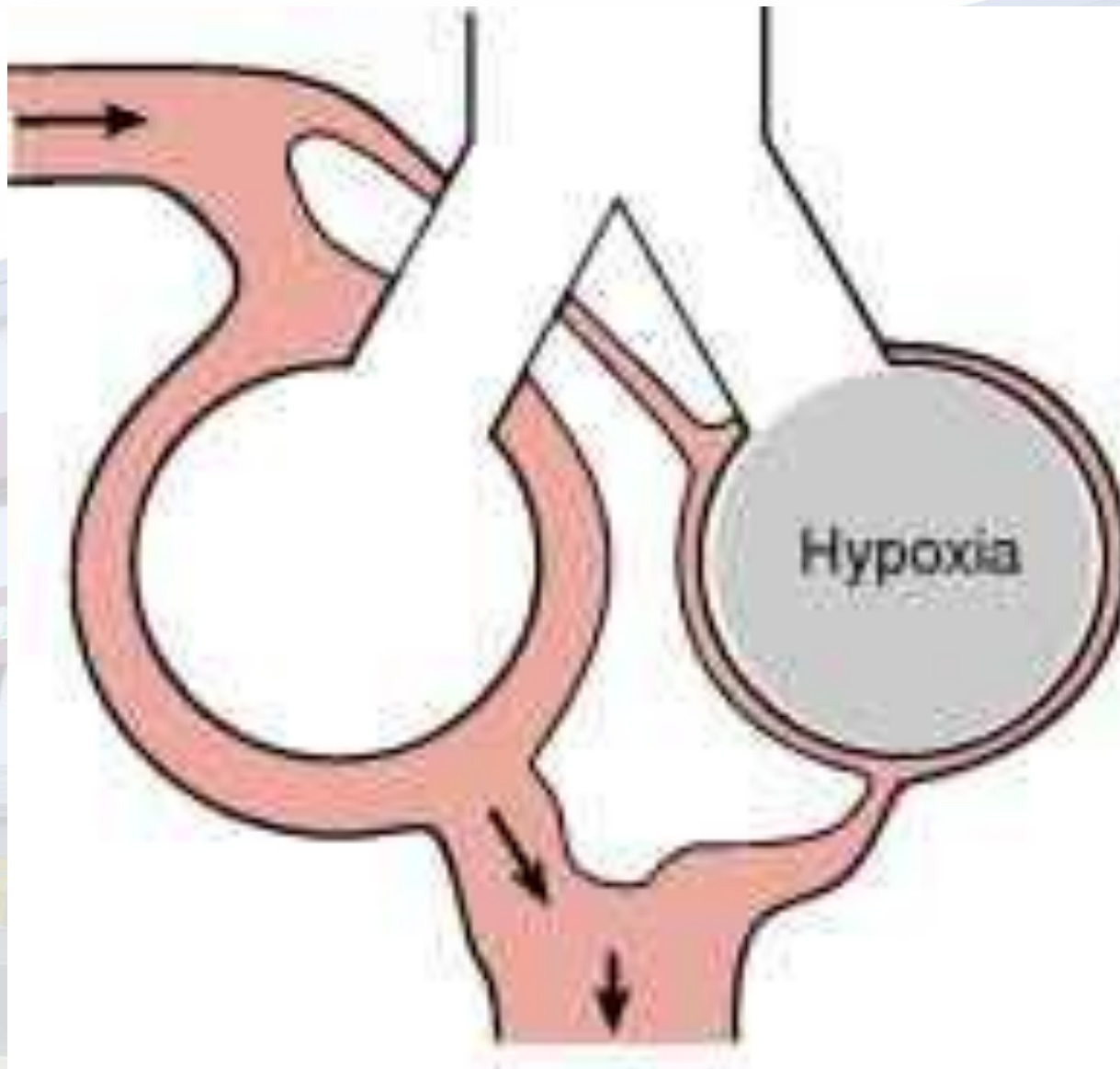
oxígeno

vasodilatador en los
vasos pulmonares

The background image shows a multi-story school building with a sign that reads 'SCHOOL' and 'AMERICAN'. The text is overlaid in large, bold, red font.

La circulación pulmonar difiere de la sistémica

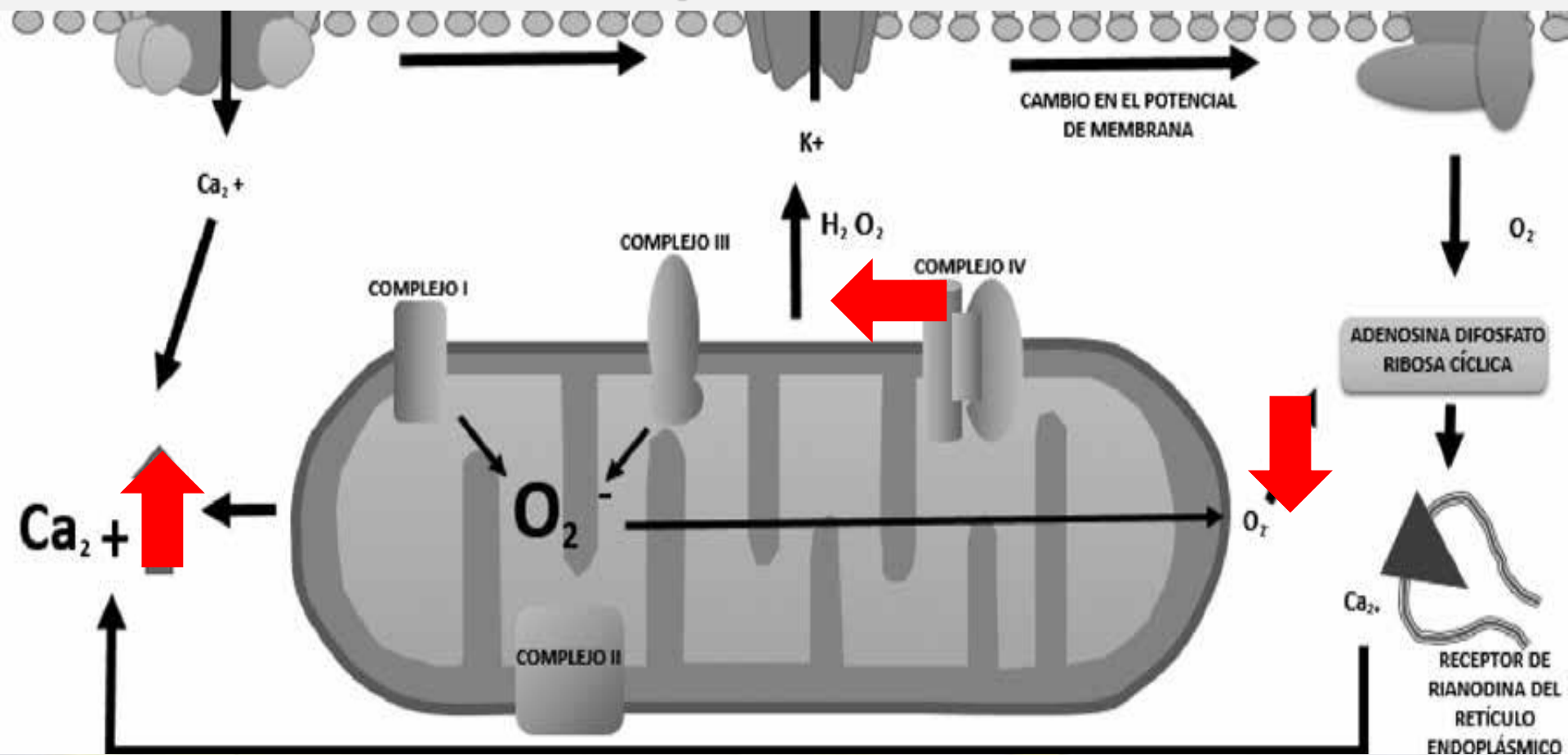
Las arterias pulmonares se contraen de forma fisiológica en la hipoxia, mientras que las arterias sistémicas tienden a vasodilatarse de forma moderada



B

Generalized hypoxia

Durante la hipoxia se producen mediadores redox (H_2O_2) que generan una inhibición de canales dependientes de potasio en las células del músculo liso de las arterias pulmonares
Aumenta el calcio citoplasmático



FARMACOS VASOCONSTRICTORES

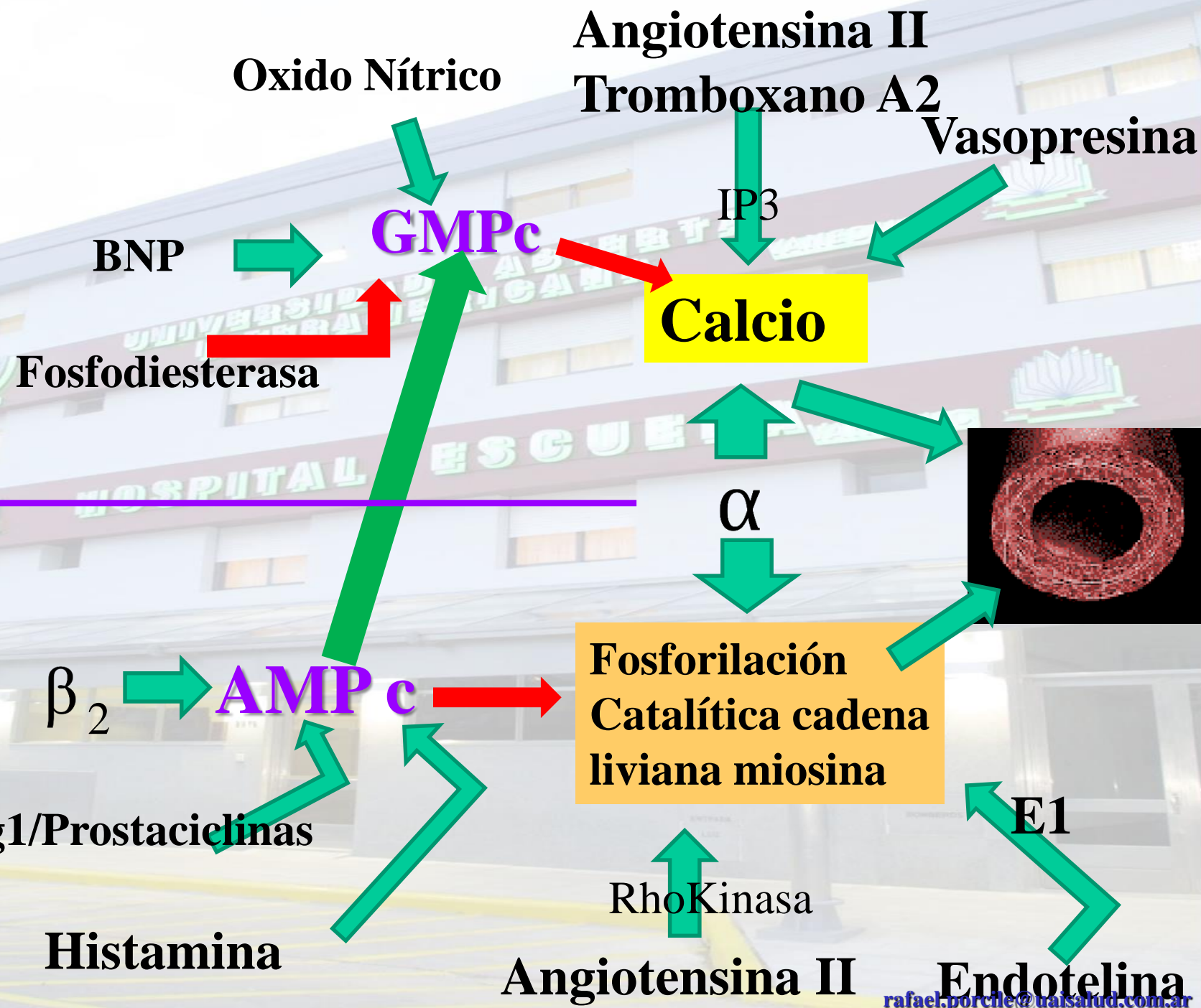
Prof. Dr. Mag. Rafael Porcile

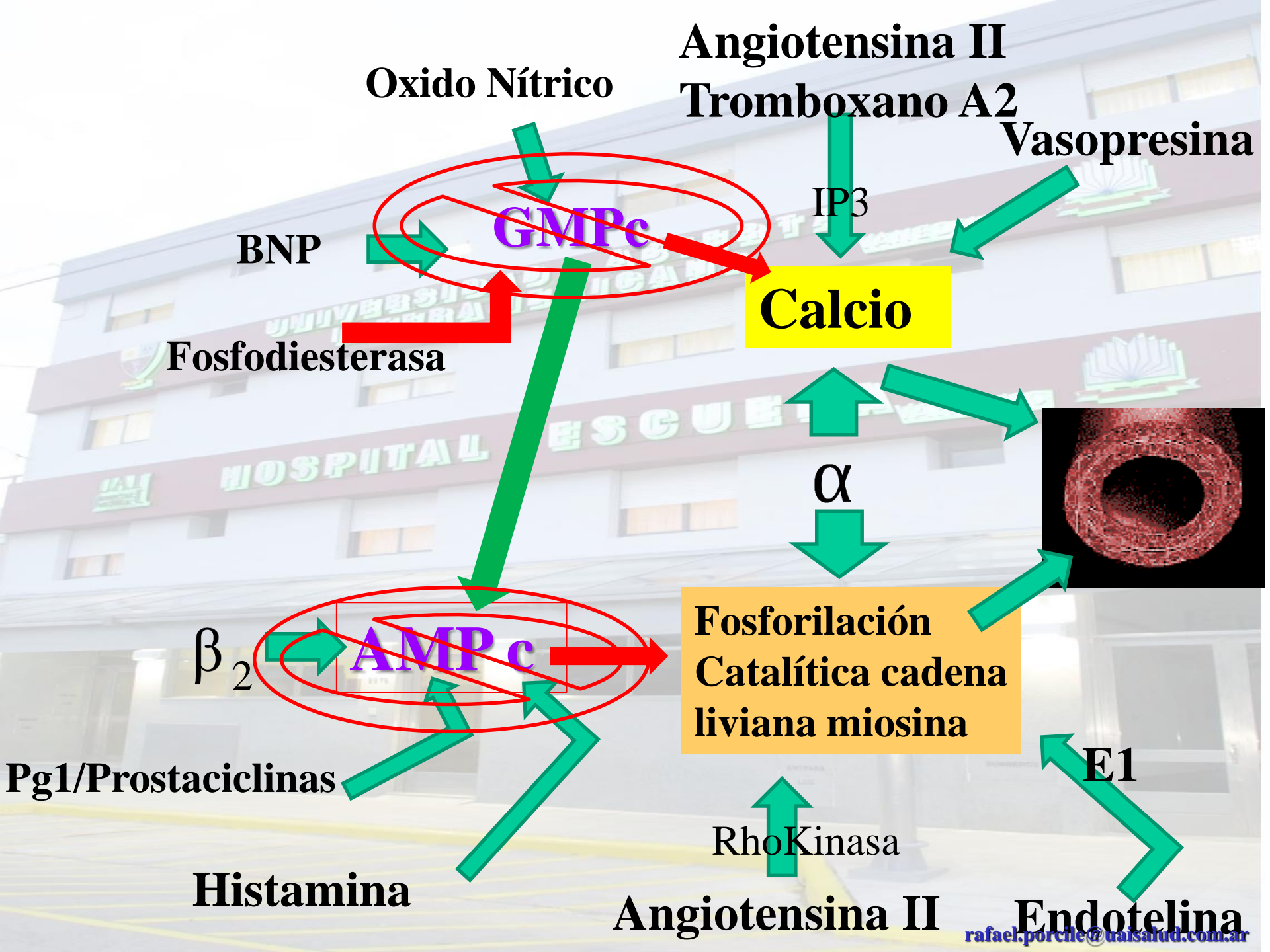
**DEPARTAMENTO DE CARDIOLOGIA
CATEDRA DE FISIOLÓGÍA**

Universidad Abierta Interamericana

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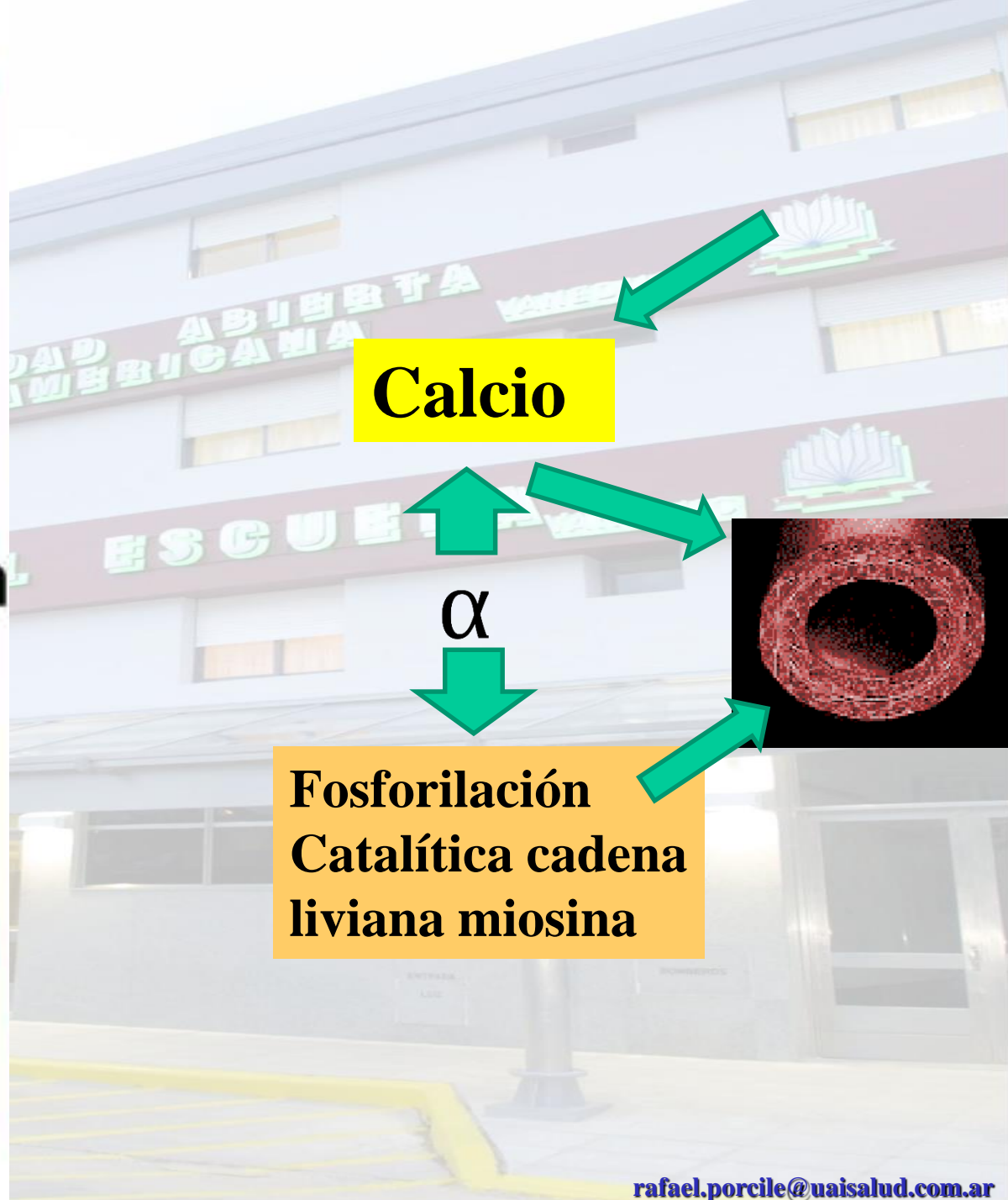
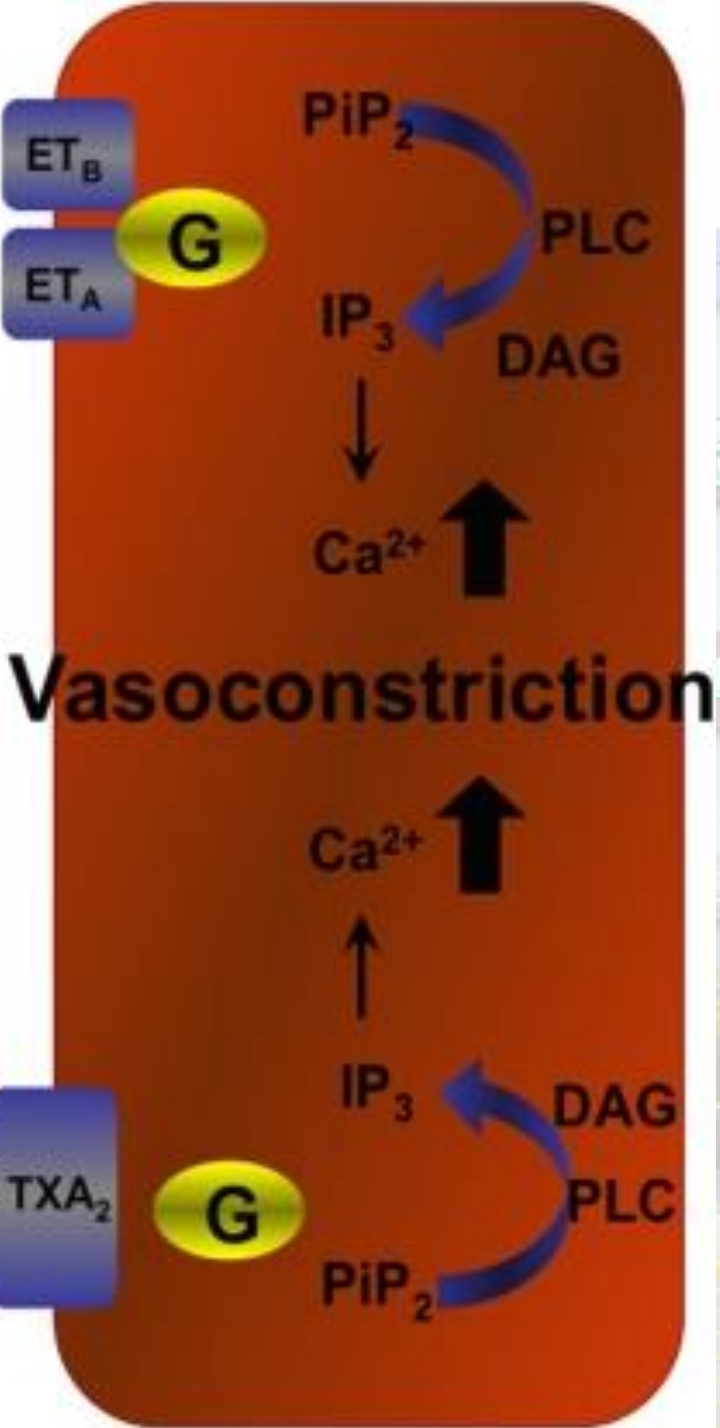
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Classification of Vasoconstrictors

- Catecholamines
 - Epinephrine
 - Norepinephrine
 - Dopamine
- Noncatecholamines
 - Amphetamine
 - Methamphetamine
 - Phenylephrine



■ AGONISTAS DIRECTOS

- Fenilefrina
- Etilefrina

■ AGONISTAS INDIRECTOS

- Efedrina
- Dopamina

■ NORADRENALINA

■ ADRENALINA

α

Agonistas α adrenérgicos

- α_1 adrenérgicos: fenilefrina
- α_2 adrenergicos: oximetazolina, xilometazolina, nafazolina

α

Secretores de noradrenalina

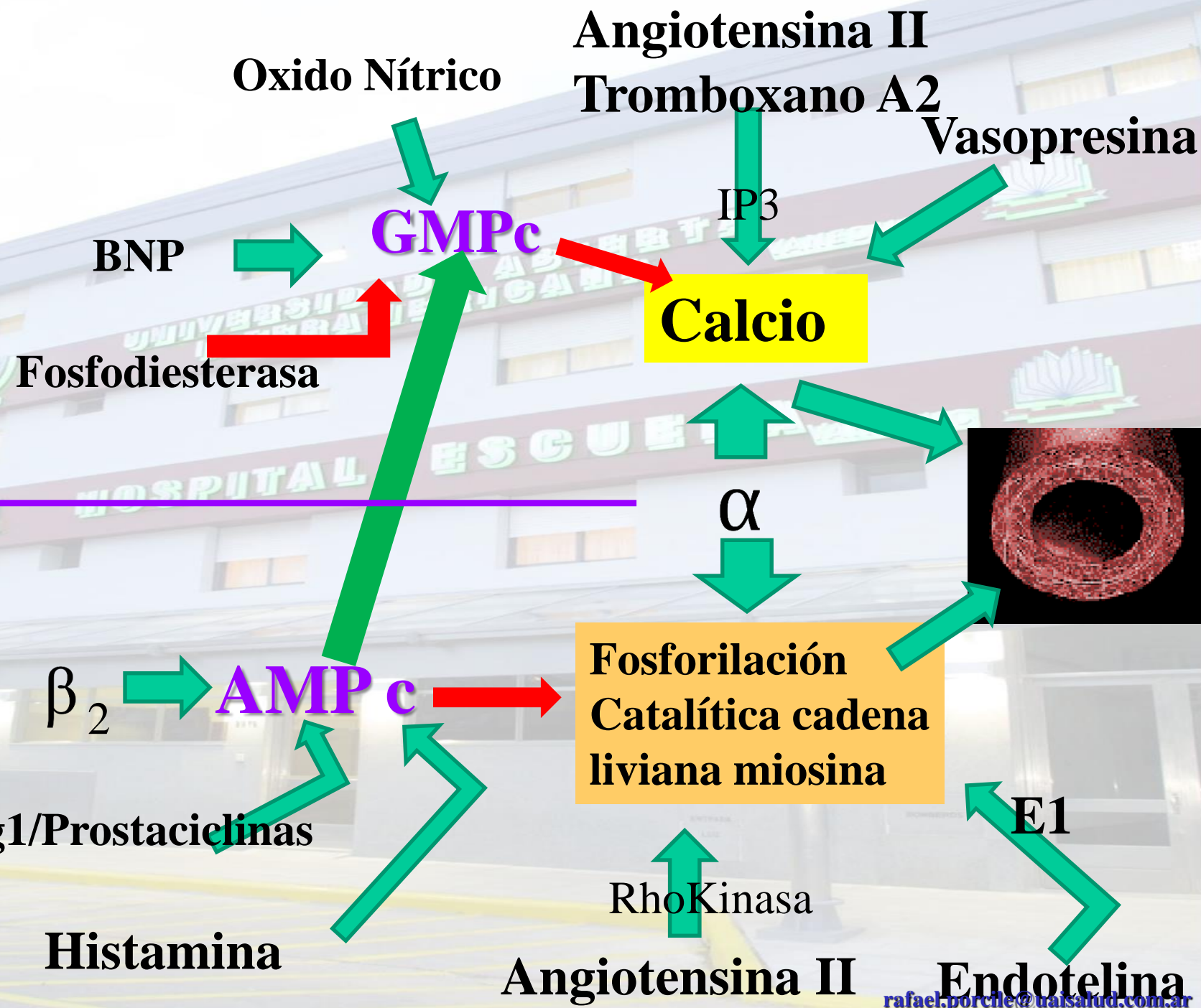
- efedrina, pseudoefedrina, anfetaminas

Bloqueadores recaptación de noradrenalina

- fenilpropanolamina, cocaína, antidepresivos triciclicos

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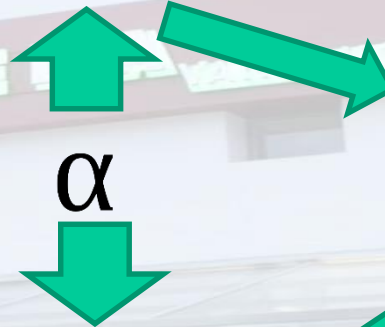
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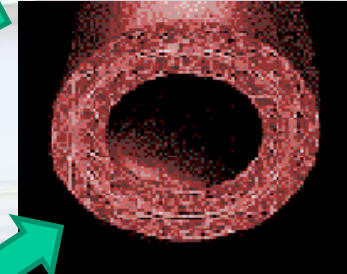


FENILEFRINA

Calcio



**Fosforilación
Catalítica cadena
liviana miosina**



FENILEFRINA

- Agonista directo α_1 selectivo.
- VASOCONSTRICCIÓN
- Duración < 5 minutos.
- Eliminación MAO (no COMT).



Figura 4 – Comparación de la frecuencia cardíaca entre dos grupos.
 FC: frecuencia cardíaca.
 Fuente: elaboración propia.

Frecuencia Cardíaca	↓↓ (refleja)
Contractilidad	-
Gasto cardíaco	- / ↓
Presión arterial	↑↑
Resistencia vascular sistémica	↑↑

- Hipotensión debida a vasodilatación periférica y RVS baja (shock séptico).
- Tto temporal de la hipovolemia (hasta restaurar el volumen sanguíneo).
- Vasopresor de elección en arteriopatía coronaria o estenosis aórtica sin ICC.

■ VENTAJAS:

- Efecto agonista directo de corta duración.
- Aumenta P de perfusión en cerebro, riñón y corazón en estados de RVS baja.
- Aumenta PPCoronaria sin aumentar contractilidad del miocardio (evitar hipertensión para no aumentar consumo O₂).

■ DESVENTAJAS:

- Puede disminuir el volúmen sistólico por aumento de postcarga.
- Bradicardia por estimulación vagal refleja (responde a atropina).
- Monitorizar diuresis y perfusión en extremidades.

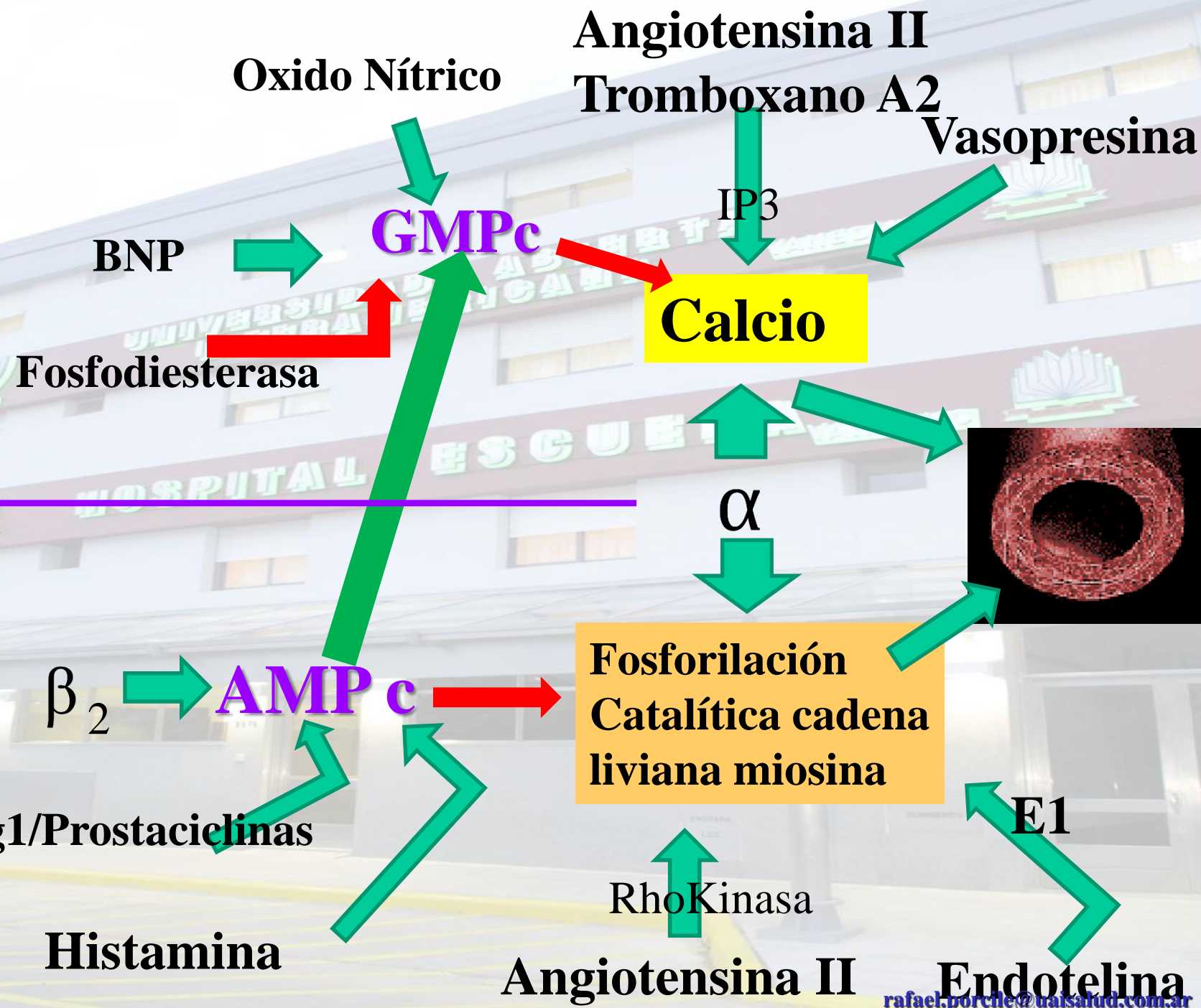
- Ampolla 10mg (1ml)
 - Llevar a 20ml SF – **500 µg/ml**
 - 1 ml preparación (500 µg), llevar a 10 SF -- **50 µg/ml**

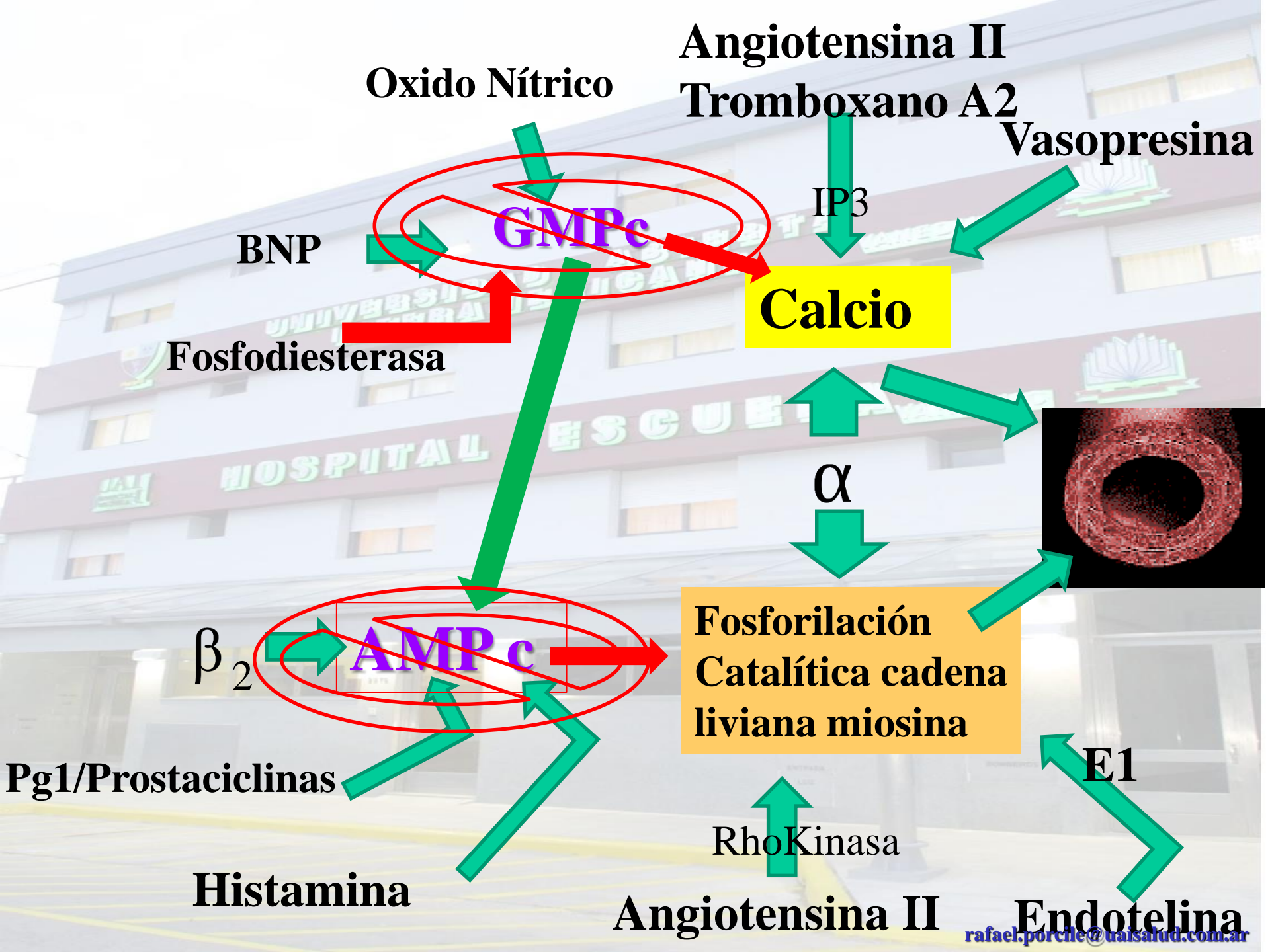
- Infusión (EV; preferible central): 0,5-10 µg/kg/min

- Bolo EV: 1-10 µg/kg (aumentando según necesidades).

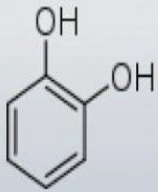
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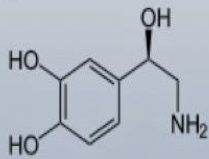
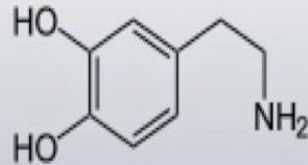




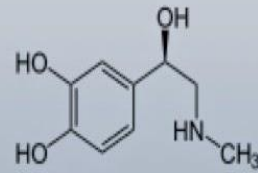
Catecolaminas



Grupo Catecol
Dopamina

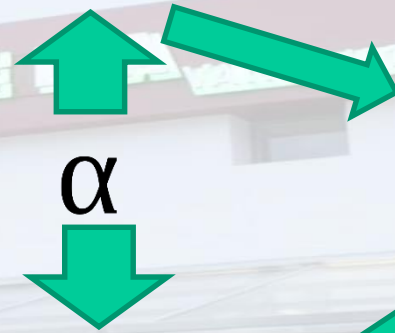


Norepinefrina



Epinefrina

Calcio



α

**Fosforilación
Catalítica cadena
liviana miosina**

	Epinephrine	Norepinephrine
Receptor activity	Powerful stimulant of α and β receptors With higher doses α effects predominates, whereas lower doses primarily produce β receptor activity	Stimulates both α and β receptors, but α effect predominates
Blood Pressure (BP)	Lesser effect	Greater increase in BP than epinephrine
Central Nervous System	Greater effect of stimulation of central nervous system in large doses	Does not stimulate central nervous system in therapeutic doses
Cardiovascular system	Greater effect of stimulation of CVS	
Bronchi	Dilatation	Little or no effect
Heart Rate (HR)	Increase in HR is of greater degree	Increase in HR is of lesser degree

Drug	Receptor activity				Predominant clinical effects
	Alpha-1	Beta-1	Beta-2	Dopaminergic	
Phenylephrine	+++	0	0	0	SVR ↑↑, CO ↔/↑
Norepinephrine	+++	++	0	0	SVR ↑↑, CO ↔/↑
Epinephrine	+++	+++	++	0	CO ↑↑, SVR ↓ (low dose) SVR/↑ (higher dose)
Dopamine (mcg/kg/min)*					
0.5 to 2.	0	+	0	++	CO
5. to 10.	+	++	0	++	CO ↑, SVR ↑
10. to 20.	++	++	0	++	SVR ↑↑
Dobutamine	0/+	+++	++	0	CO ↑, SVR ↓

NORADRENALINA

- Principal neurotransmisor simpático postganglionar; también se libera en médula suprarrenal.
- Agonista directo α_1 , α_2 y β_1 .
- Fin de acción por recaptación y metabolismo por COMT y MAO.

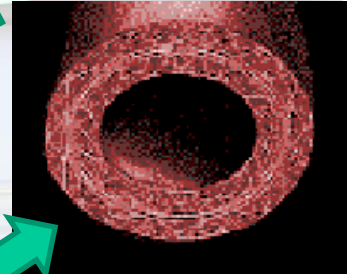
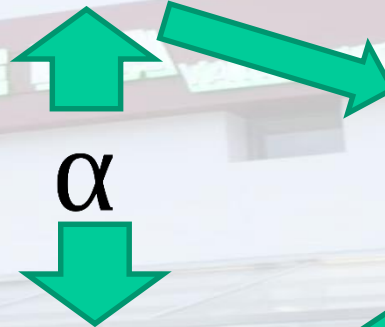
Frecuencia Cardíaca	Según valor TA
Contractilidad	↑↑
Gasto cardíaco	↑ o ↓ (depende RVS)
Presión arterial	↑↑
Resistencia vascular sistémica	↑↑↑
Resistencia vascular pulmonar	↑↑

presentación - preparación - dosis

- Ampolla 4mg (4ml)
 - Preparar en volumen total de 400 ml SF – **10 µg/ml**
- Infusión (EV; central):
 - Dosis inicial habitual: 0,015 – 0,03 µg/kg/min
 - Intervalo habitual: 0,05 – 3 µg/kg/min
- *Vigilar estrictamente diuresis y EAB. Minimizar la duración de su uso.*



Calcio



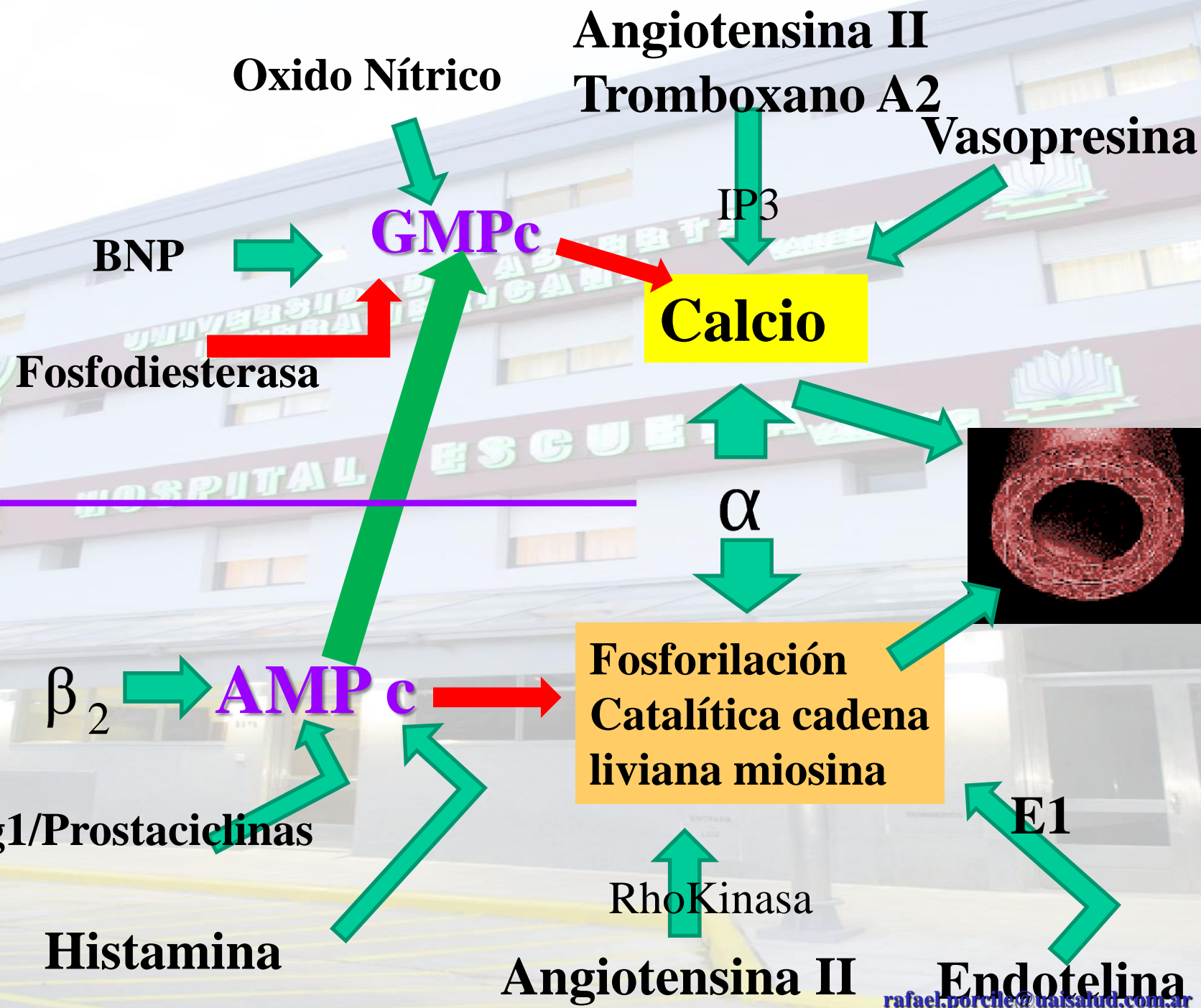
**Fosforilación
Catalítica cadena
liviana miosina**

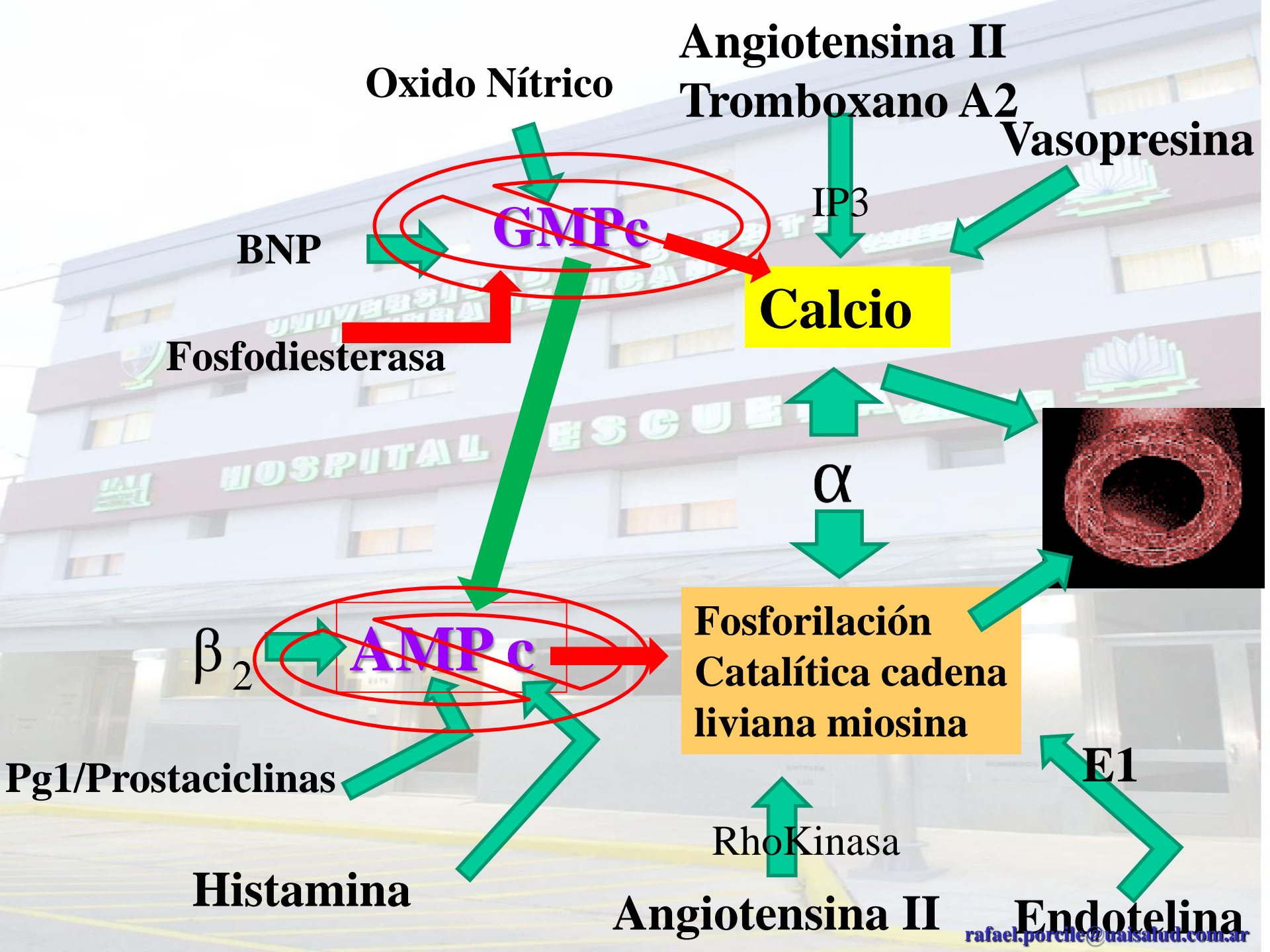
METARAMINOL

- Agonista α .
- VASOCONSTRICCIÓN.
- Indicación: Hipotensión arterial.
- Duración de acción 3-7''
- Presentación: 10mg (1ml)
 - Preparar 50mg en 250ml Dx 5% -- **200 $\mu\text{g/ml}$**
 - Dosis Infusión (EV): 50-500 $\mu\text{g/min}$ (2.5 $\mu\text{g/kg/min}$)

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PRESENTACION:



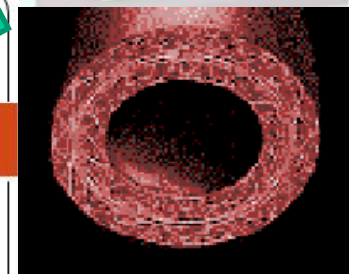
Forma farmacéutica:
Solución inyectable

Concentración de : 20u/ml



Vasopresina

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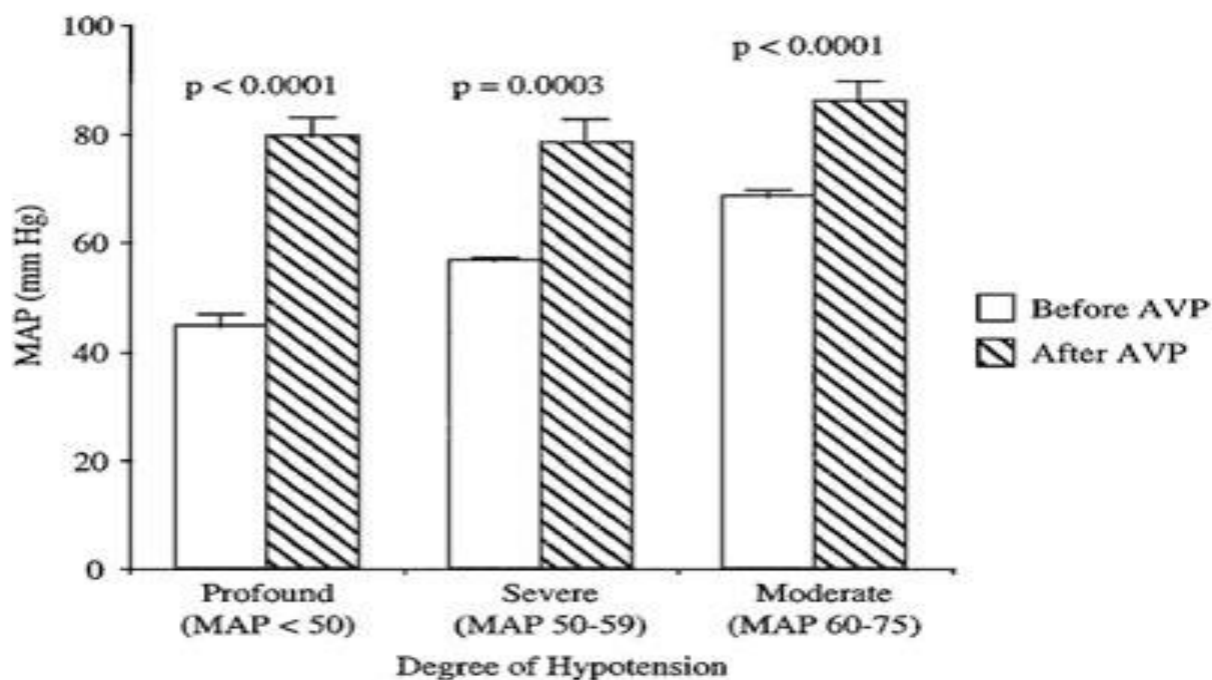


PRECAUCIONES/ CONTRAINDICACIONES	INDICACIONES	ADMINISTRACION IV
<ul style="list-style-type: none">• POTENTE VASOCONSTRUCTOR PERIFERICO• EL AUMENTO DE LA RESISTENCIA VASCULAR PERIFERICA PUEDE PROVOCAR ISQUEMIA CARDIACA Y ANGINA• NO SE RECOMIENDA EN PACIENTES QUE RESPONDEN Y TIENE ENFERMEDAD CORONARIA	<ul style="list-style-type: none">• SE PUEDE UTILIZAR COMO AGENTE PRESOR ALTERNATIVO A LA ADRENALINA EN EL TRATAMIENTO DE LA FIBRILACION VENTRICULAR REFRACTARIA A LAS DESCARGAS EN EL ADULTO• PUEDE SER ALTERNATIVA UTIL A LA ADRENALINA EN ASISTOLIA/AESP• PUEDE SER UTIL COMO APOYO HEMODINAMICO EN SHOK POR VASODILATACION (SHOCK SEPTICO)	<p><u>PARO CARDIACO:</u></p> <p>UNA DOSIS DE 40 U EN BOLO IV /IO PUEDE SUSTITUIR A LA PRIMERA O SEGUNDA DOSIS DE ADRENALINA</p> <p>DESCARGA POR VASODILATACION:</p> <p>INFUSION CONTINUA DE 0,02 A 0.04 U POR MINUTO</p> <p>PUEDE ADMINISTRARSE POR TUBO ENDOTRAQUEAL</p>

MANAGEMENT OF VASODILATORY SHOCK AFTER CARDIAC SURGERY: IDENTIFICATION OF PREDISPOSING FACTORS AND USE OF A NOVEL PRESSOR AGENT

Michael Argenziano, Jonathan M. Chen, Asim F. Choudhri, Suzanne Cullinane, Evan Garfein, Alan D. Weinberg, Craig R. Smith, Jr, Eric A. Rose, Donald W. Landry and Mehmet C. Oz

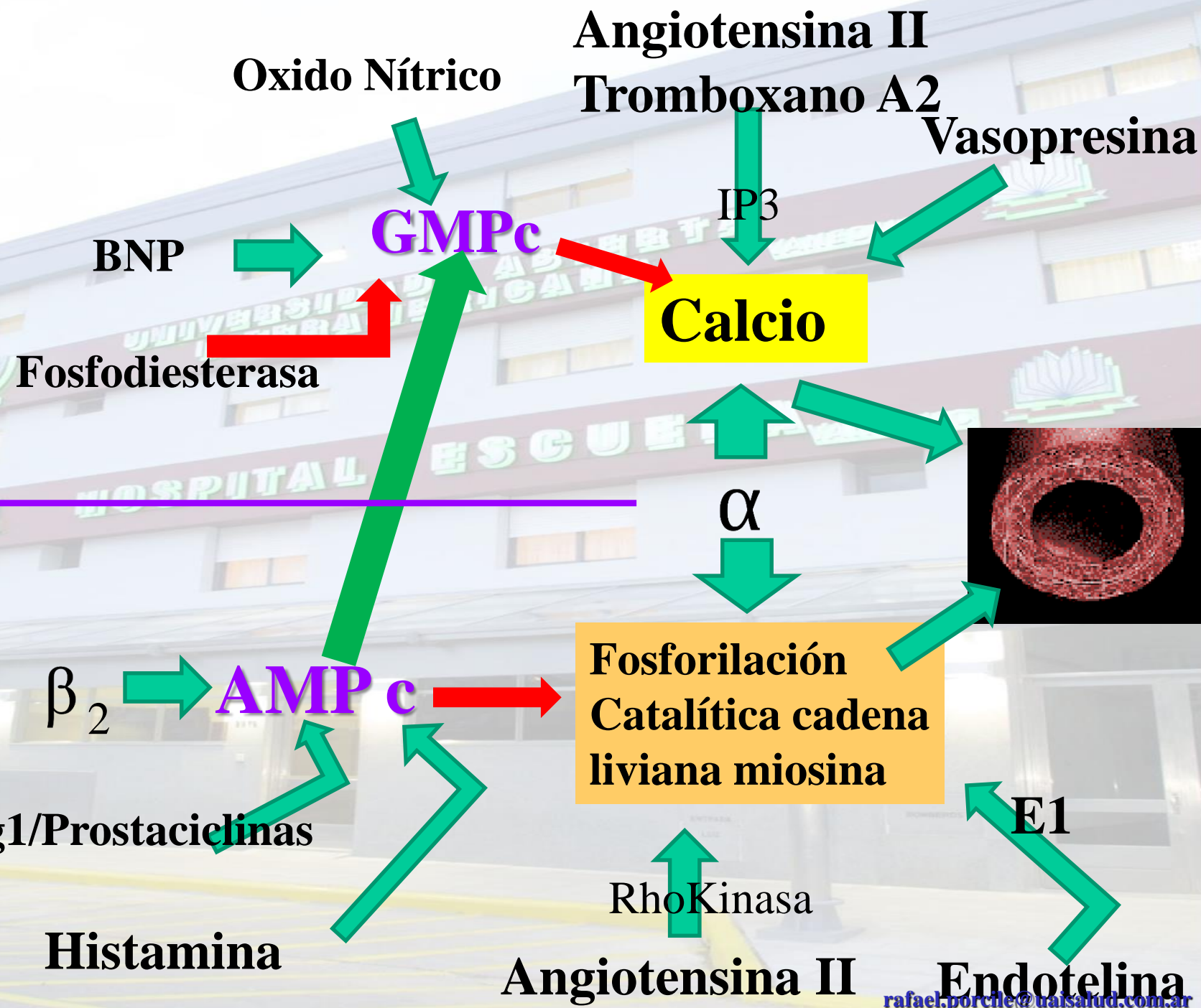
J Thorac Cardiovasc Surg 1998;116:973-980



Argenziano et al *J Thorac Cardiovasc Surg* 1998;116:973-980

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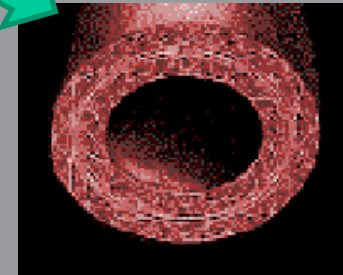


Oxido Nítrico

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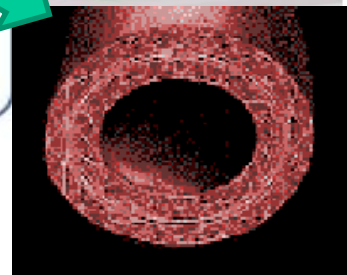
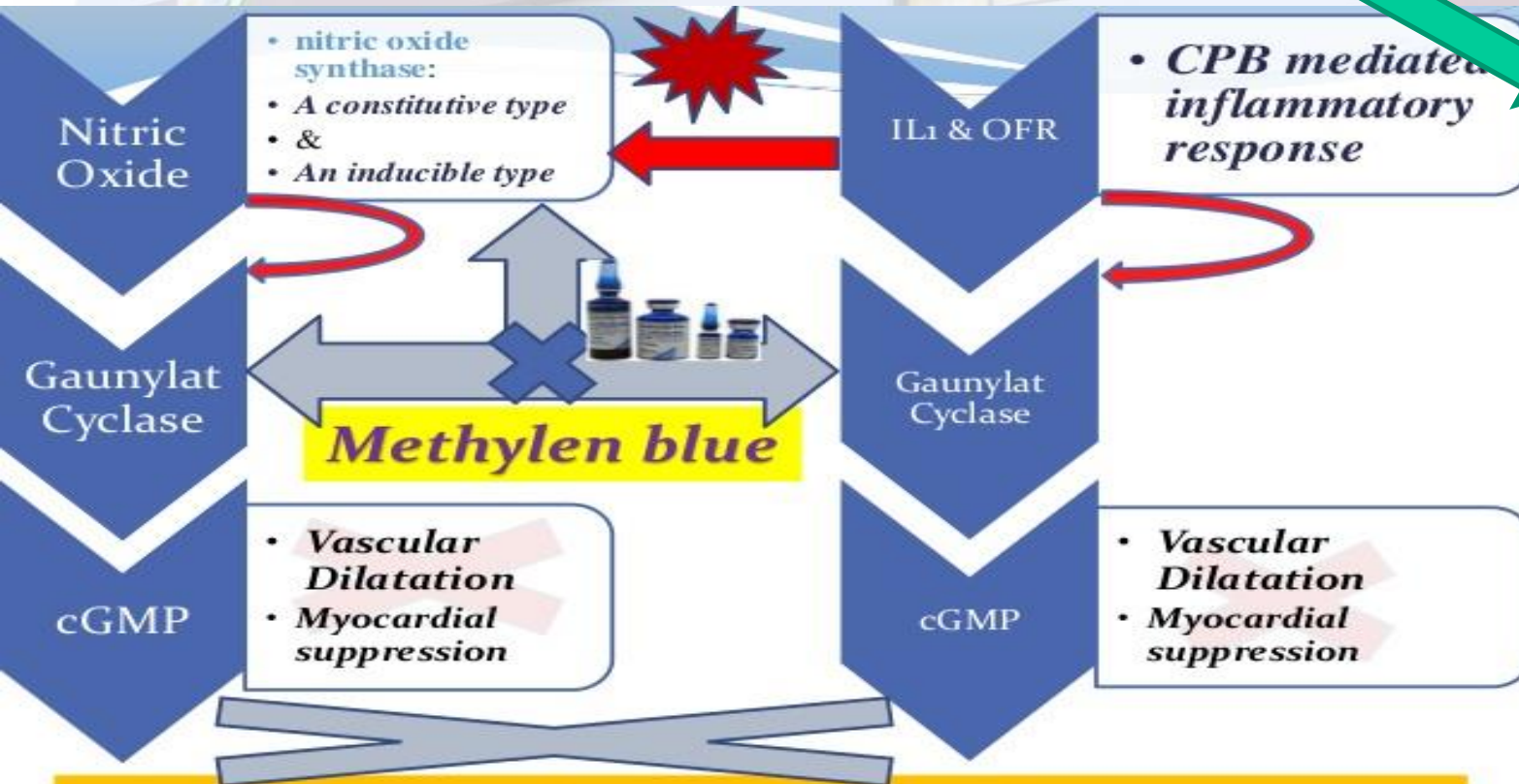


Oxido Nítrico

BNP

GMPC

Calcio



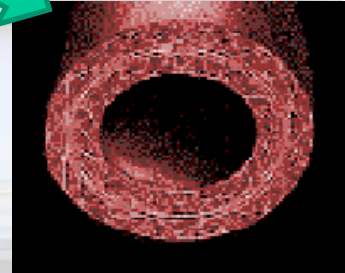
Vasoplegic Syndrome

Oxido Nítrico

BNP

GMPC

Calcio



Methylene blue: The drug of choice for catecholamine-refractory vasoplegia after cardiopulmonary bypass?

Rainer G. Leyh, MD

Theo Kofidis, MD

Martin Strüber, MD

The Journal of Thoracic and Cardiovascular Surgery • June 2003

Methylene Blue in the Treatment of Refractory Shock From an Amlodipine Overdose

David H. Jang, MD, Lewis S. Nelson, MD, Robert S. Hoffman, MD

From New York University School of Medicine, Bellevue Hospital Center and New York University Langone Medical Center, New York, NY, and New York City Poison Control Center, New York, NY.

REVIEW ARTICLE

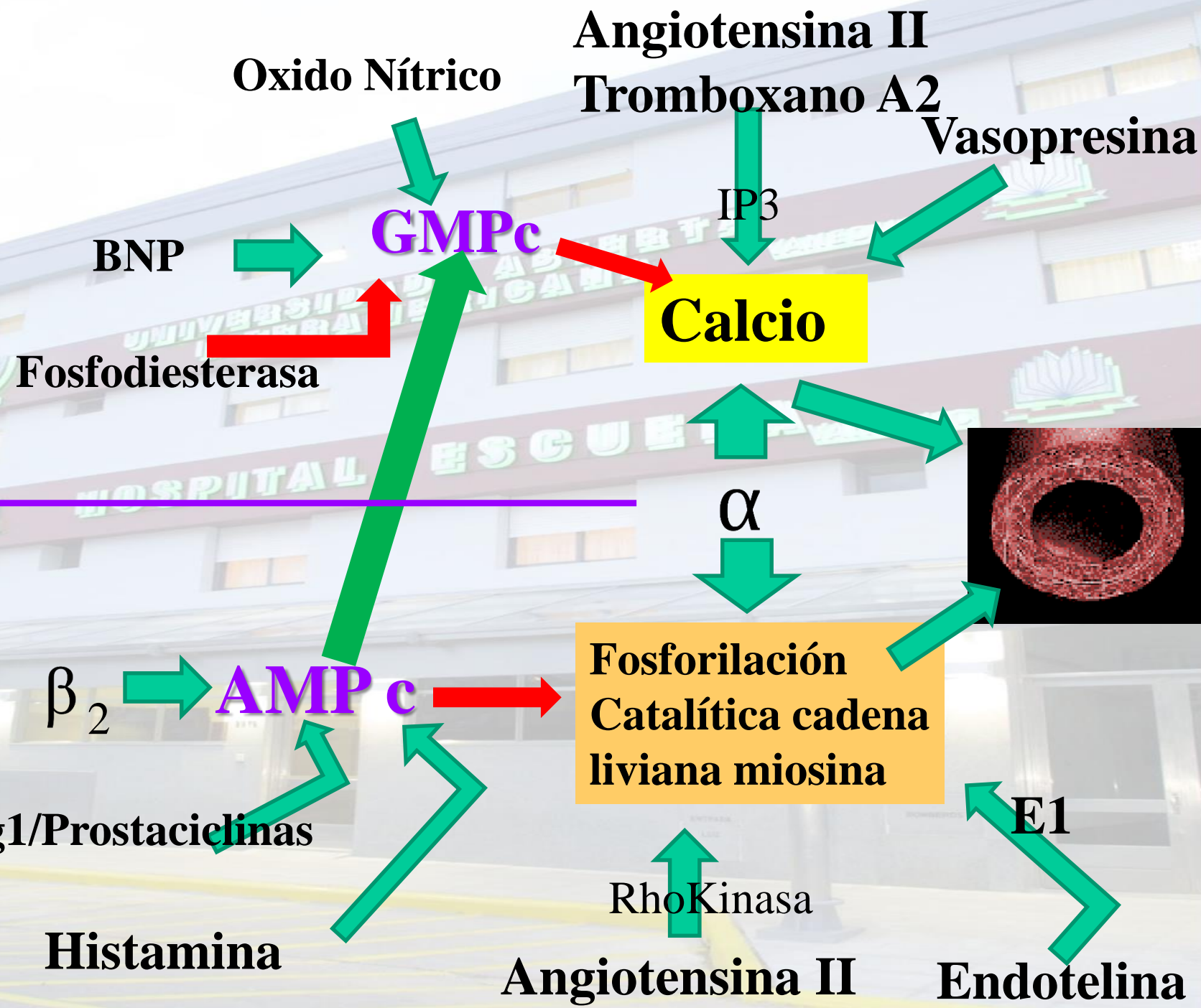
CME Methylene Blue: Magic Bullet for Vasoplegia?

Leila Hosseinian, MD,* Menachem Weiner, MD,* Matthew A. Levin, MD,* and Gregory W. Fischer, MD*†

Methylene blue (MB) has received much attention in the perioperative and critical care literature because of its ability to antagonize the profound vasodilation seen in distributive (also referred to as vasodilatory or vasoplegic) shock states. This review will discuss the pharmacologic properties of MB and review the critical care, liver transplantation, and cardiac anesthesia literature with respect to the efficacy and safety of MB for the treatment of shock. Although improved blood pressure has consistently been demonstrated with the use of MB in small trials and case reports, better oxygen delivery or decreased mortality with MB use has not been demonstrated. Large randomized controlled trials are still necessary to identify the role of MB in hemodynamic resuscitation of the critically ill. (*Anesth Analg* 2016;122:194–201)

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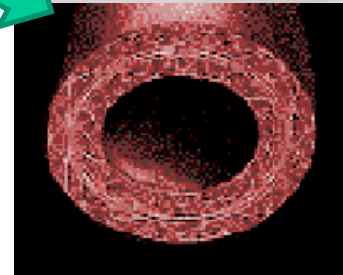
Gluconato de Calcio

Calcio

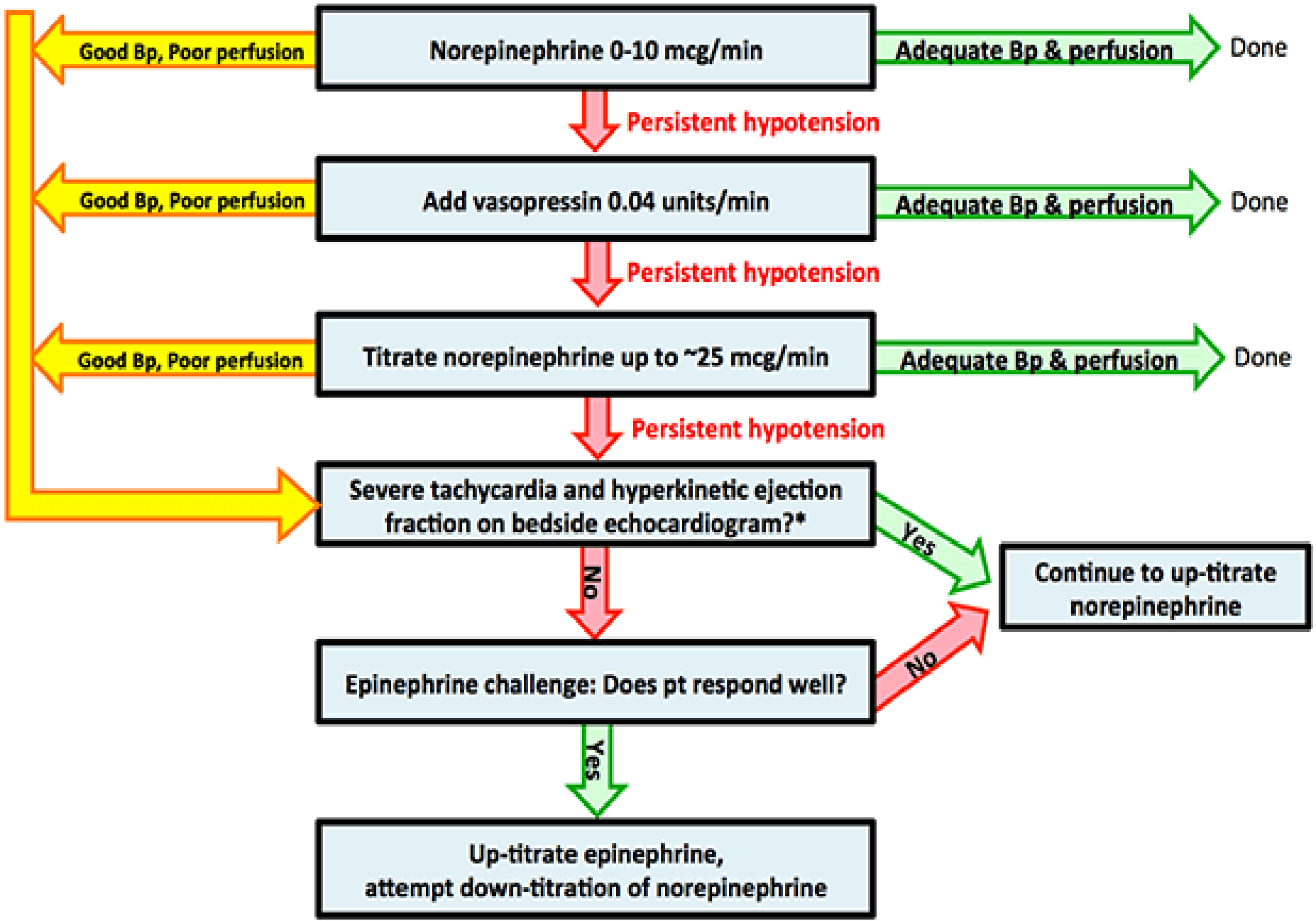
Gluconato de Calcio al 10%: inyectable, ampollas de 10ml o frascos de ampollas

Dosis de carga: una o dos ampollas de 10ml de gluconato de Calcio al 10%, diluidas en 50-100 ml de dextrosa al 5% en 10 minutos.

Mantenimiento: diez ampollas de 10ml de gluconato de Calcio al 10% en un litro de dextrosa al 5%. 50 ml/hora.



Vasopressor titration algorithm for septic shock



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**MUCHAS
GRACIAS POR SU
ATENCIÓN**

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