



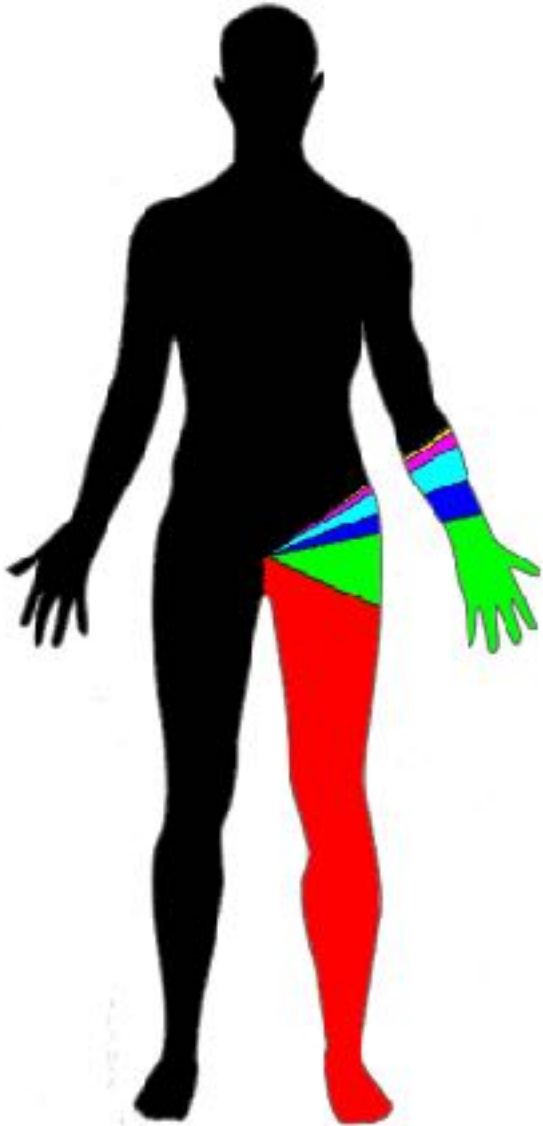
# Generalidades del Cinc



<b>Numero atómico</b>	<b>30</b>
Valencia	2
Estado de oxidación	+2
Conf. Electrónica	[Ar]3d <sup>10</sup> 4s <sup>2</sup>
Masa atómica (g/mol)	65,40

<b>Abundancia %</b>	<b>Elemento</b>
46.71	O
27.69	Si
8.07	Al
5.05	Fe
3.65	Ca
2.75	Na
2.58	K
2.08	Mg
0.12~	Cu

# Generalidades del Cinc: *Composición elemental en un humano de 70 Kg.*



## Masa de elementos e iones minerales

Oxígeno	44 Kg	Fosforo	0,68 Kg
Carbono	12.6 Kg	Potasio	0,250 Kg
Hidrógeno	6.6 Kg	Cloro	0,115 Kg
Nitrógeno	1.8 Kg	Azufre	0,100 Kg
Calcio	1.7 Kg	Sodio	0,070 Kg
		Magnesio	0,042 Kg

# Generalidades del Cinc: *Composición elemental en un humano de 70 Kg*



Elementos traza y ultra traza			
Fe	5 g	Pb	0,035 g
<b>Zn</b>	<b>2,3 g</b>	Ba	0,021 g
Rb	0,36 g	Mo	0,014 g
Cu	0,28 g	B	0,014 g
Sr	0,28 g	As	0,003 g
Br	0,14 g	Co	0.003 g
Sn	0,14 g	Cr	0.003 g
Mn	0,070 g	Ni	0.003 g
I	0.070 g	Se	0.002 g
Al	0.035 g	Li / V	0.002 g

# **Generalidades del Cinc:** *distribución en el cuerpo humano*

## **Zn<sup>2+</sup>**

- **~ 25-30 % en piel y huesos**
- **~ 50 % en la sangre**
  - ~ 12-20 % plasma
  - ~ 75-80 % eritrocitos
  - ~ 3 % leucocitos
- **Pancreas (celulas-b)**
- **Ojos**

# **Generalidades del Cinc:** *Roles en el cuerpo humano*

## **Rol de $Zn^{2+}$ :**

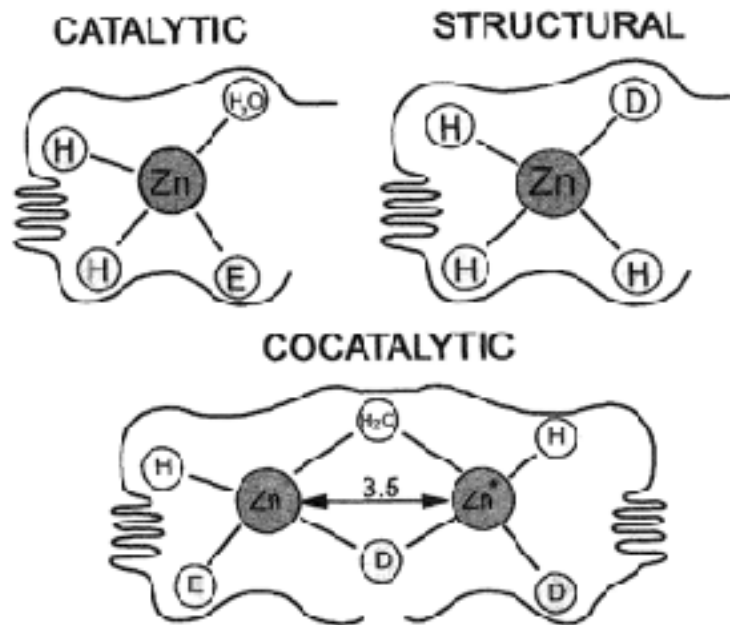
### **Deficiencia:**

- **Desordenes en el sistemas reproductor**
- **Enanismo**
- **Lesiones a la piel**
- **Anormalidades esqueléticas**

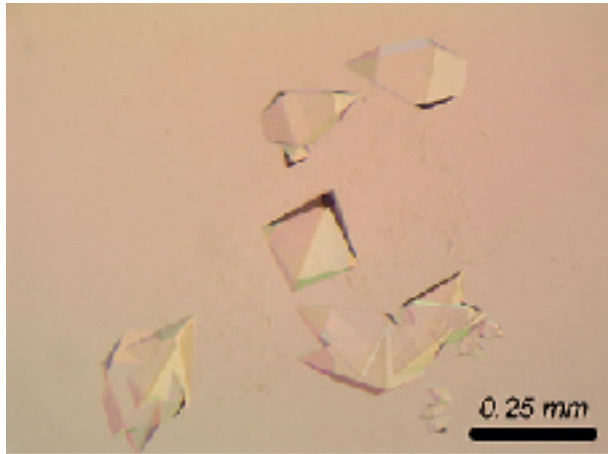
# Generalidades del Cinc: *Funciones*

## Función de metaloenzimas de Zn

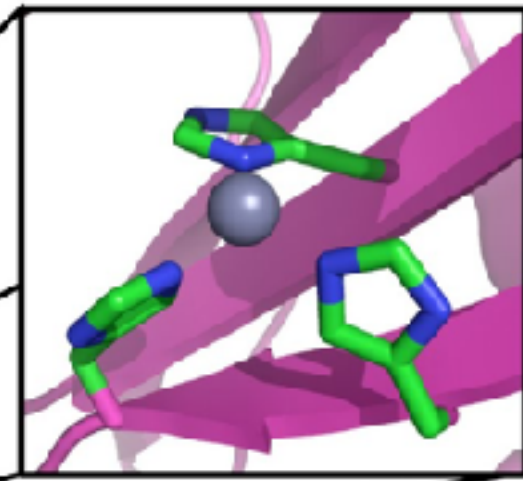
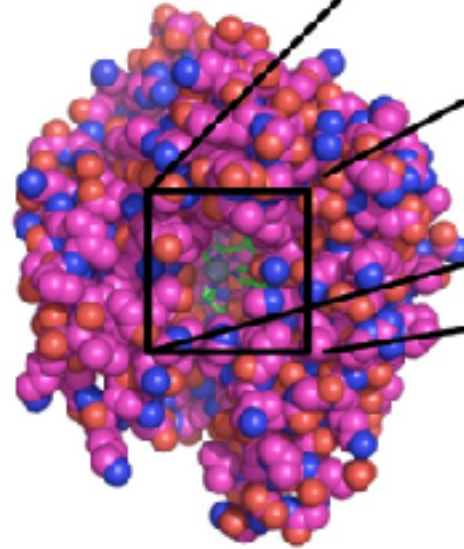
1. Estructural
2. Unir substratos
3. Acido de Lewis: captar electrones



# Anhidrasa carbónica:



Anhidrasa carbónica



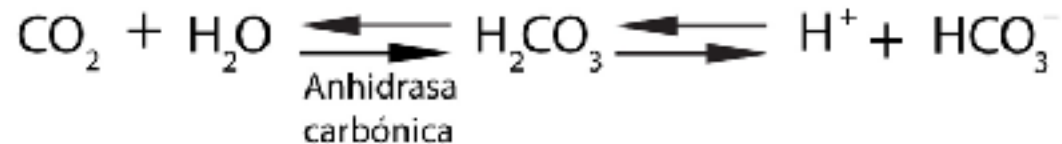
3 Histidinas

Existen 3 clases de anhidrasa carbonica:

**Clase  $\alpha$ :** humanos y animales;

**Clase  $\beta$ :** plantas y muchas bacterias;

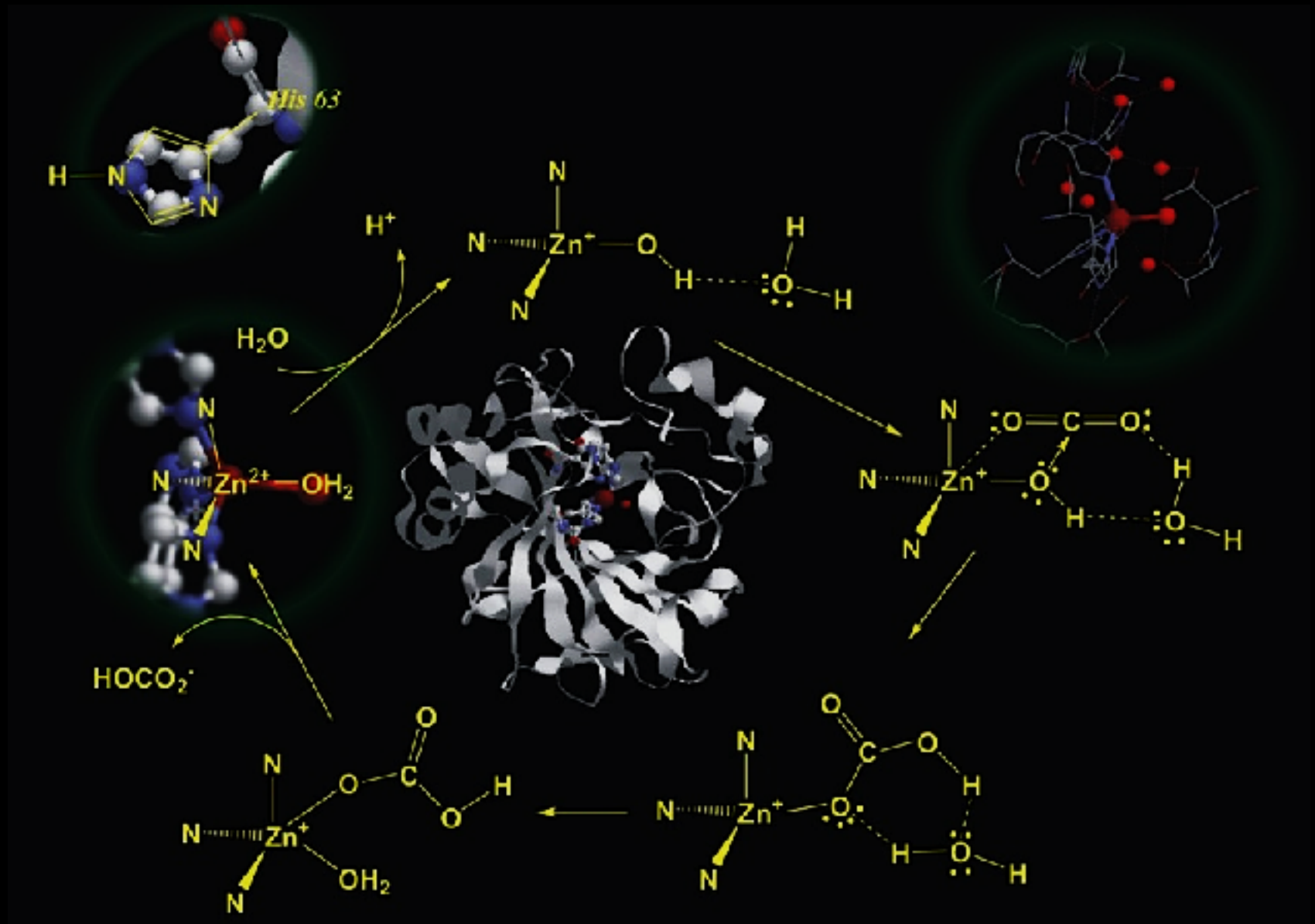
**Clase  $\gamma$ :** arqueobacterias(procarioticas)



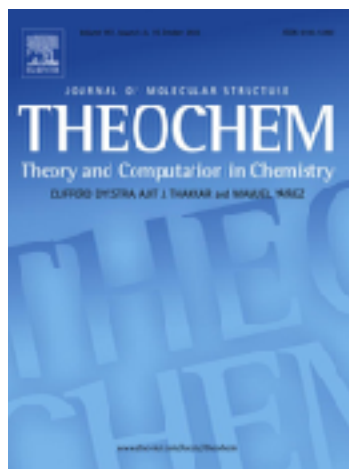
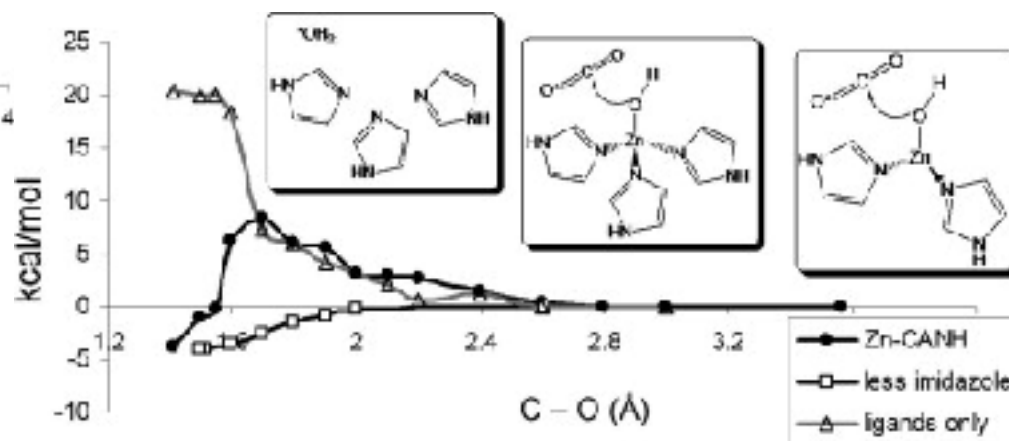
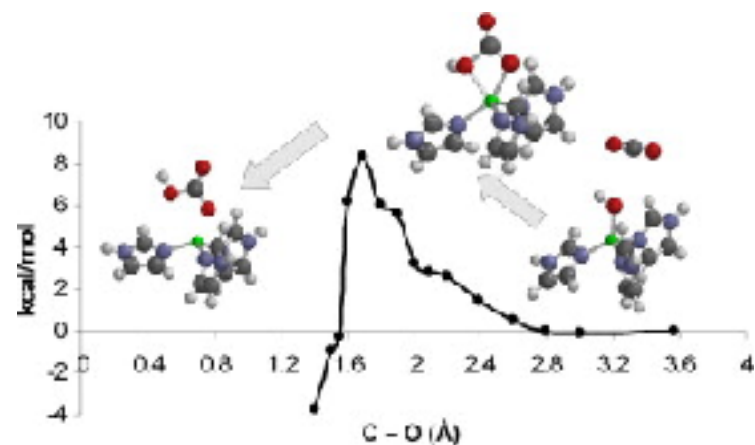
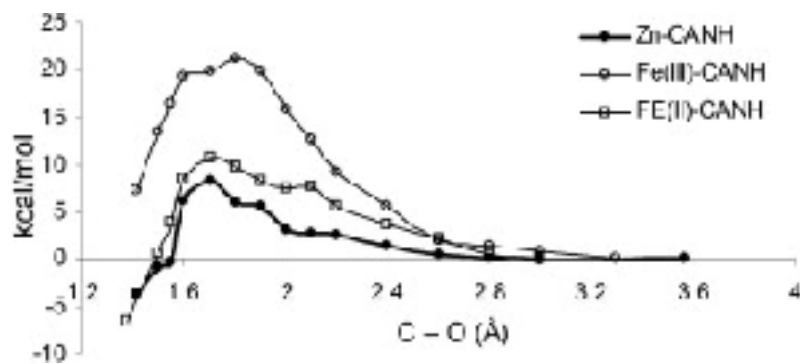
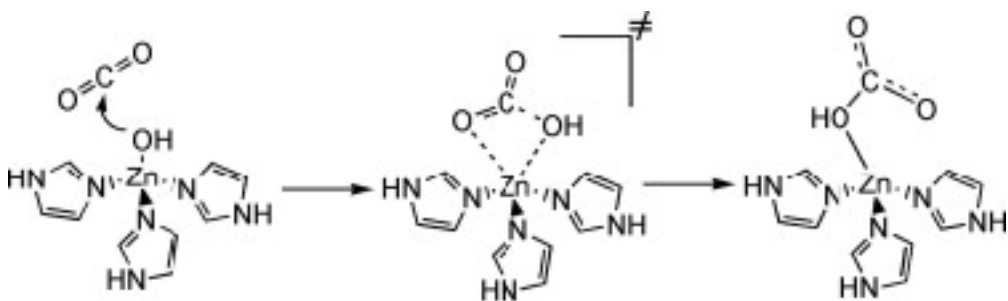
Ni(II), Ni(II), Fe(II) < Zn(II)



# Anhidrasa carbónica: *mecanismo*



# Carbon dioxide activation: Hydration by carbonic anhydrase and related systems – What makes a good catalyst?



**Anhidrasa carbonica:** *Participación en procesos fisiológicos*

**Acidificación del tracto renal**

**Acidificación del tracto reproductivo masculino**

**Reabsorción de huesos**

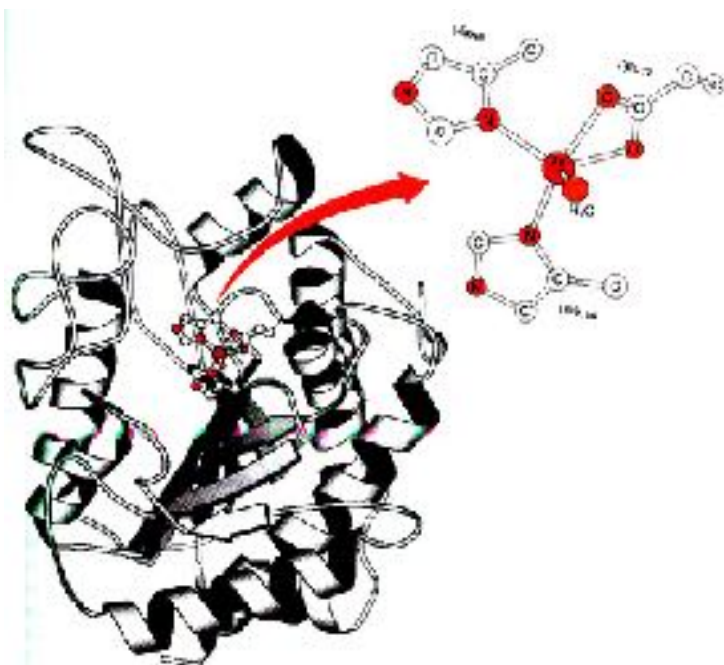
**Respiración**

**Gluconeogénesis**

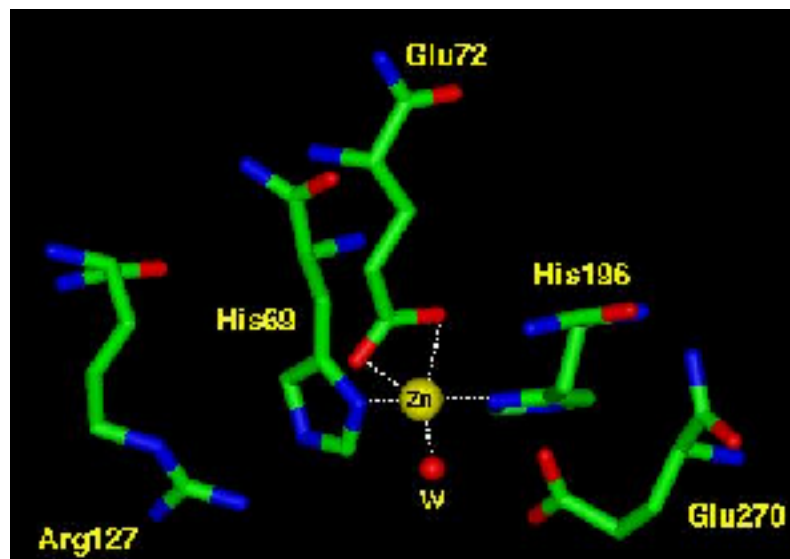
**Transducción de señales**

**Formación de ácido gástrico**

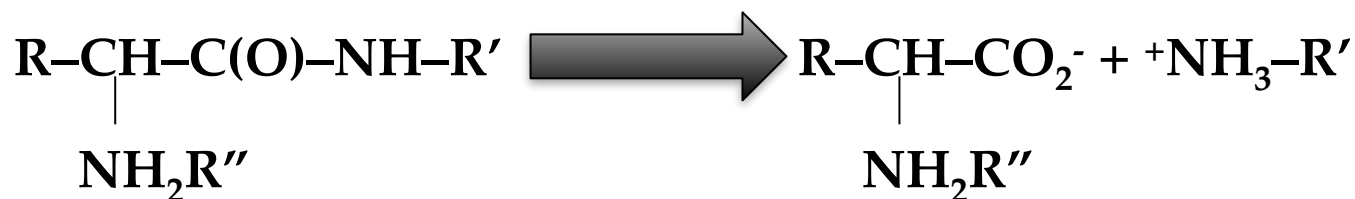
# Hidrolasas: Carboxipeptidasas: ruptura enlaces entre aminoacidos



311.600 + Zn

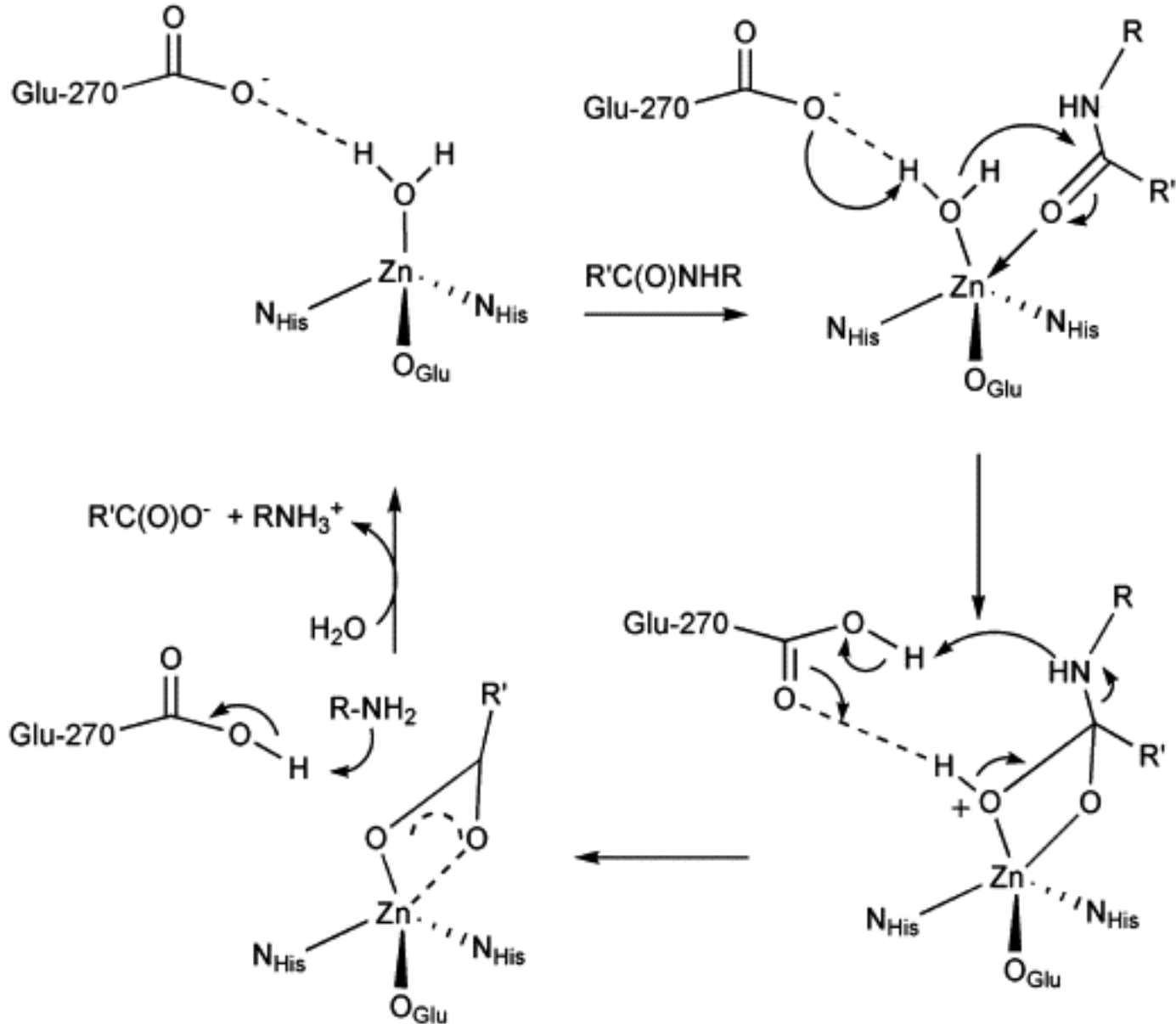


Tetraedro fuertemente distorsionado

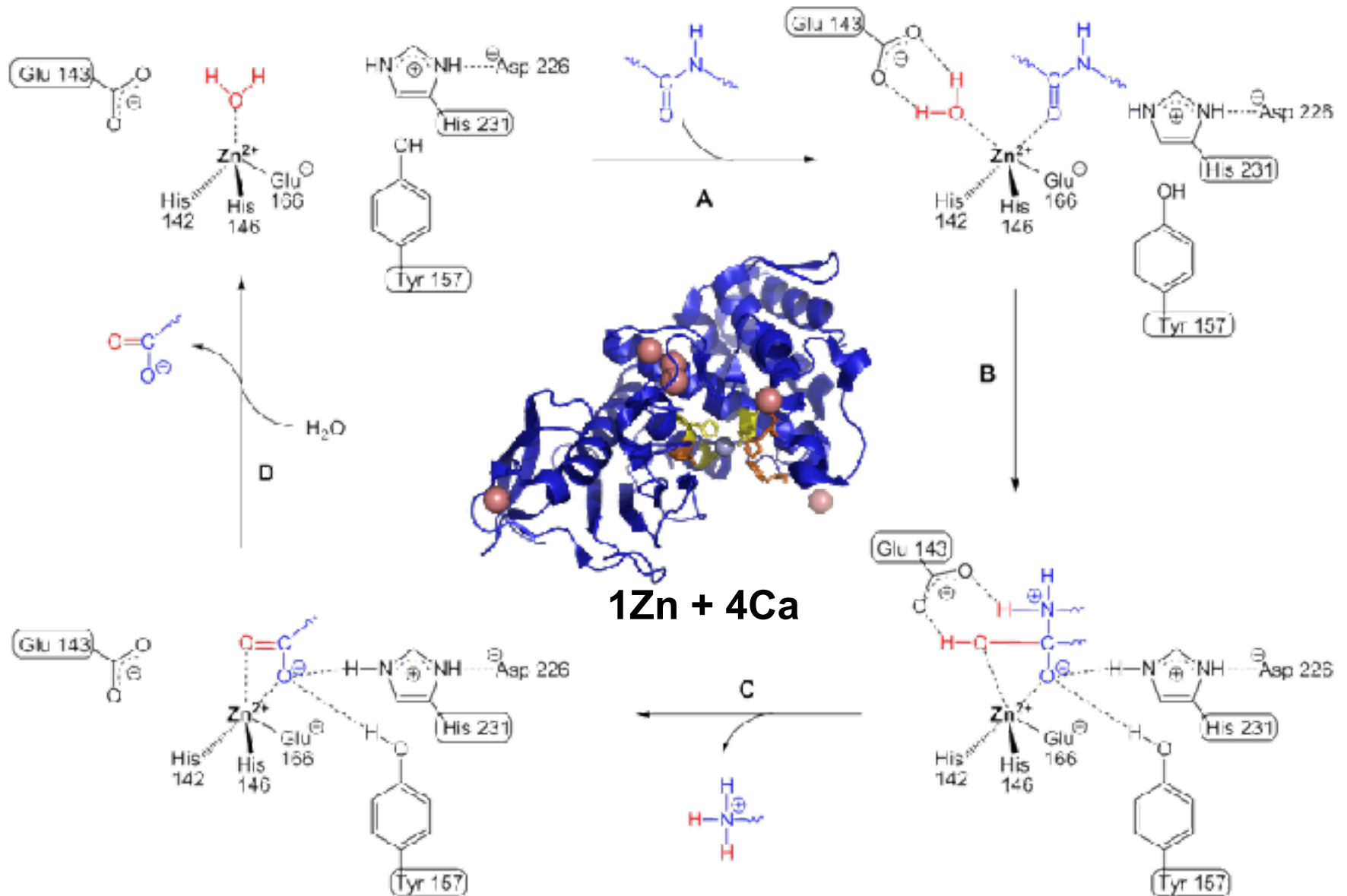


Union a través del C-terminal en el enlace peptidico.

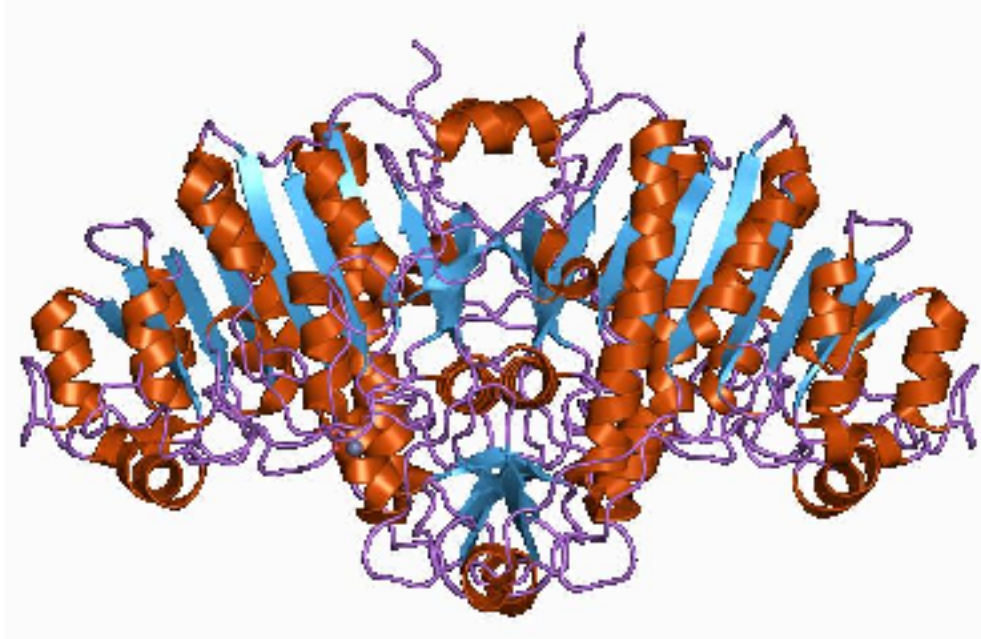
# Hidrolasas: Carboxipeptidasas



# Hidrolasas: Termolisina



# Fosfatasa alcalina

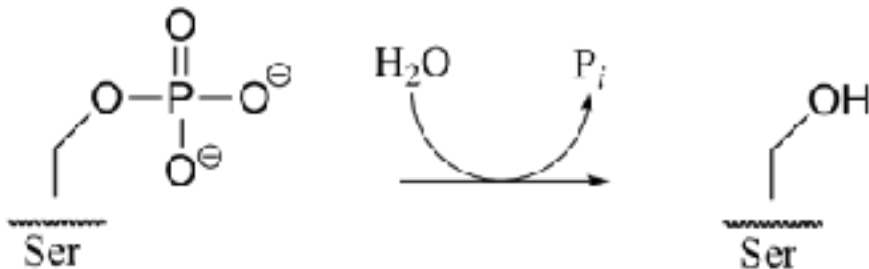


2Zn: estabilización estructural  
2Zn: actividad catalítica

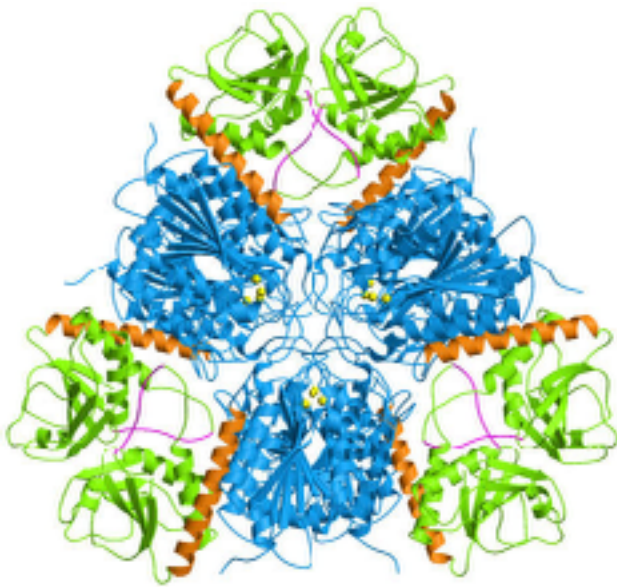
**Remueve fosfatos desde:  
nucleotidos, proteínas y  
alcaloides.**

**Propósito: ? ...**

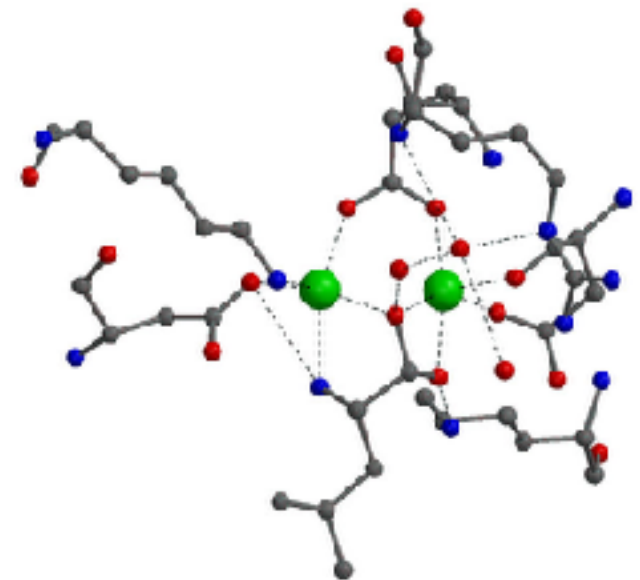
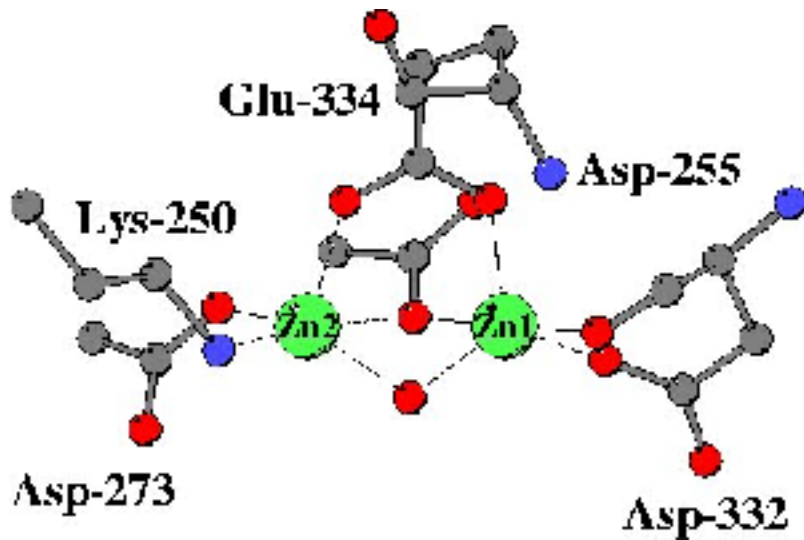
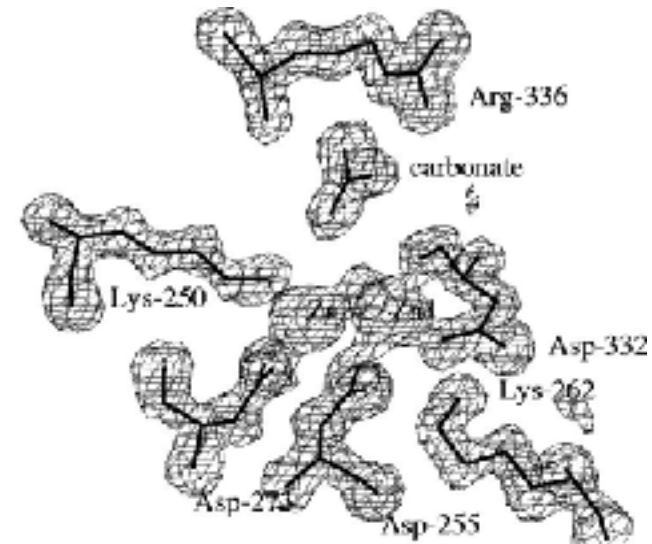
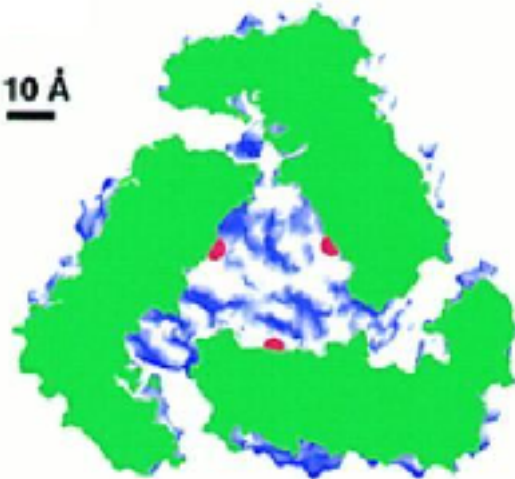
Fosfatos para posterior uso?  
Eliminar fosfatos para el paso a  
través de la membrana celular e  
ingresar moléculas orgánicas?



# Aminopeptidasa: degradación de cadenas polipeptídicas

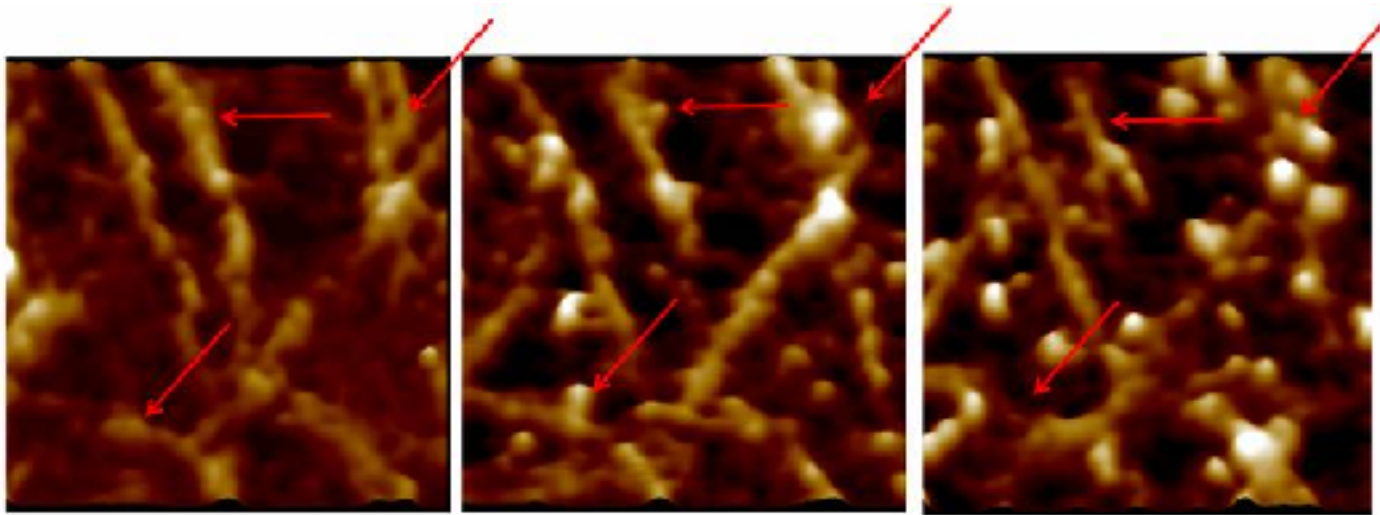
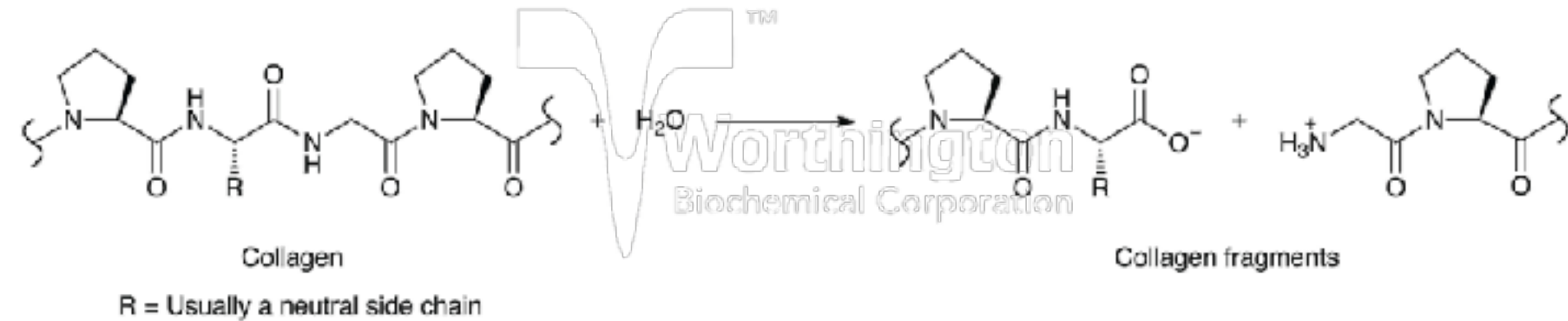


10 Å



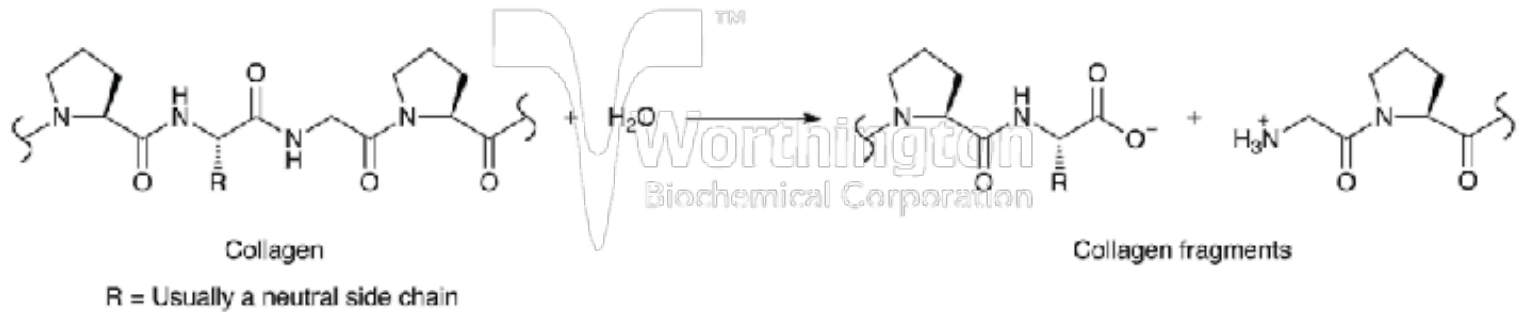


# Colagenasas: degradación de colágeno de tejidos conectivos.

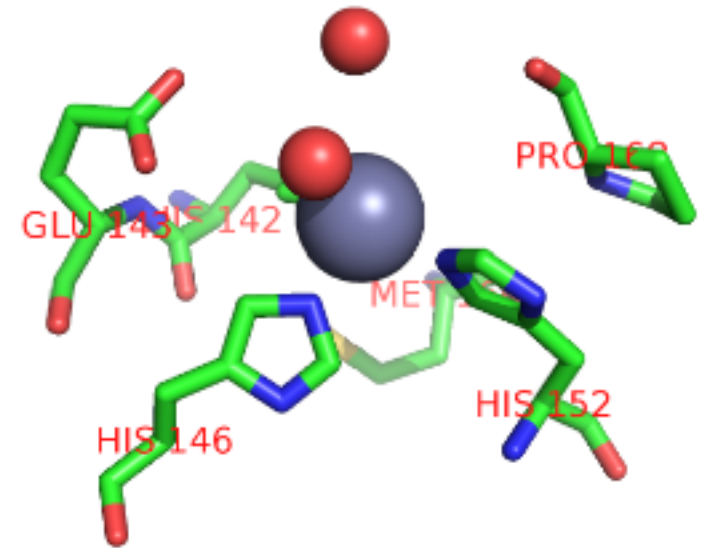


600 nm x 600 nm imágenes de Colágeno. Las moléculas de Colágeno I iniciales (izquierda) e inmediatamente after online addition of collagenase (middle). Red arrows indicate globular collagenase attached to the collagen fibers. The right panel shows an image after 4 minutes where two collagen molecules were broken (red arrows).

# Colagenasas: degradación de colágeno de tejidos conectivos.



Actividad  
hemorrágica  
y proteolítica

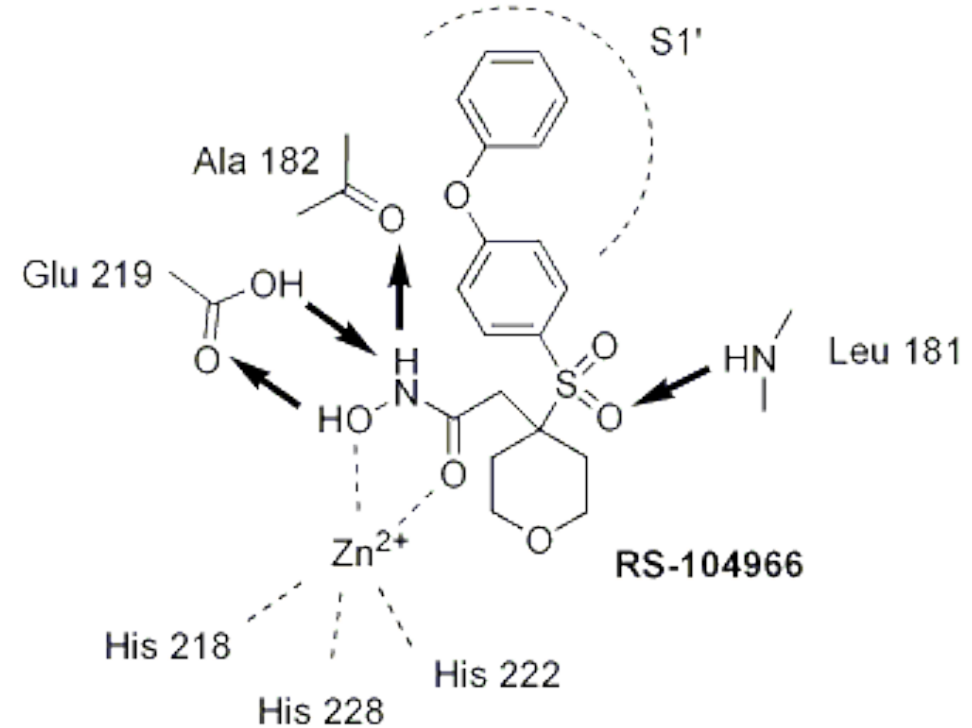
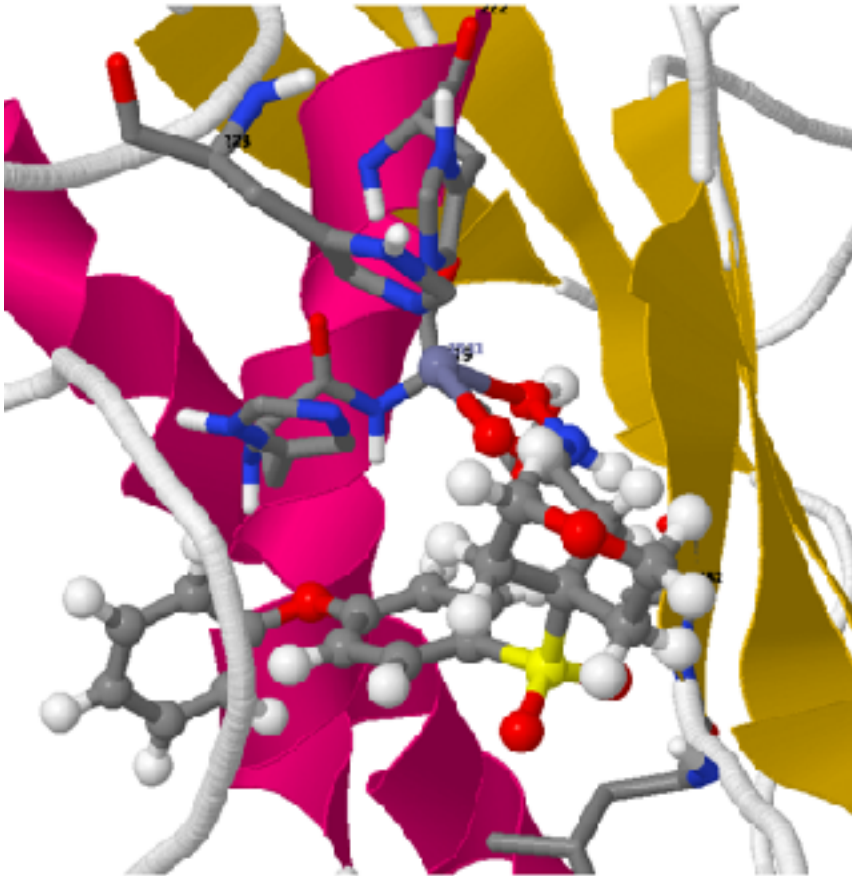


Zinc in the structure of First Structure of A Snake Venom Metalloproteinase: A Prototype For Matrix Metalloproteinases(Slash)Collagenases

F.-X.GOMIS-RUETH, W.BOD

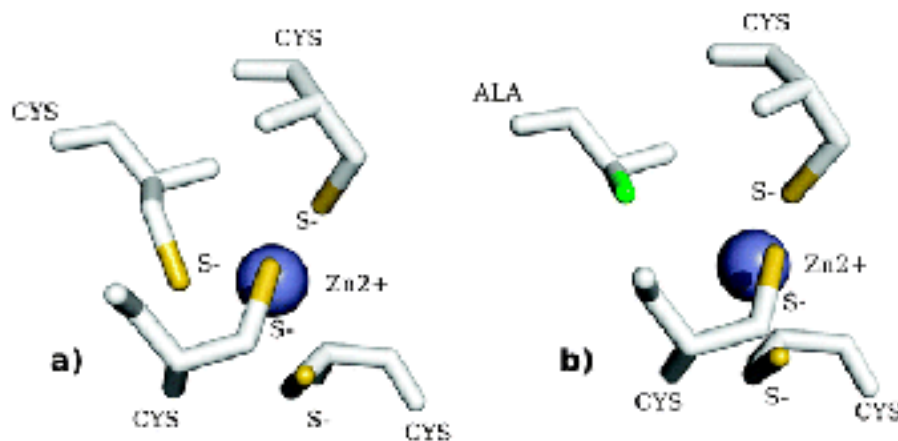
# Colagenasas: *degradación de colágeno de tejidos conectivos.*

Collagenase-1 (MMP-1, fibroblast collagenase)

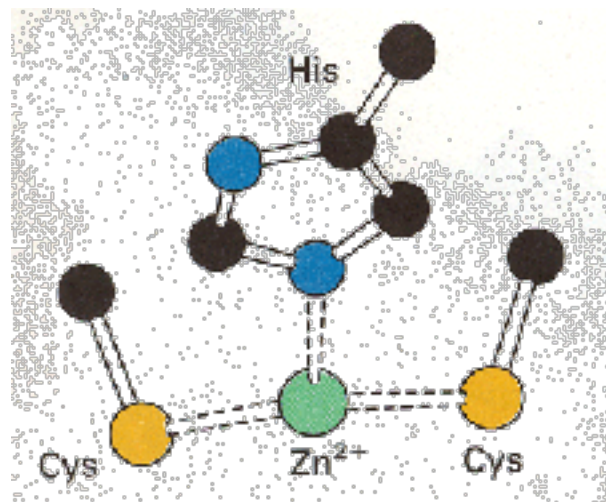


Inhibidores de colagenasa son usados para el tratamiento de reumatoides y osteoartritis.

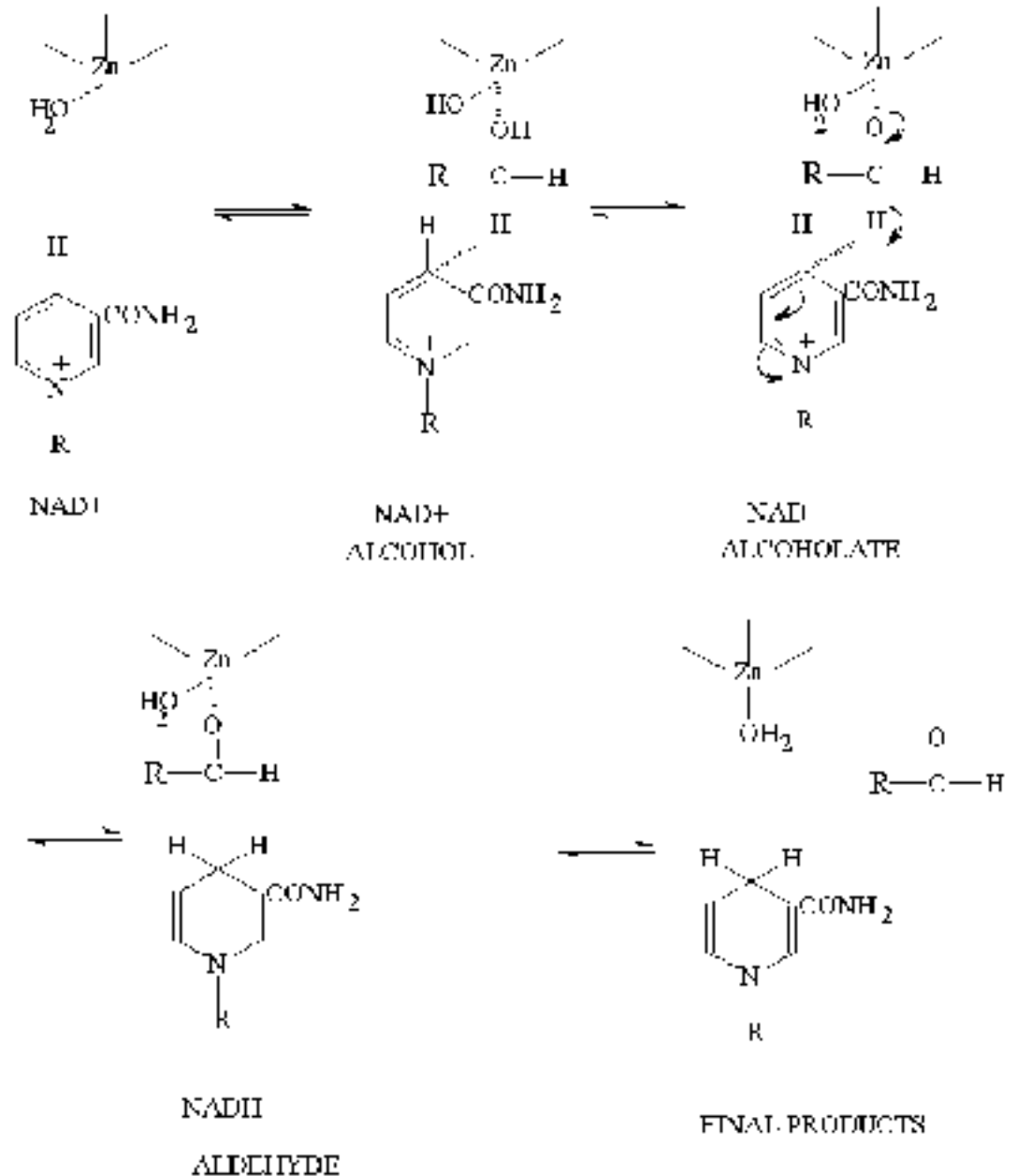
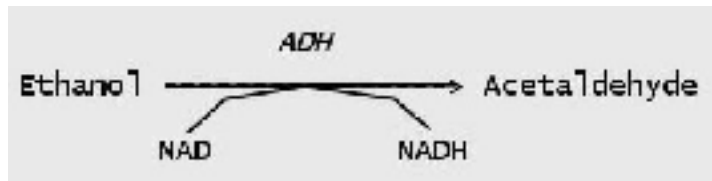
# Alcohol deshidrogenasa: Oxidación de alcoholes primarios



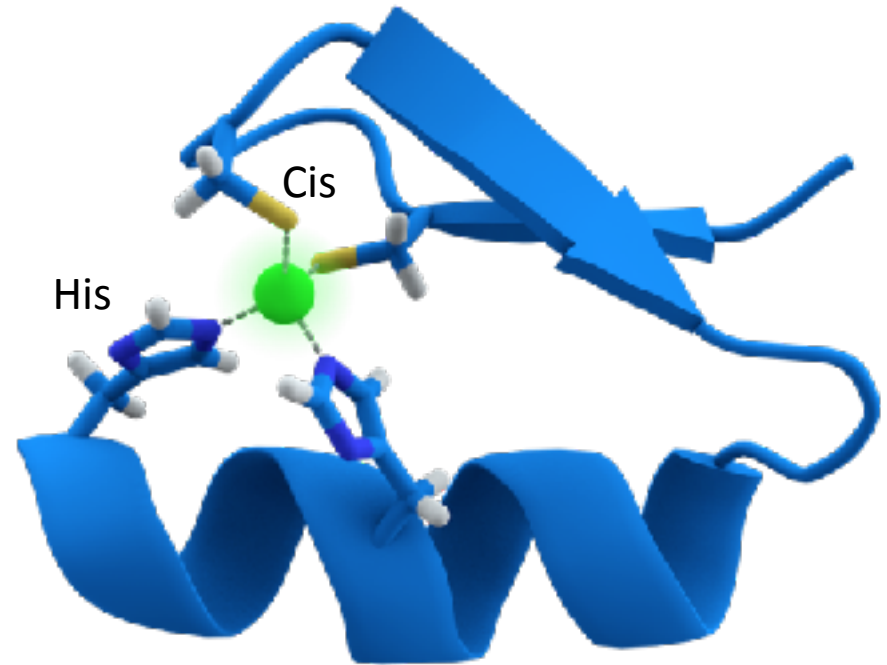
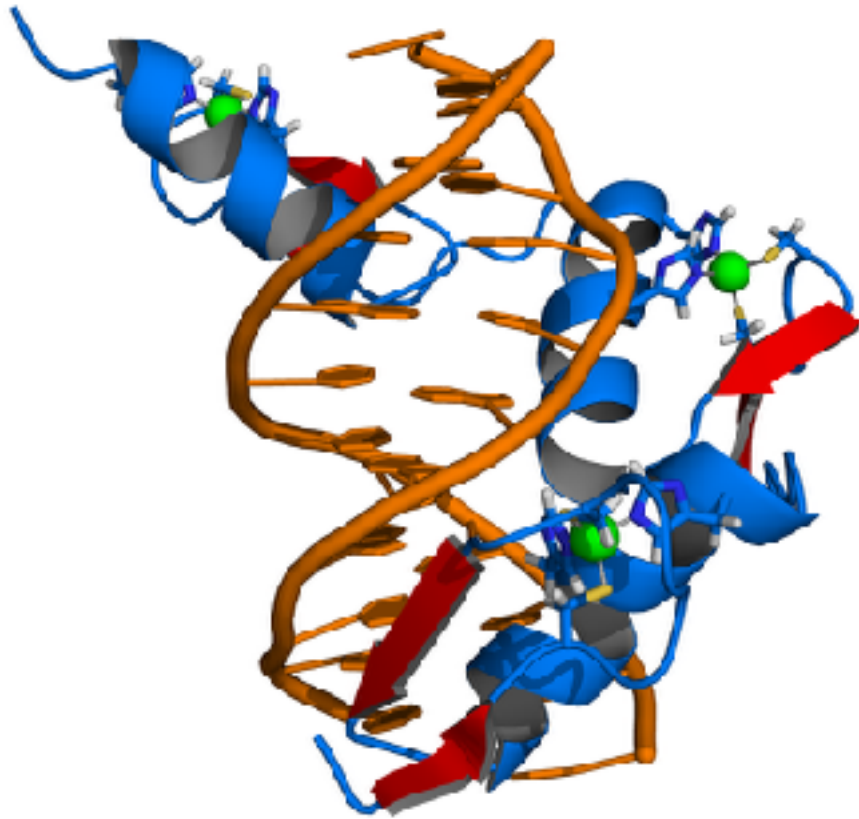
**2Zn:** 1Zn estructural (4Cisteinas) y 1Zn (1N Imidazol + 2s(Cisteinas) + H<sub>2</sub>O



# Alcohol deshidrogenasa: Oxidación de alcoholes primarios



# Dedos de Cinc: factores de transcripción



ORGANOS SEXUALES

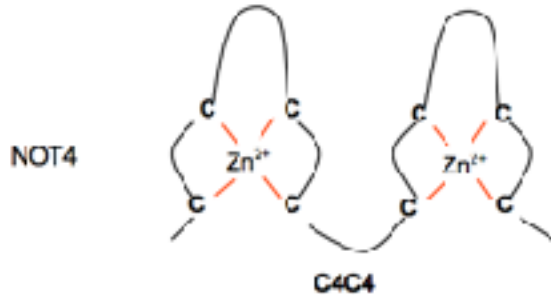
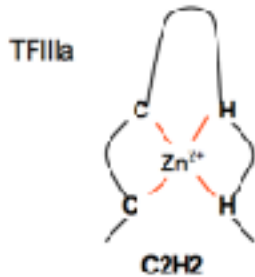


TRANSF. INFORMACION GENETICA

**ADN, Traducción, metabolismo, señalización, uniéndose también a RNA u otras proteínas que presentan estos motivos.**

# Dedos de Cinc

**ADN, RNA**  
**Replicación retrovirus**



**reparación del DNA de levaduras**



El péptido del gen 63 del virus herpes equino tipo 1 y la proteína humana de la leucemia promielocítica PML.

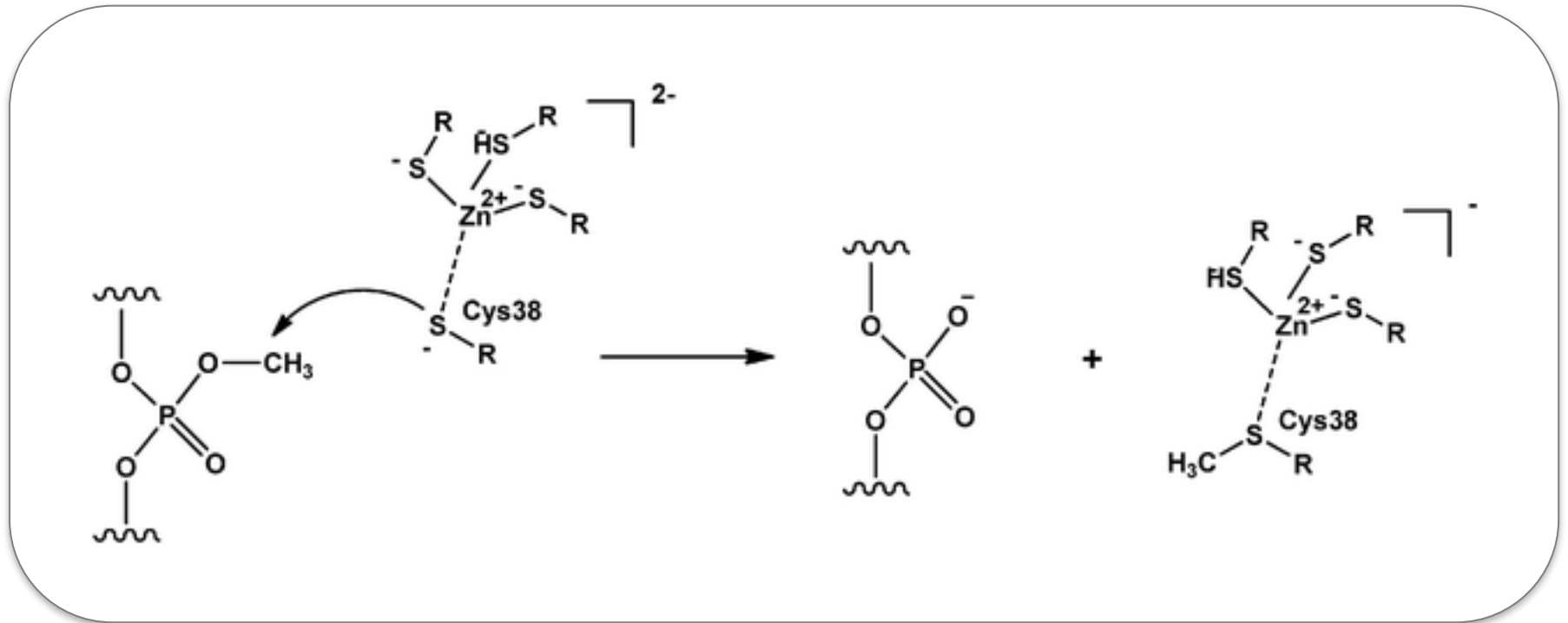


Activa la transcripción de genes involucrados en la utilización de la galactosa y la melibiosa

Regulan la expresión de genes en diversos tejidos durante el desarrollo celular

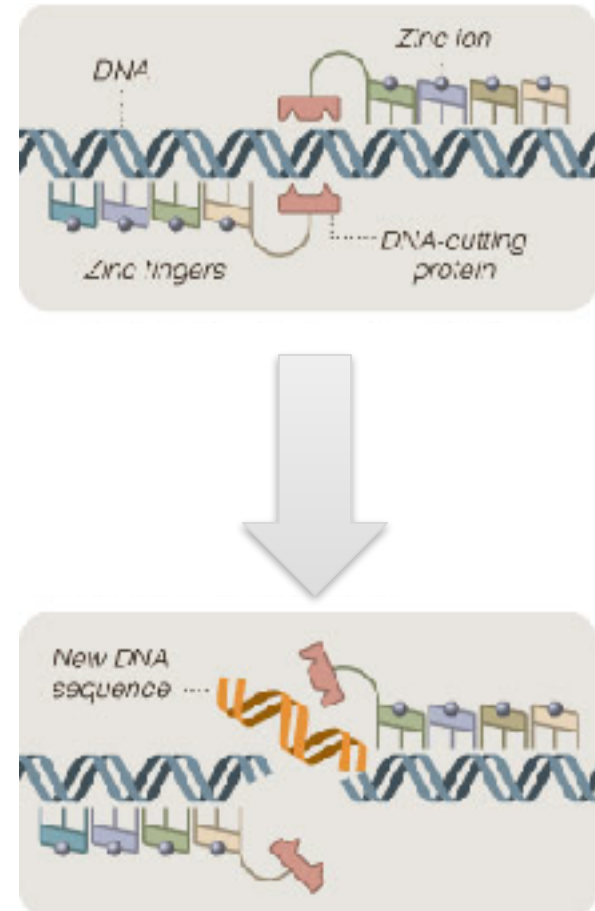
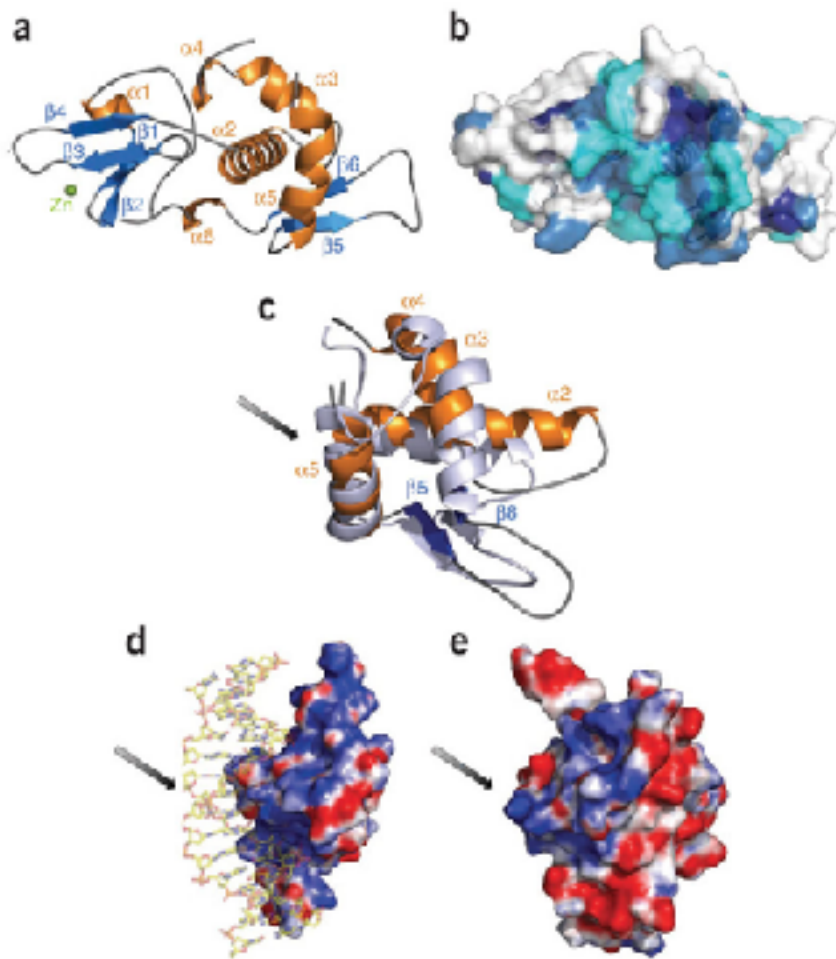
Regulación del desarrollo de los glóbulos rojos

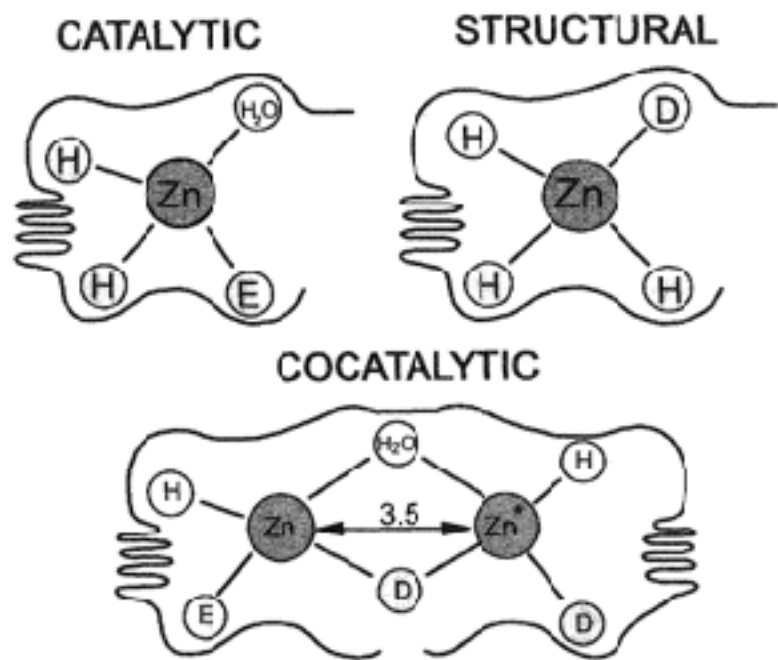
# Transferencia de un grupo CH<sub>3</sub> desde ADN dañado hacia cysteinato-Zn en *E. Coli*.



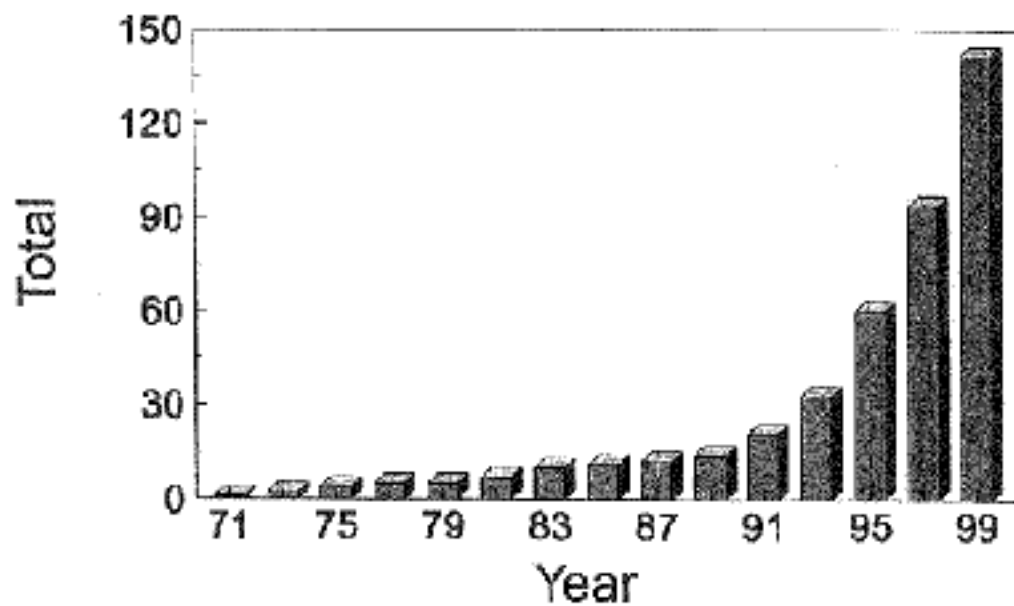


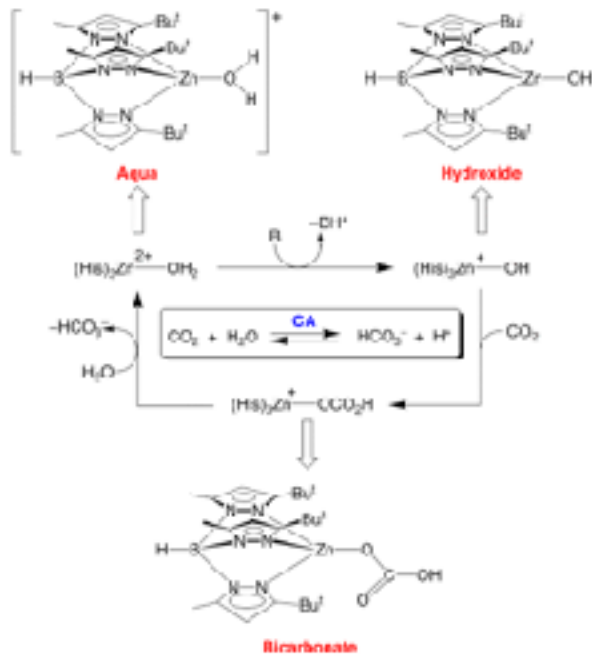
# Dedos de Cinc



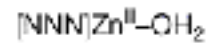
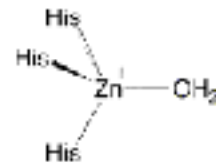


Zinc Binding Sites in Metalloproteins

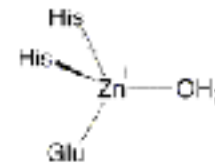




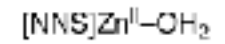
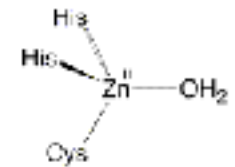
## Examples of Zinc Enzymes and Proteins



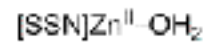
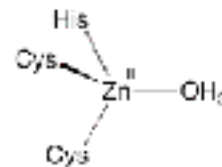
**Carbonic Anhydrase**



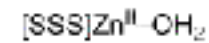
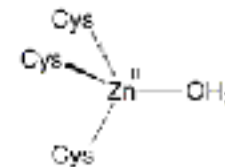
**Thermolysin**



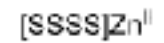
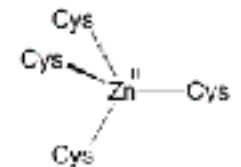
**Bacteriophage T7  
Lysozyme**



**Liver Alcohol  
Dehydrogenase**



**5-Aminolevulinic  
Dehydratase**



**Ada DNA  
Repair Protein**

Fin clase  
2016