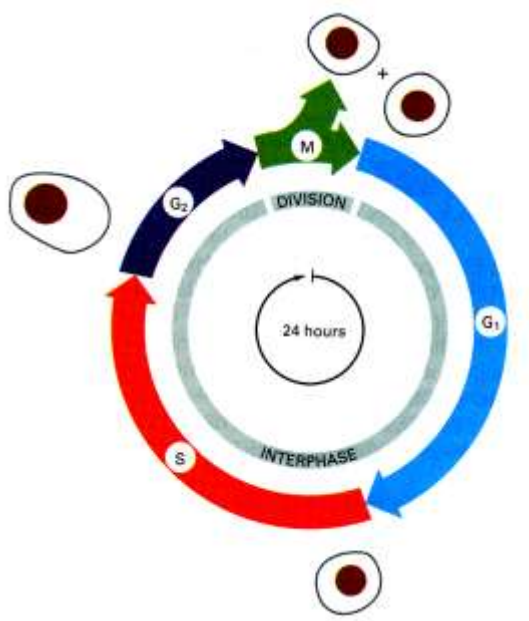


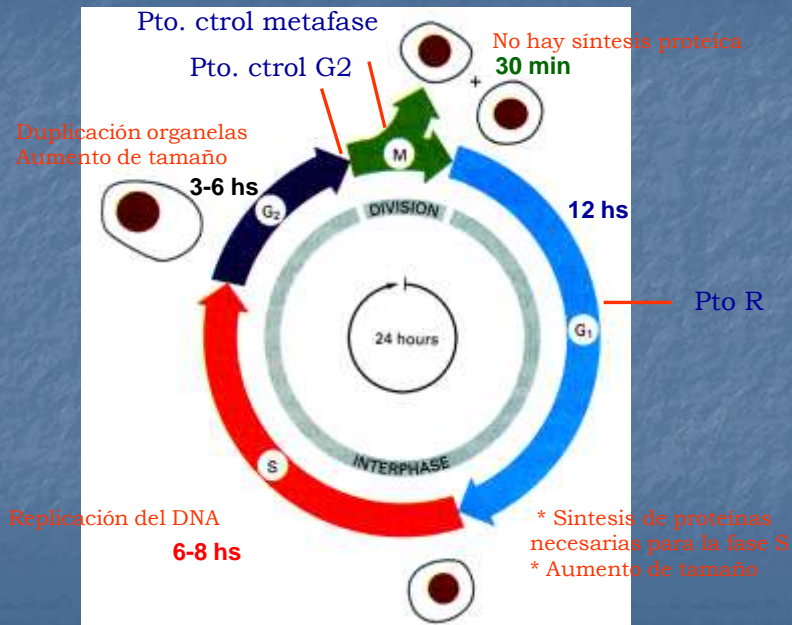
# Ciclo celular



Interfase:  $G_1$   
S  
 $G_2$

Estados: División  
Quiescencia ( $G_0$ )

# Ciclo celular



\* **Proliferación**  $\longleftrightarrow$  **Quiescencia**

\* **Duplicación del DNA + Crecimiento celular**

\* **Desarrollo de puntos de control (*checkpoints*)**

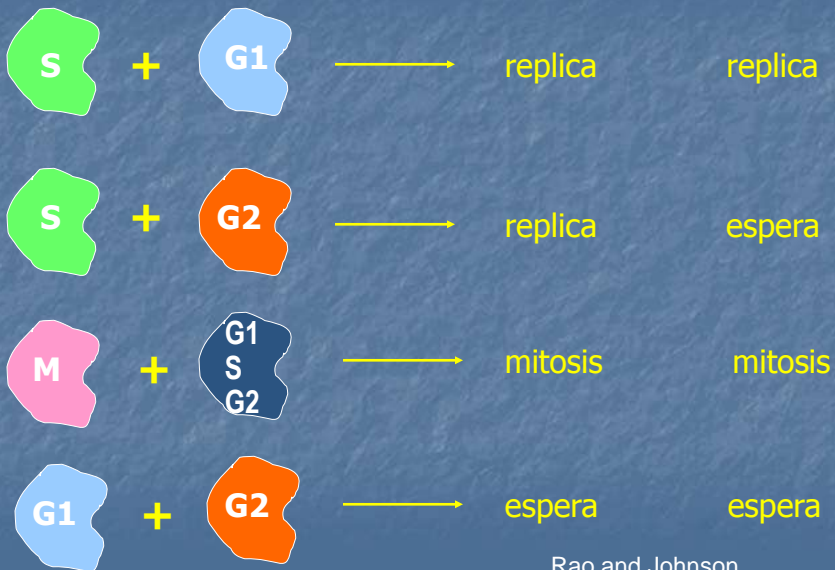
*checkpoints* rígidos

*checkpoints* lábiles

Incapacidad de proliferar

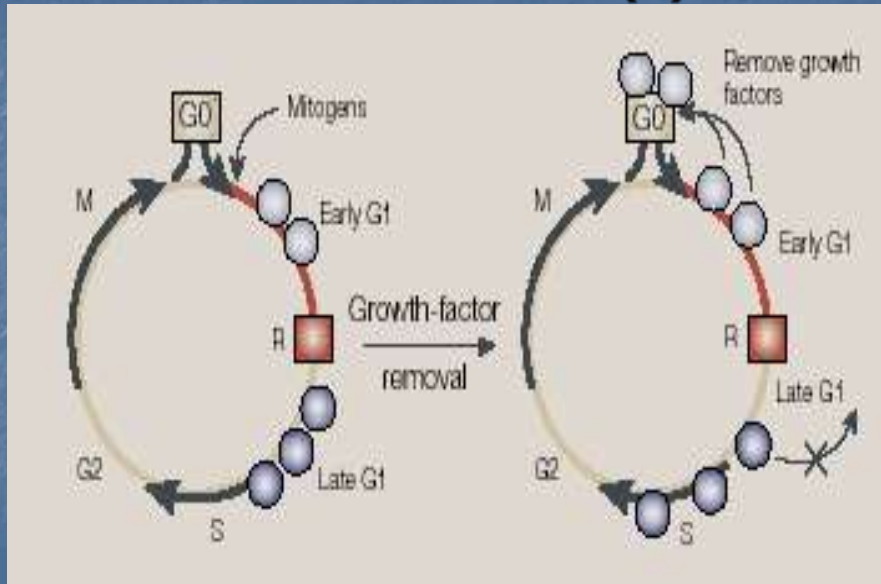
proliferación descontrolada

## Experimentos de fusión celular



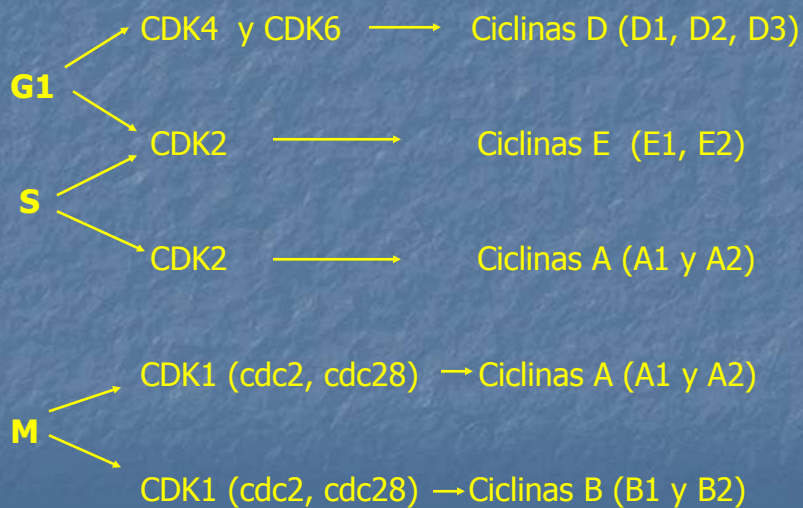
Rao and Johnson

## Punto de restricción (R)

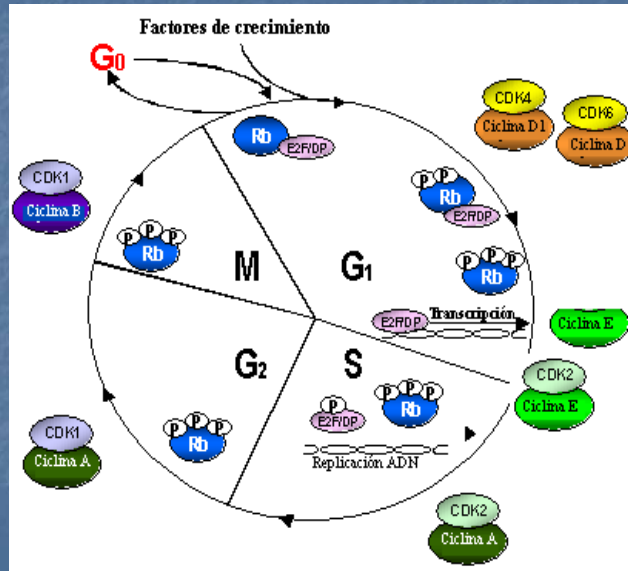


*Nat. Rev. Cancer* 1 (2001), 222

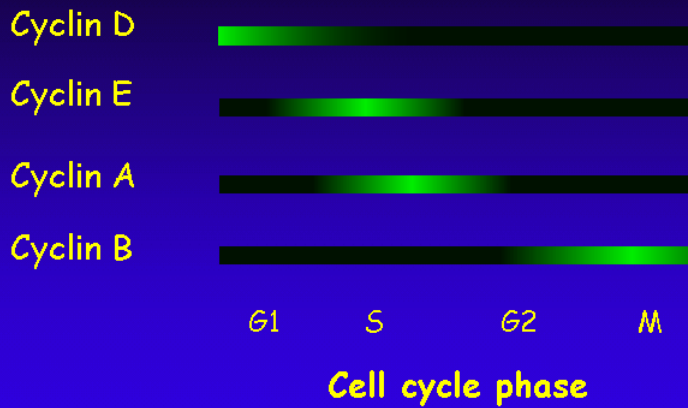
## Ciclinas y CDKs



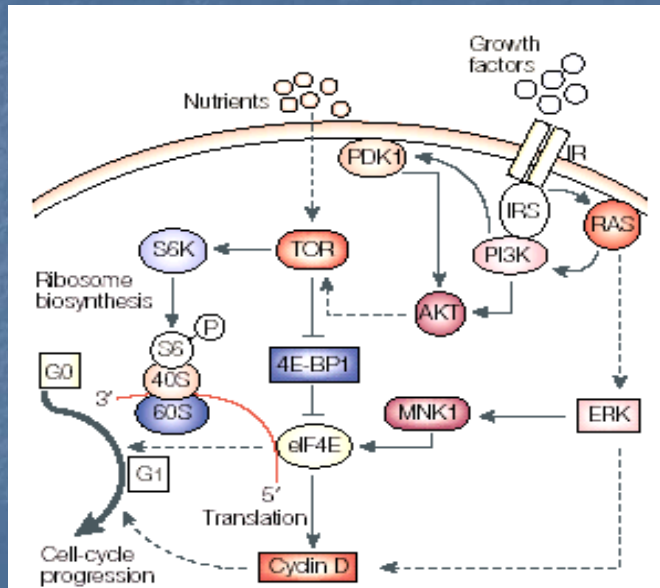
## Ciclinas y CDKs



## Expresión temporal de las ciclinas

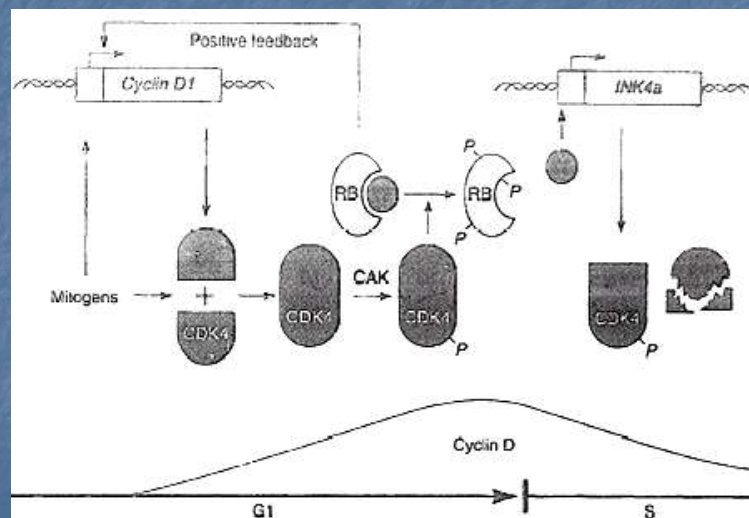


## Crecimiento vs. división celular



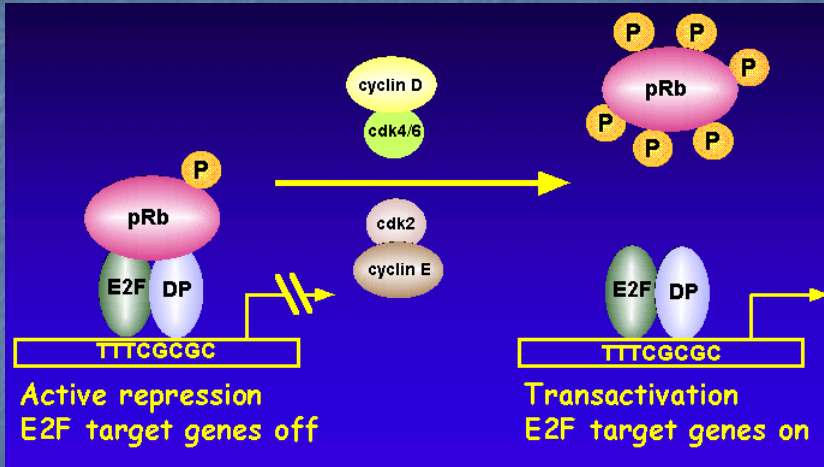
*Nat. Rev. Cancer* 1 (2001), 222

## Ciclina D y fosforilación del Retinoblastoma

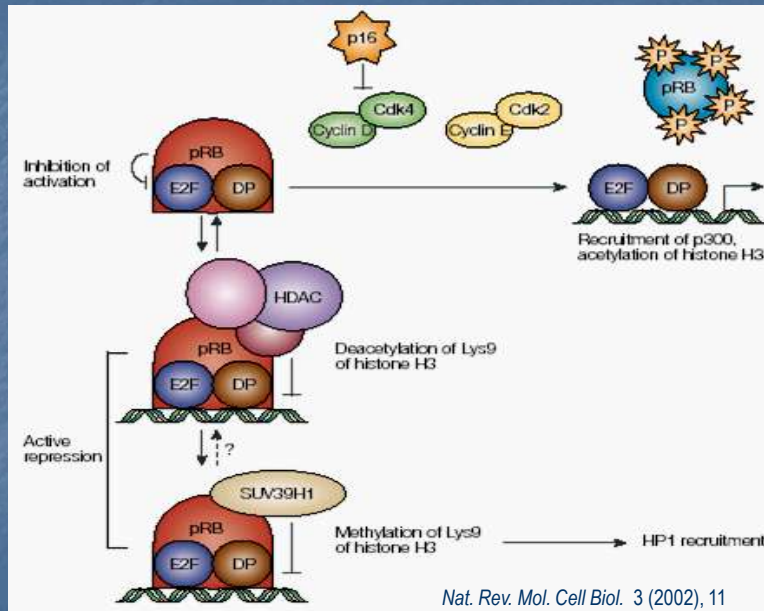




## Activación del factor E2F



## Mecanismos de represión de Rb sobre E2F



## Inhibidores de CDKs (CKIs)

### Familia Cip/Kip

p21 Cip1/Waf1 (CDKN1A)

p27 Kip1 (CDKN1B)

p57 Kip2 (CDKN1C)

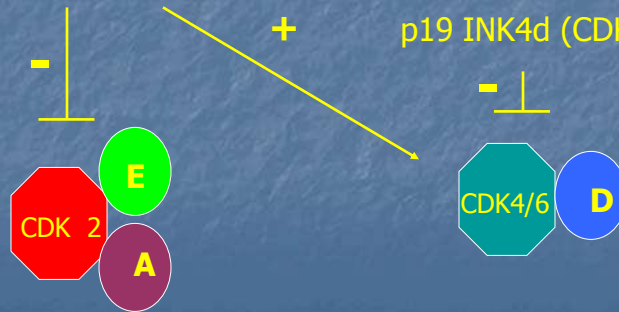
### Familia INK4

p16 INK4a (CDKN2A)

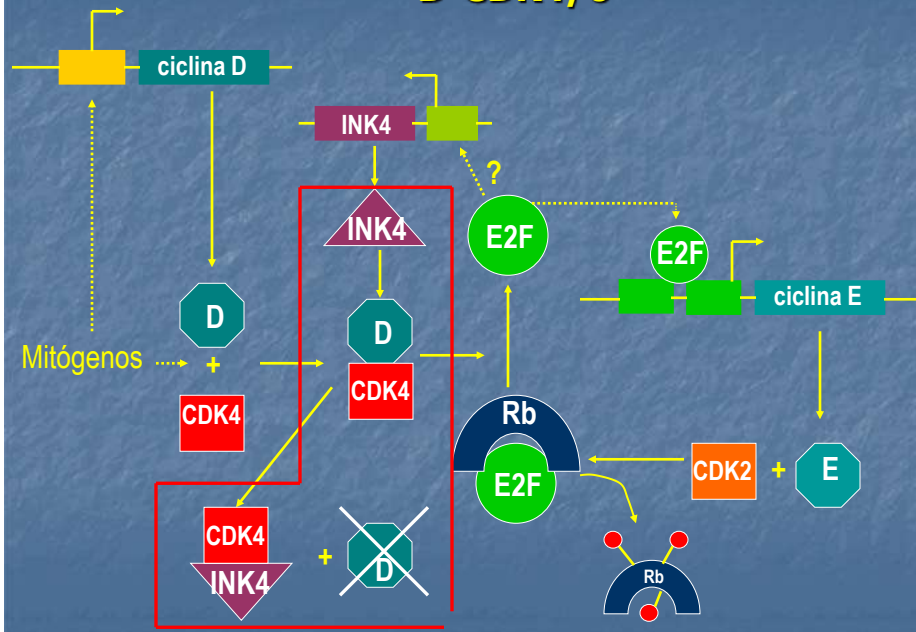
p15 INK4b (CDKN2B)

p18 INK4c (CDKN2C)

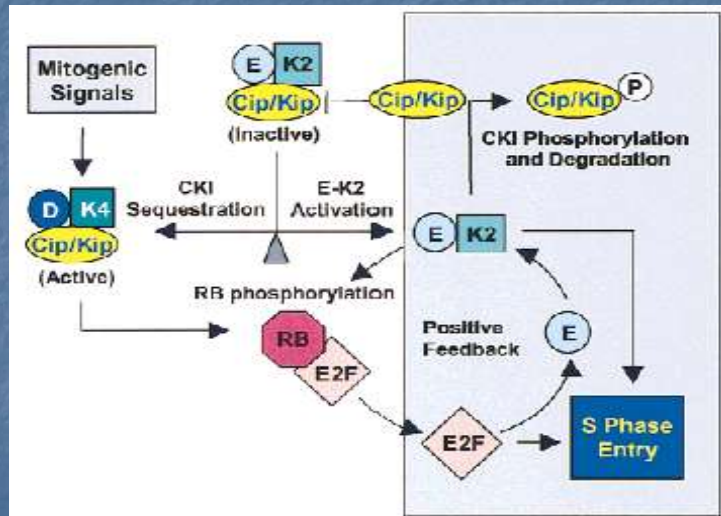
p19 INK4d (CDKN2D)



## Proteínas INK4 inhiben el complejo ciclina D-CDK4/6

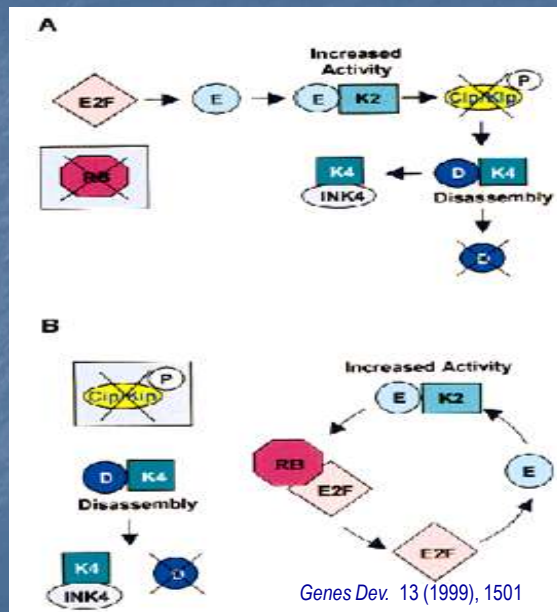


## Transición G1/S



*Genes Dev.* 13 (1999), 1501

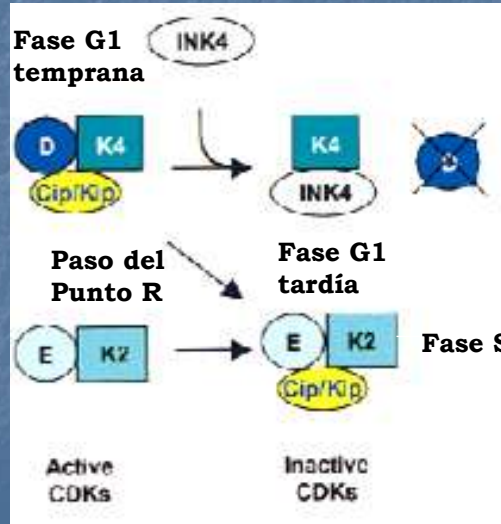
## Pérdida de la función de Rb y Cip/Kip



*Genes Dev.* 13 (1999), 1501

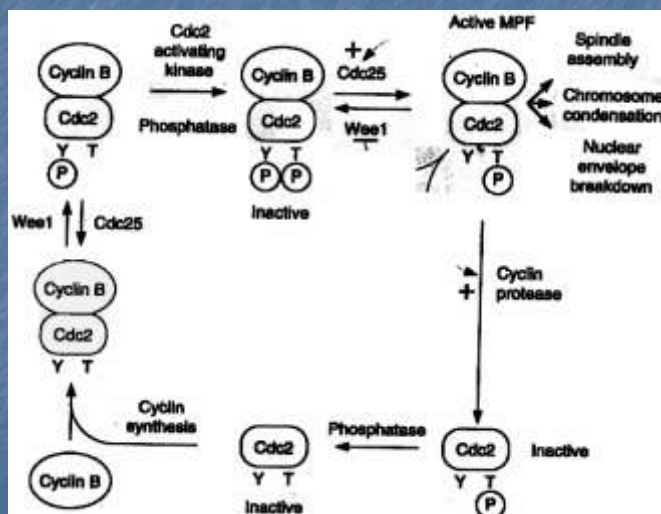


## INK4 antagoniza la proliferación

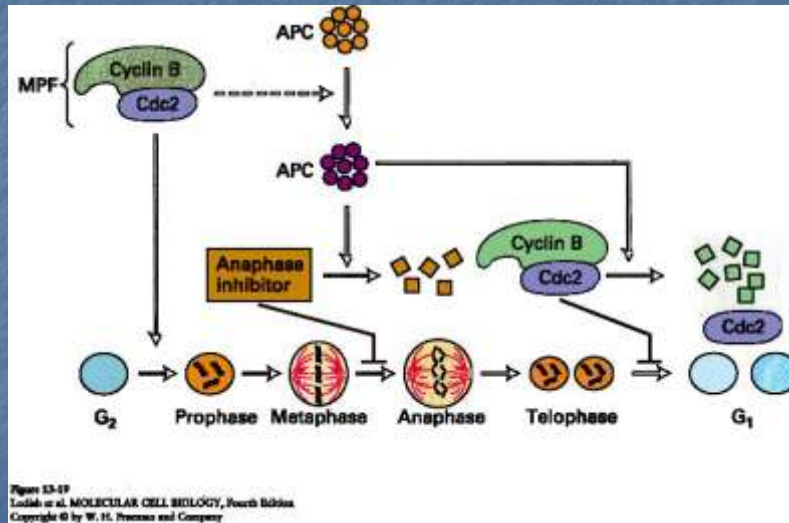


*Genes Dev.* 13 (1999), 1501

## Activación de Famoso MPF (ciclinaB/CDK1) Fase M



## Mecanismo de acción de APC



## Mecanismo de acción de APC

