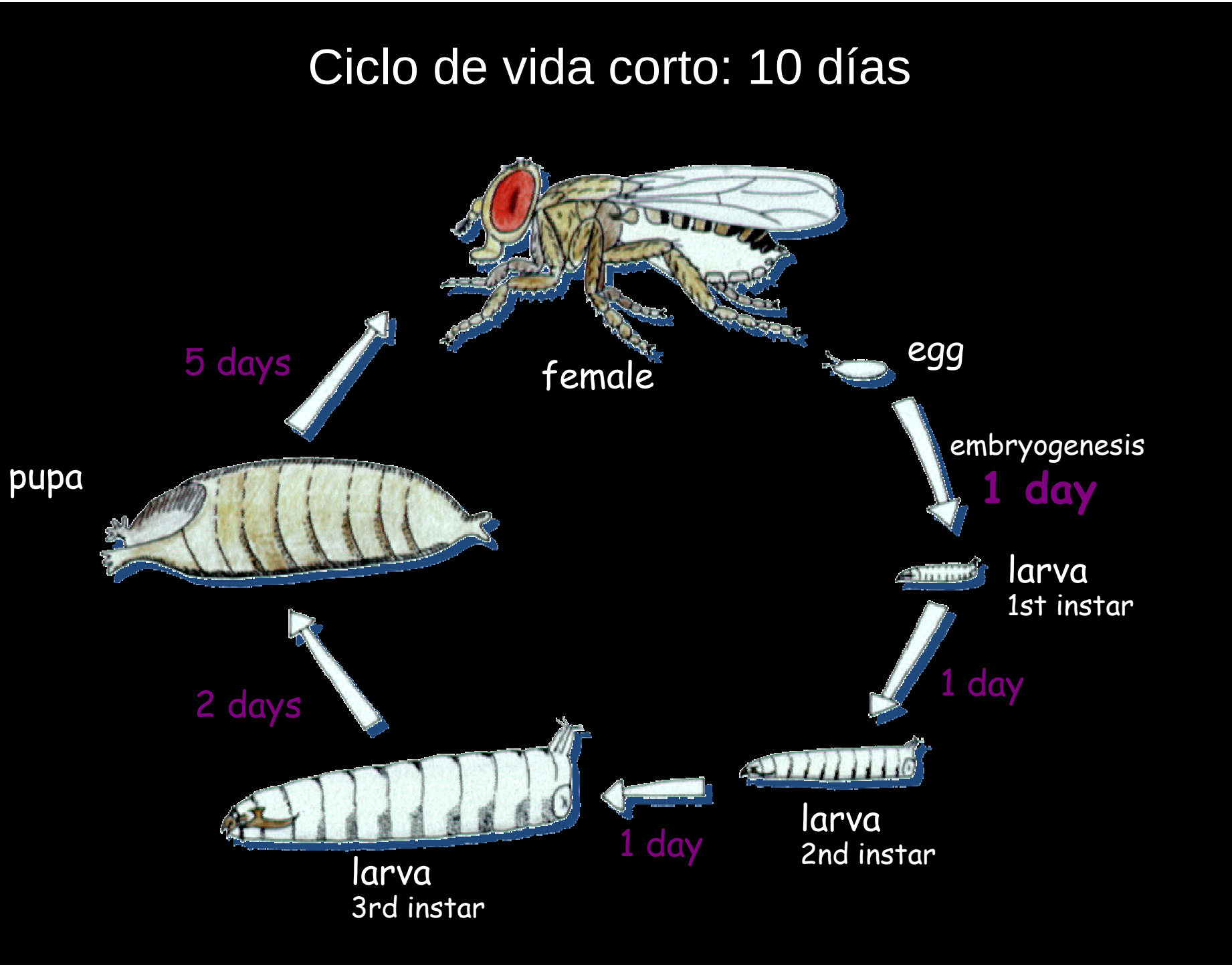
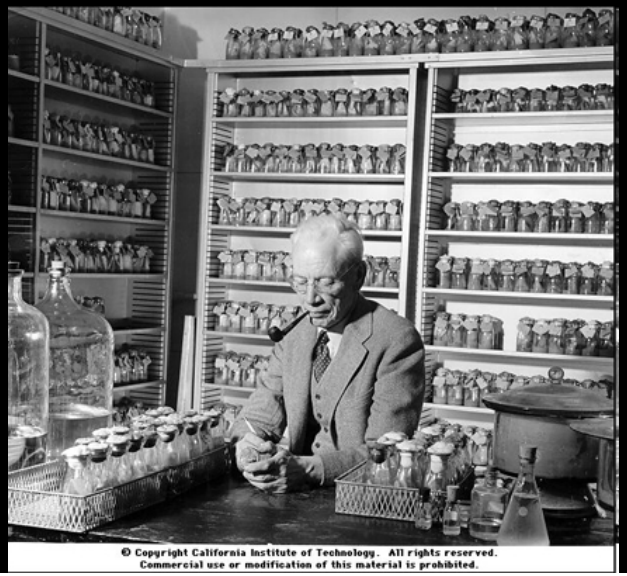
Ciclo de vida corto: 10 días



Barato y fácilmente almacenable



Primera mutación aislada en 1910 por Thomas Hunt Morgan: el mutante *white*.

Genoma secuenciado en 2000

Enfermedades humanas y genes en *Drosophila*

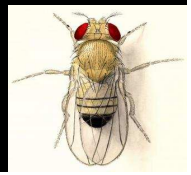
Table 1 | **Categories of human disease genes well suited to analysis in *Drosophila melanogaster* ***

Disease	Human gene symbol	Fly gene symbol	Gene product	References
Dysmorphology				
Sympolydactyly	*HOXD13*‡	*Abd-B*§	Transcription factor	140–142
Single bone in zeugopod	*HOXD9–HOXD13* (heterozygous deletion)	*Abd-B*§	Transcription factor	143,144
Hand-foot-genital syndrome	*HOXA13* or heterozygous *HOXA11–13* deletion	*Abd-B*§	Transcription factor	145–149
Aniridia	*PAX6*	*ey*§, *toy*§	Transcription factor	150–153
Townes-Brocks syndrome	*SALL1*	*salm*§, *sall*§	Transcription factor	154–156
Saethre-Chotzen syndrome	*TWIST1*	*twi*§	Transcription factor	133
Pfieffer syndrome	*FGFR1*, *FGFR2*	*htl*§	RTK	157
Apert syndrome	*FGFR2*	*htl*§	RTK	157
Crouzon syndrome	*FGFR3*	*htl*§	RTK	157
Saethre-Chotzen syndrome-like	*FGFR3*, gain-of-function?	*htl*§	RTK	133
Alagille syndrome	*JAG1*	*Ser*§, *Dl*§	Notch ligand	158
Spondylocostal dysostosis	*DLL3*	*Dl*§	Notch ligand	159
Primary congenital glaucoma	*CYP1B1*	*Cyp18a1*§	Cytochrome P450	108,109
Cardiac disease				
Congenital heart disease	*NKX2-5* *GATA4*	*tin*§ *pnr*§	Transcription factor Transcription factor	160–163 163–165
Holt–Oram syndrome	*TBX5*	*Doc1–Doc3*§	Transcription factor	166–168
DiGeorge syndrome	*TBX1*	*org-1*§, *bi*§	Transcription factor	169
Venous malformations	*TEK*	*htl*§	RTK	170
Neurological				
Spinocerabellar ataxia	*SCA1* (also known as *ATXN1*) *SCA2* (also known as *ATXN2*) *SCA6* (also known as *CACNA1A*) *SCA14* (also known as *PRKCG*) *SCA17* (also known as *TBP*)	*CG4547* *CG5166* *cac*§, *Ca-α1D*§ *inaC*§, *Pkc53E* *Tbp*§	Transcription cofactor? Unknown Ca^{2+} ion channel Ca^{2+}-dependent PKC TATA binding protein	27,30,171
Huntington disease	*HD*	*huntingtin*§	Axonal transport?	30,172–174
Spinal and bulbar muscular atrophy 3	*AR*	*ERR*, *svp*§	Androgen receptor	27,171
Parkinson disease	*PARK2* *PARK5* (also known as *UCHL1*) *PARK7* *NR4A2* *MAPT* *PINK1* *SNCA*	*park*§ *Uch* *dj-1β*, *CG6646* *Hr38*§ *tau*§ *CG4523*§ None known	E3-ubiquitin ligase Ubiquitin pathway Androgen-R regulator? Nuclear hormone receptor Microtubule binding PTEN-induced kinase Dopamine transmission?	49–51 28–30 30,175 176 28–30
Alzheimer disease	*PSEN1*, *PSEN2* *APP*	*Psn*§ *Appl*§	γ-Secretase Signalling, axonal transport?	27–30,66
Fragile X syndrome	*FMR1*	*Fmr1*§	Translational regulator	72,177,178
Angelman syndrome	*UBE3A*	*dube3A*§	E3-ubiquitin ligase	179,180
Cancer				
Tuberous sclerosis	*TSC1*, *TSC2*	*tsc1*§, *tsc2*§	GAP for RHEB in TOR pathway	86,181–184
Endometrial carcinoma	*PTEN*	*Pten*§	Negative regulator PI3K	86,92
No known disease mutations in homologue	*LATS1*	*wts*§ (also known as *lats*)	Cyclin regulation?	94,95
Renal cancer lines	*SAV1*	*sav*§	Cyclin regulation?	96
No known disease mutations in homologue	*MST1*, *MST2* (also known as *STK3*)	*hpo*§	Cyclin regulation?	97
Bladder and colorectal cancer	RAS family genes	*Ras85D*§	RTK signalling	185
No known disease mutations in homologues	*SCRIB*, *LLGL1*, *DLG1*	*scrib*§, *l(2)g*§, *dlg1*§	Cell polarity, metastasis in the presence of RAS-V12	
B-cell leukaemia	*CCND1*	*CycD*§	Cell cycle	93
Melanoma	*CDK4*	*Cdk4*§	Cell cycle	
Retinoblastoma	*RB1*	*Rbf*§, *Rbf2*	Cell cycle	
Hepatocellular carcinoma	*TP53*	*hth*§ ($e<10^{-10}$)	Cell cycle	
Ectodermal dysplasia	*TP73L*	*hth*§ ($e<10^{-7}$)	Cell cycle	

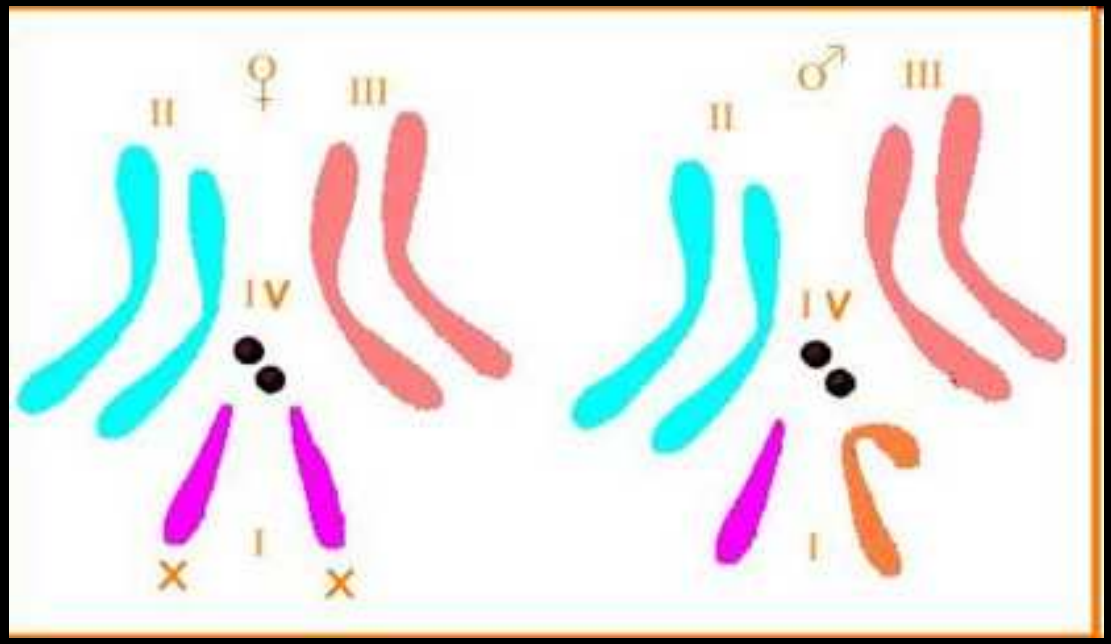
*An extended version of this table with additional disease categories can be found online. All e-values $<10^{-20}$ unless otherwise indicated. ‡Mild heterozygotes and strong null phenotypes. GAP, GTPase-activating protein; PI3K, phosphoinositide 3-kinase; PKC, protein kinase C; PTEN, phosphatase and tensin homologue; RAS-V12, a constitutively active form of RAS; RHEB, RAS homologue enriched in brain; RTK, receptor tyrosine kinase; TOR, target of rapamycin. §*D. melanogaster* genes for which mutant as well as wild-type alleles have been isolated.

Gran variedad de herramientas genéticas

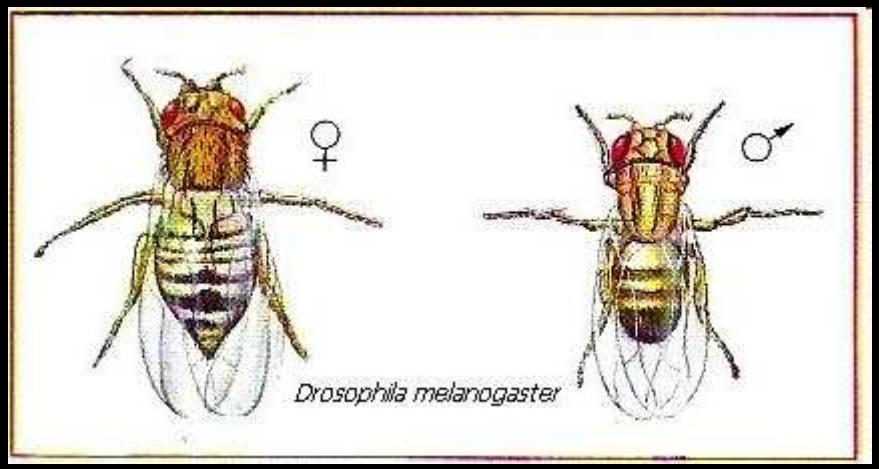
- Marcadores genéticos
- Cromosomas balanceadores
- Elementos P y transgénesis
- Sistema GAL4-UAS



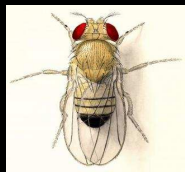
3 pares de autosomas
1 par de cromosomas sexuales



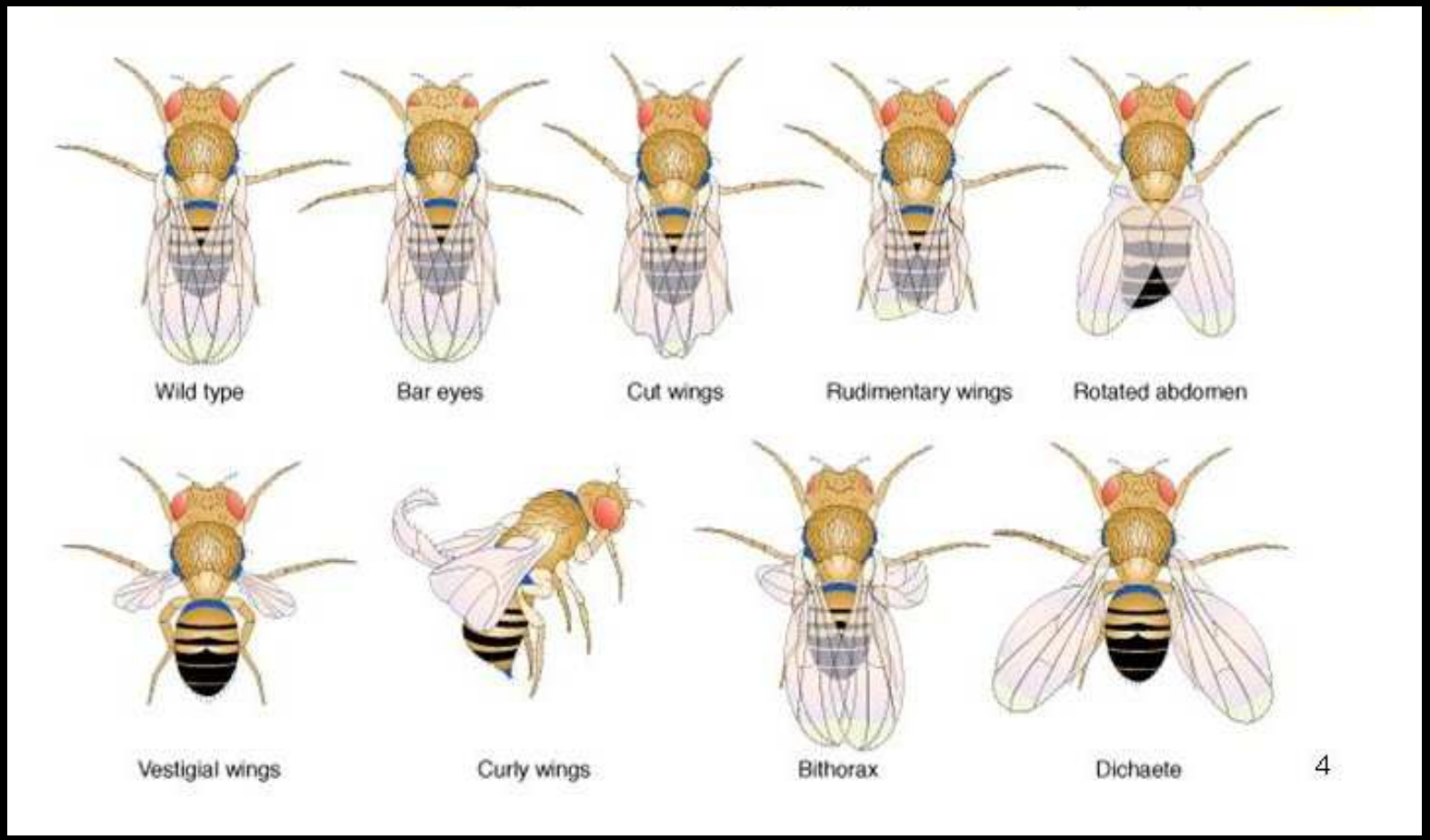
XX



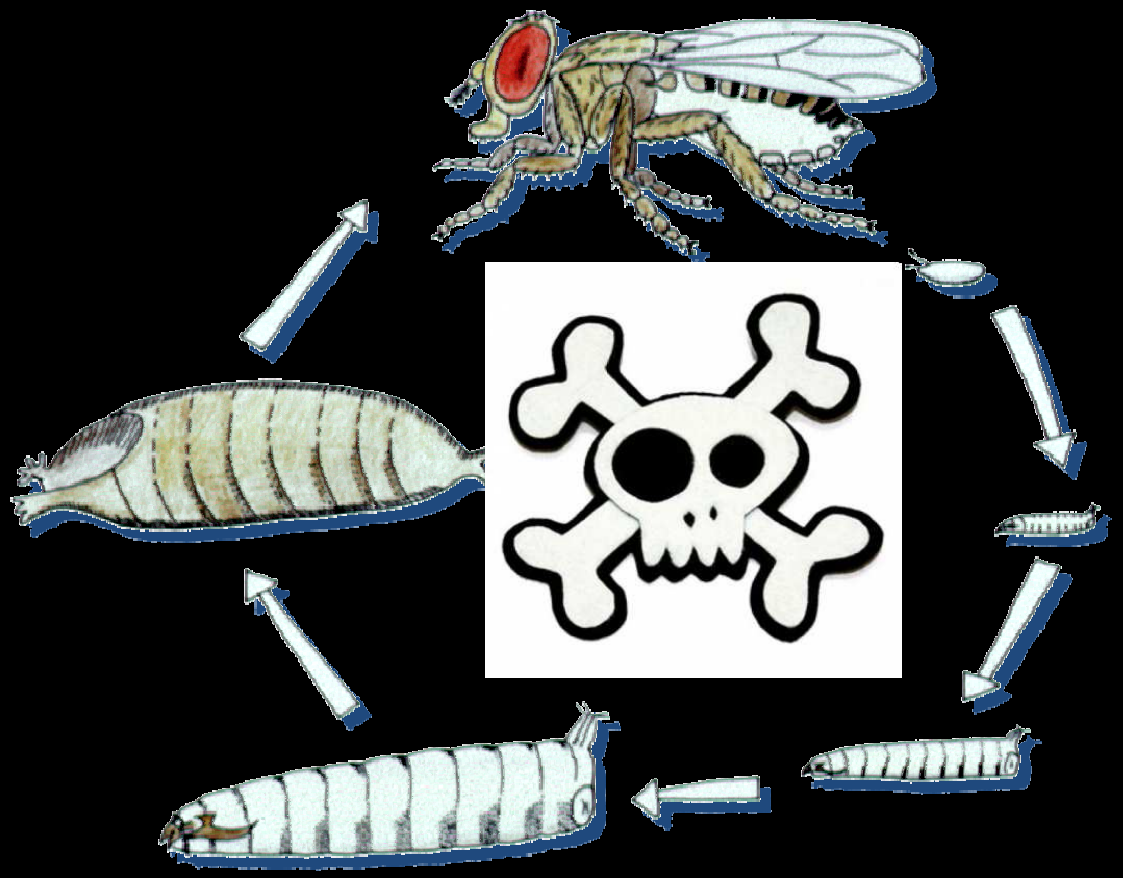
XY



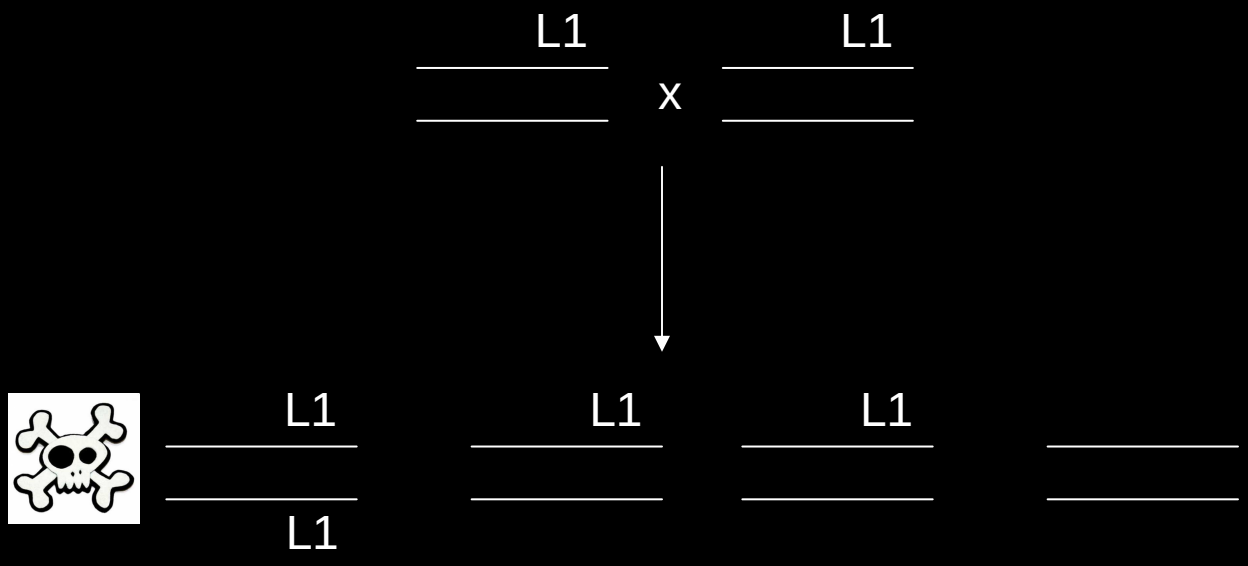
Análisis genético de procesos biológicos: del fenotipo al gen



Análisis genético de procesos biológicos: ¿Cómo resolver la letalidad?

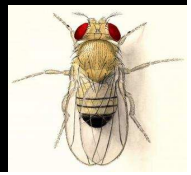


Cómo mantener mutaciones en heterozigosis??



Cromosomas balanceadores

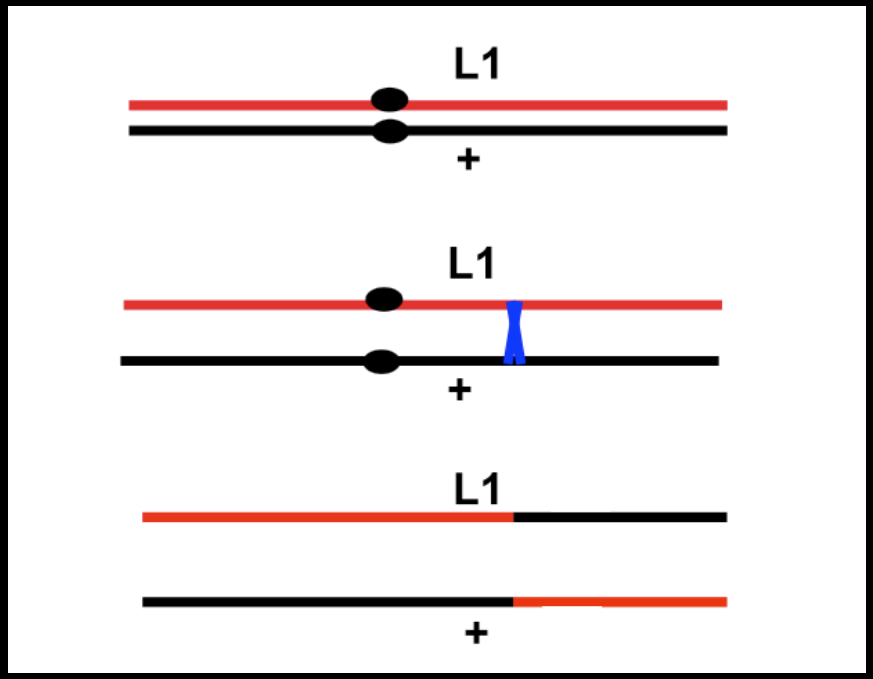
- Inversiones mútiples
- Marcadores dominantes
- Letales en homozigosis



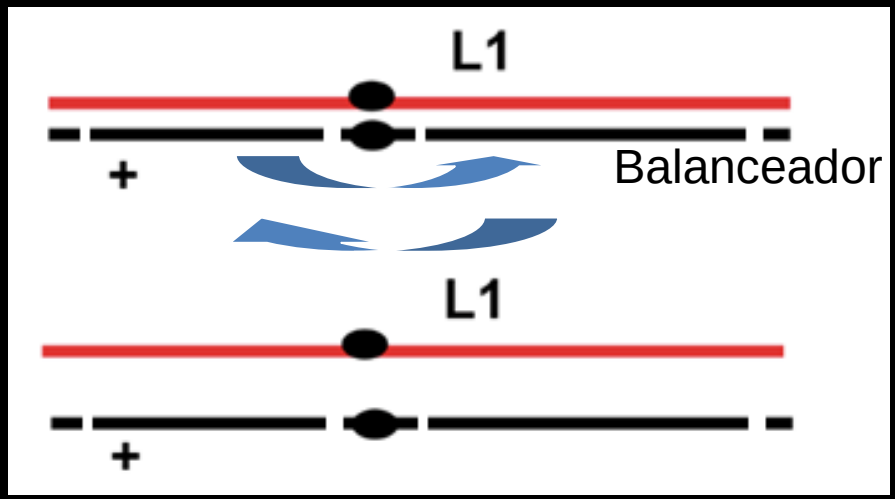
Cromosomas balanceadores

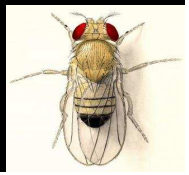
- Inversiones mútiples

Recombinación meiótica



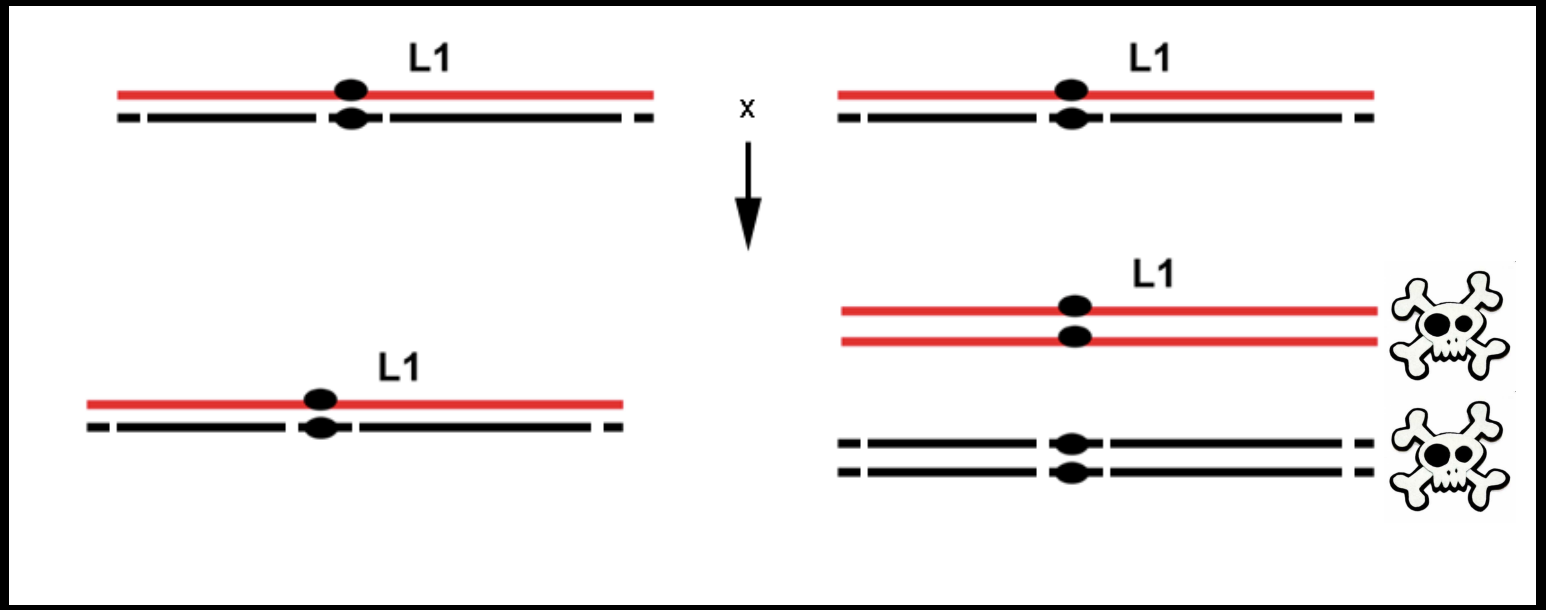
No recombinación meiótica

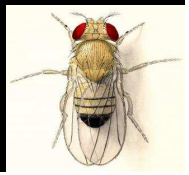




Cromosomas balanceadores

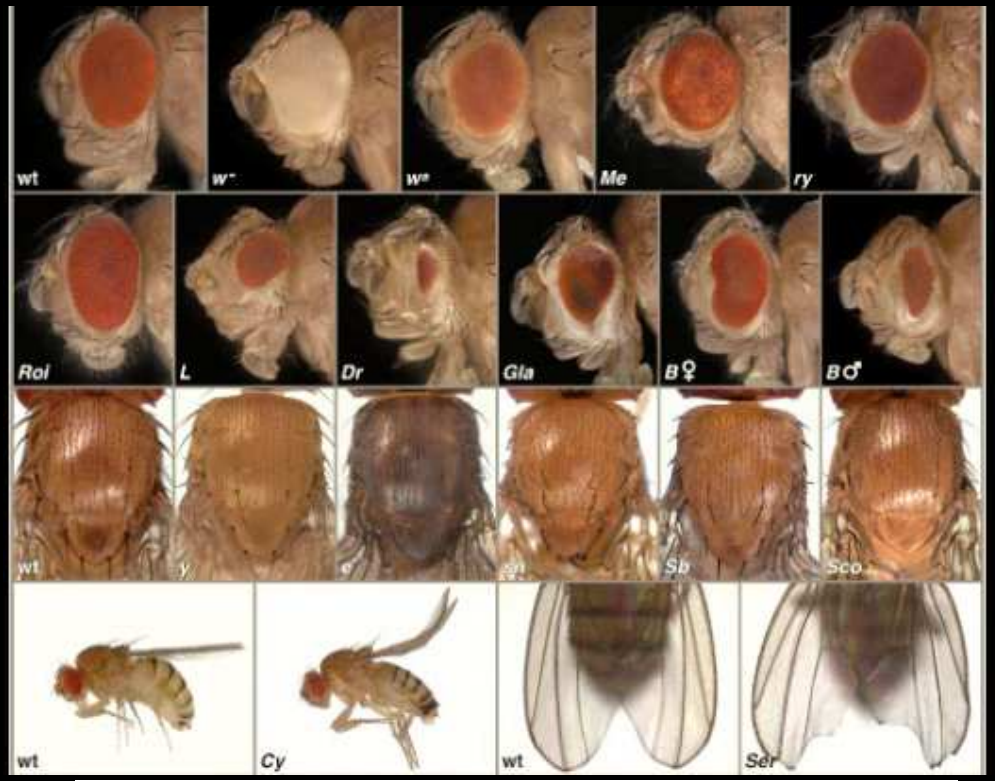
- Letales en homozigosis

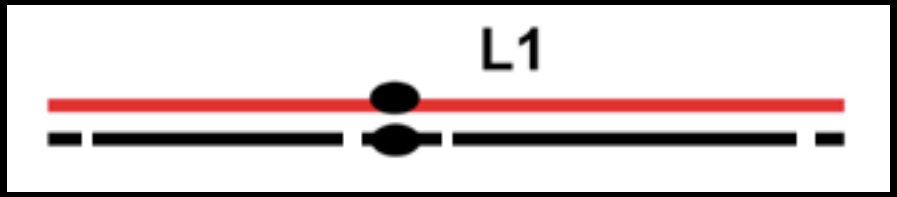




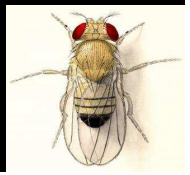
Cromosomas balanceadores

- Marcadores dominantes





Gla, Ser, Cy, etc



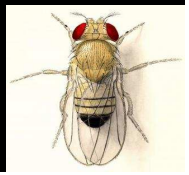
Tipos de mutaciones

Falta de función

- hipomorfos –(m/m < m/Deficiencia)
- amorfos – (m/m = m/Df)

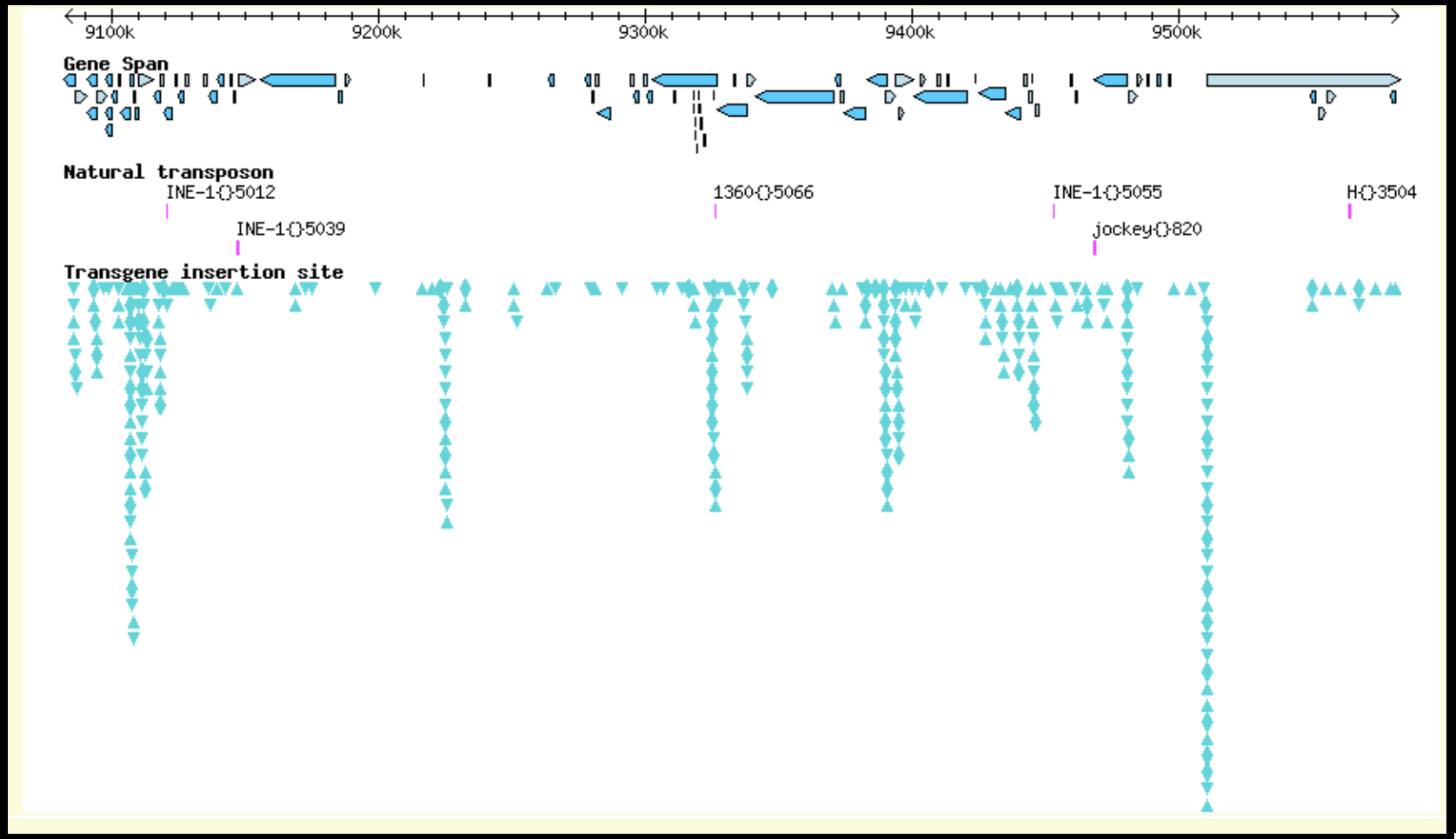
Ganancia de función

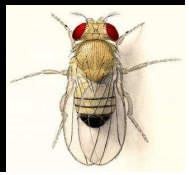
- hipermorfos – (m/m > m/+ > m/Df)
- neomorfos – nueva actividad
- antimorfo – dominant negative (m/+ > Df/+)



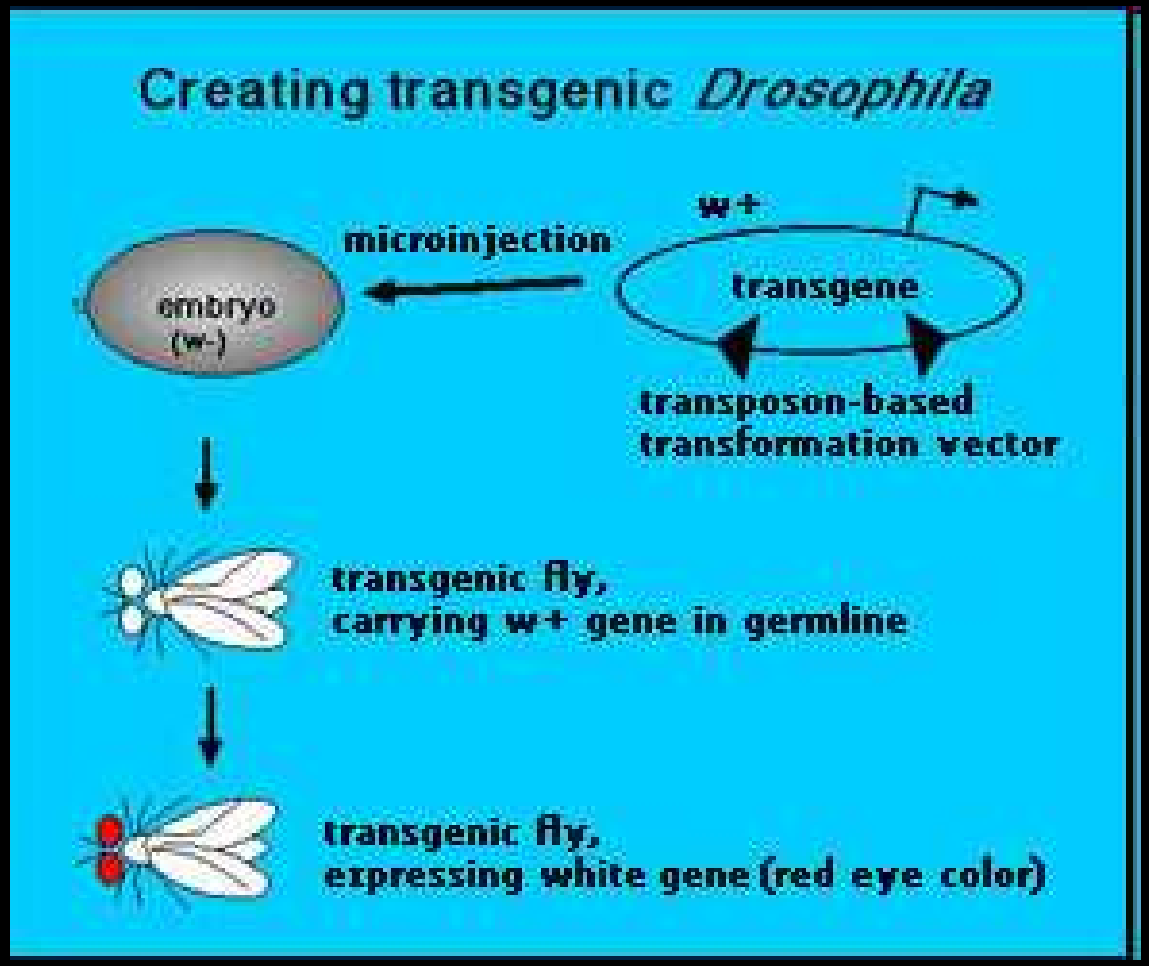
Elementos P

P-elements – transposones presentes en *Drosophila* que causan mutaciones



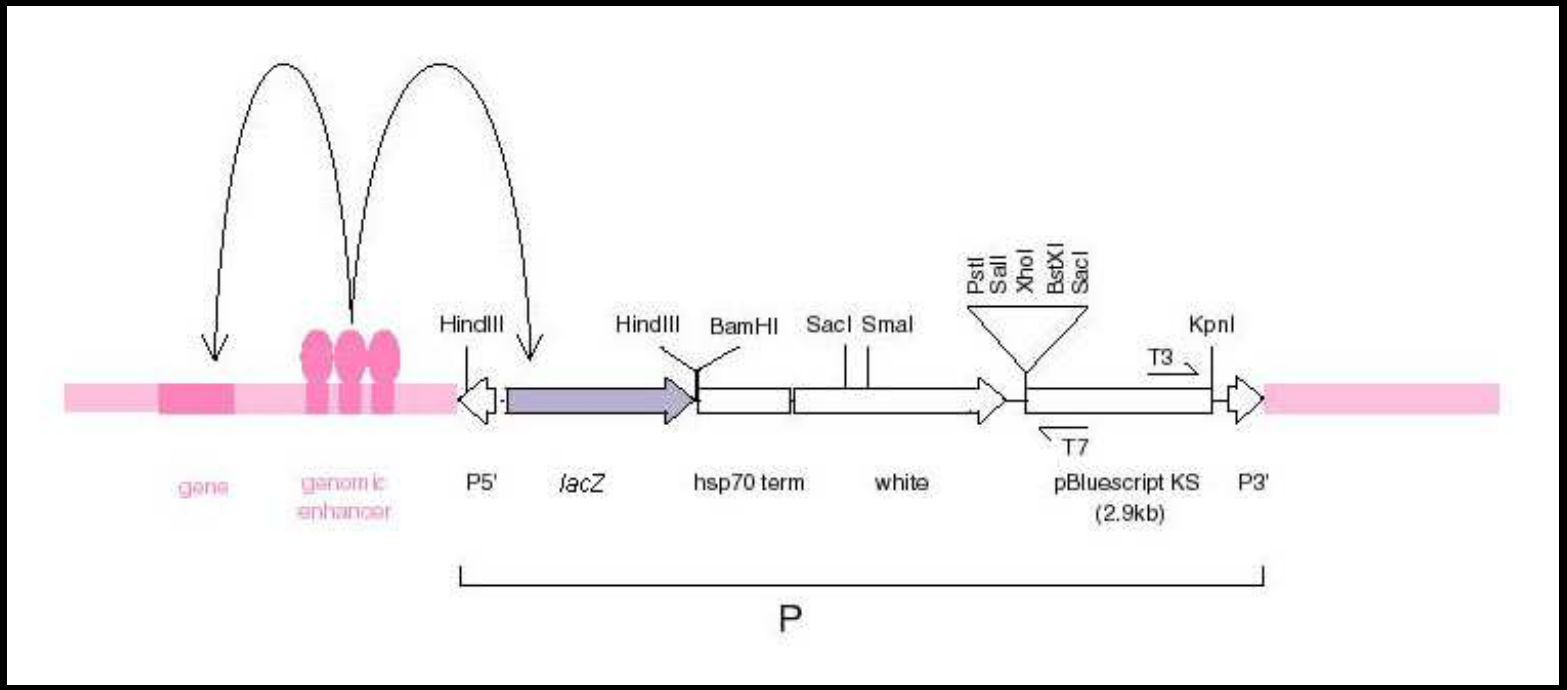


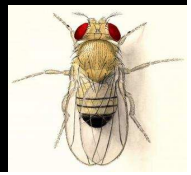
Transgénesis mediante elementos P



Elementos P

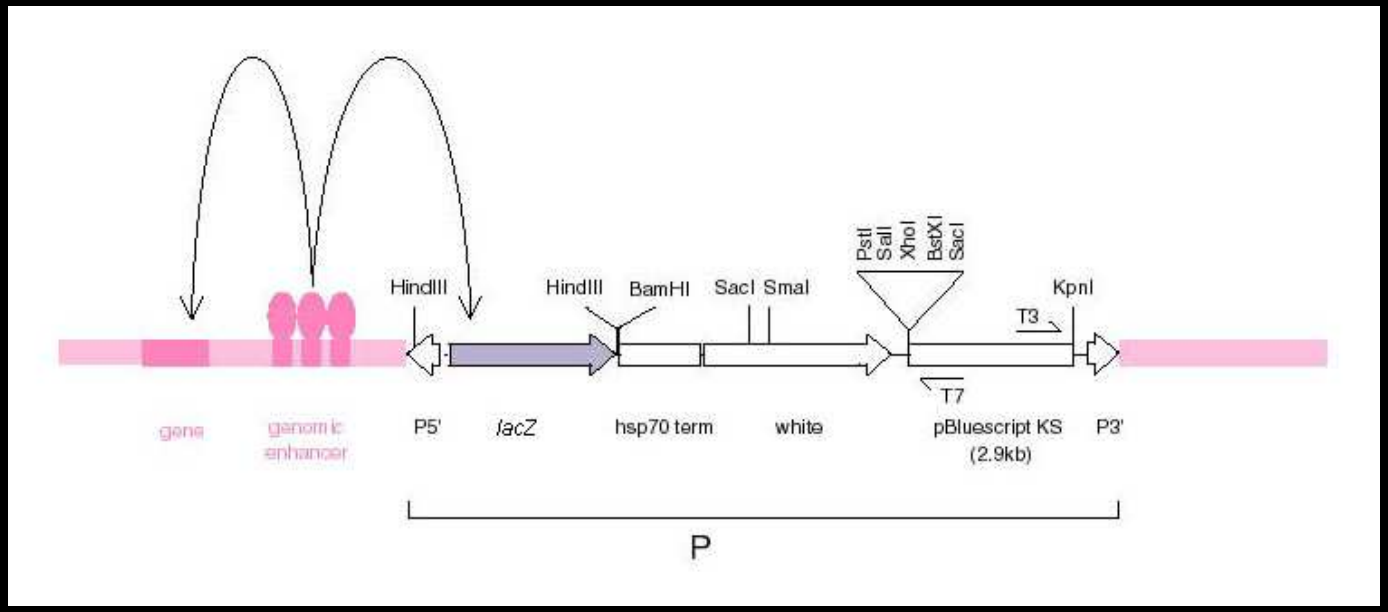
P-elements – transposones para visualizar expresion génica

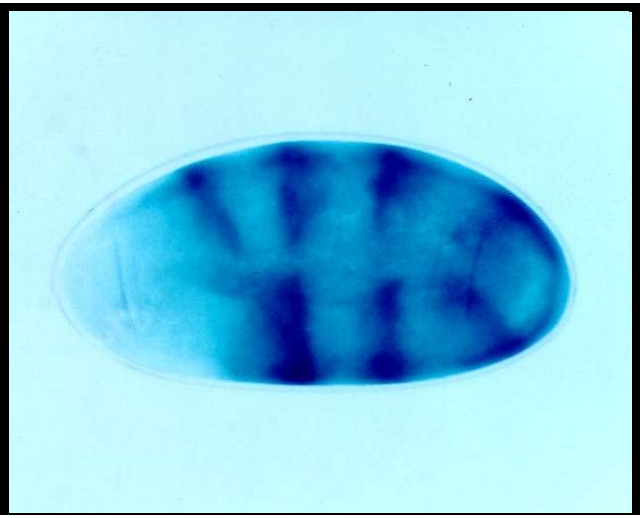


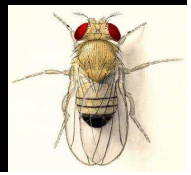


Elementos P

P-elements – transposones para visualizar expresion génica

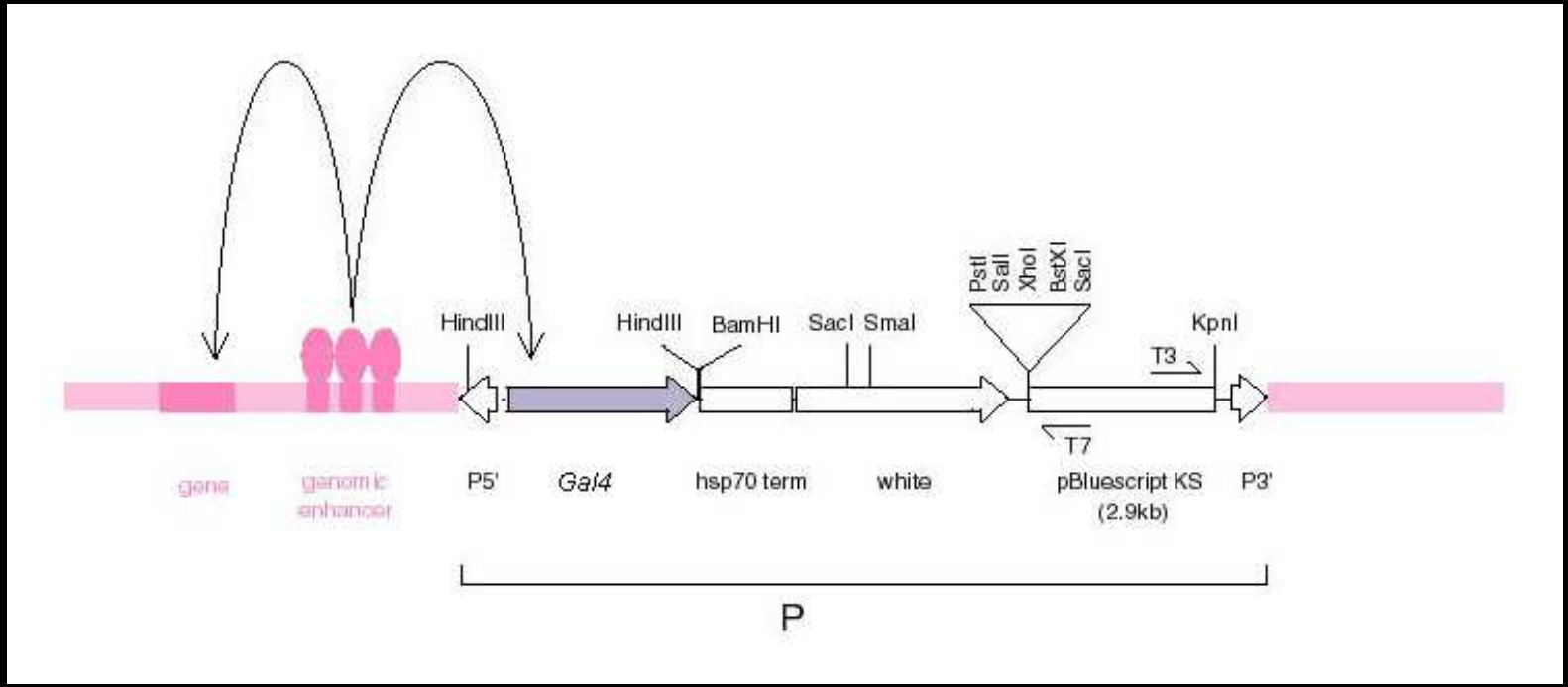


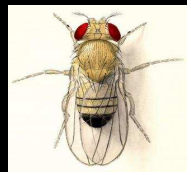




Elementos P

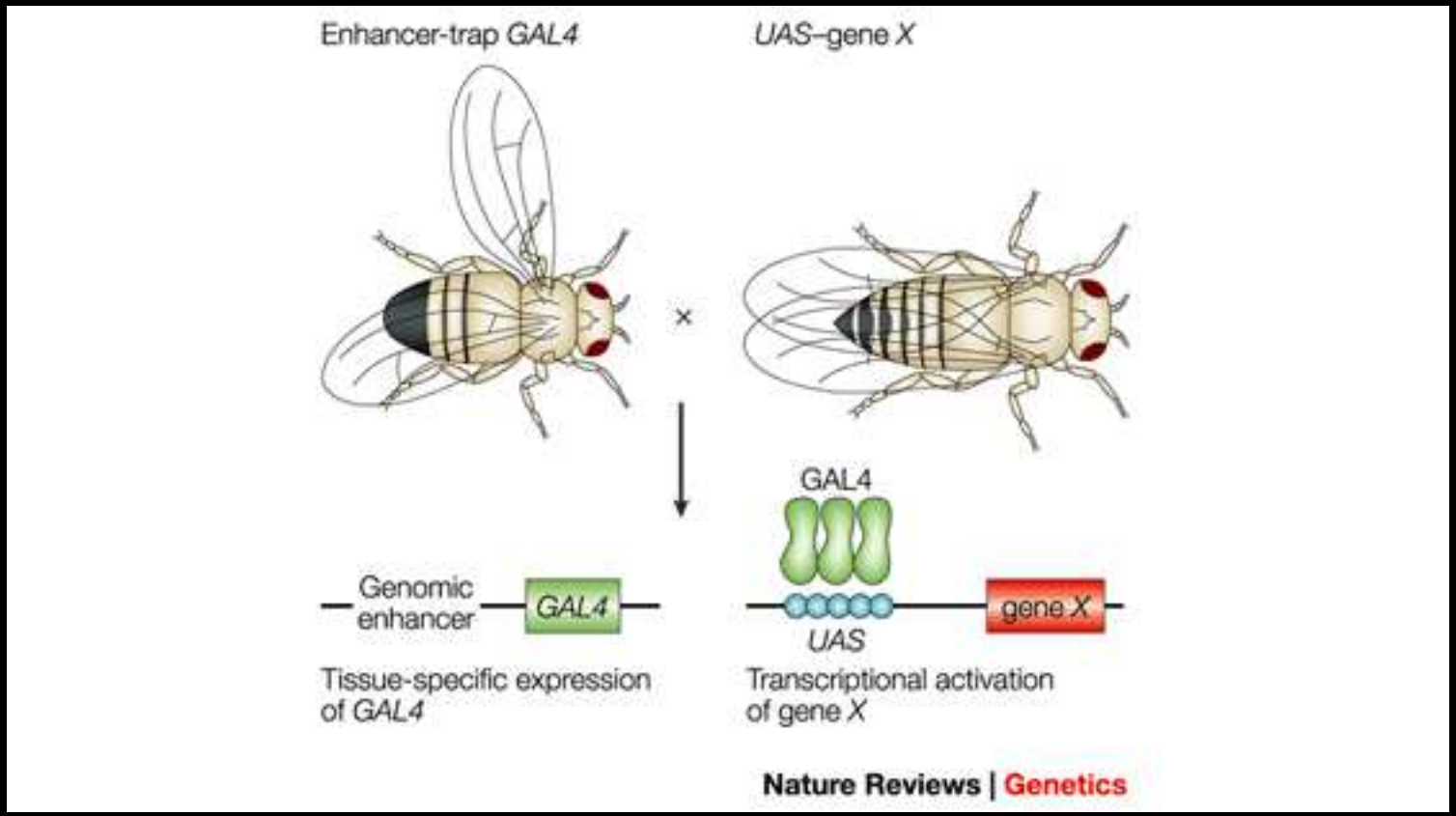
P-elements – transposones para visualizar expresion génica

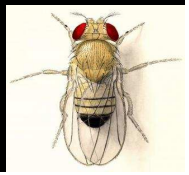


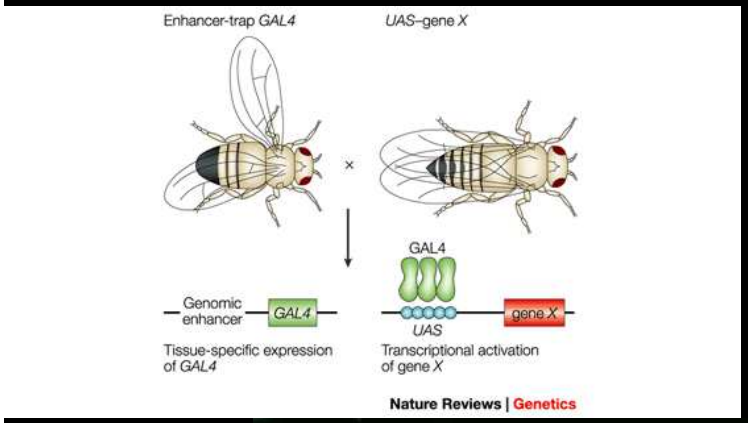


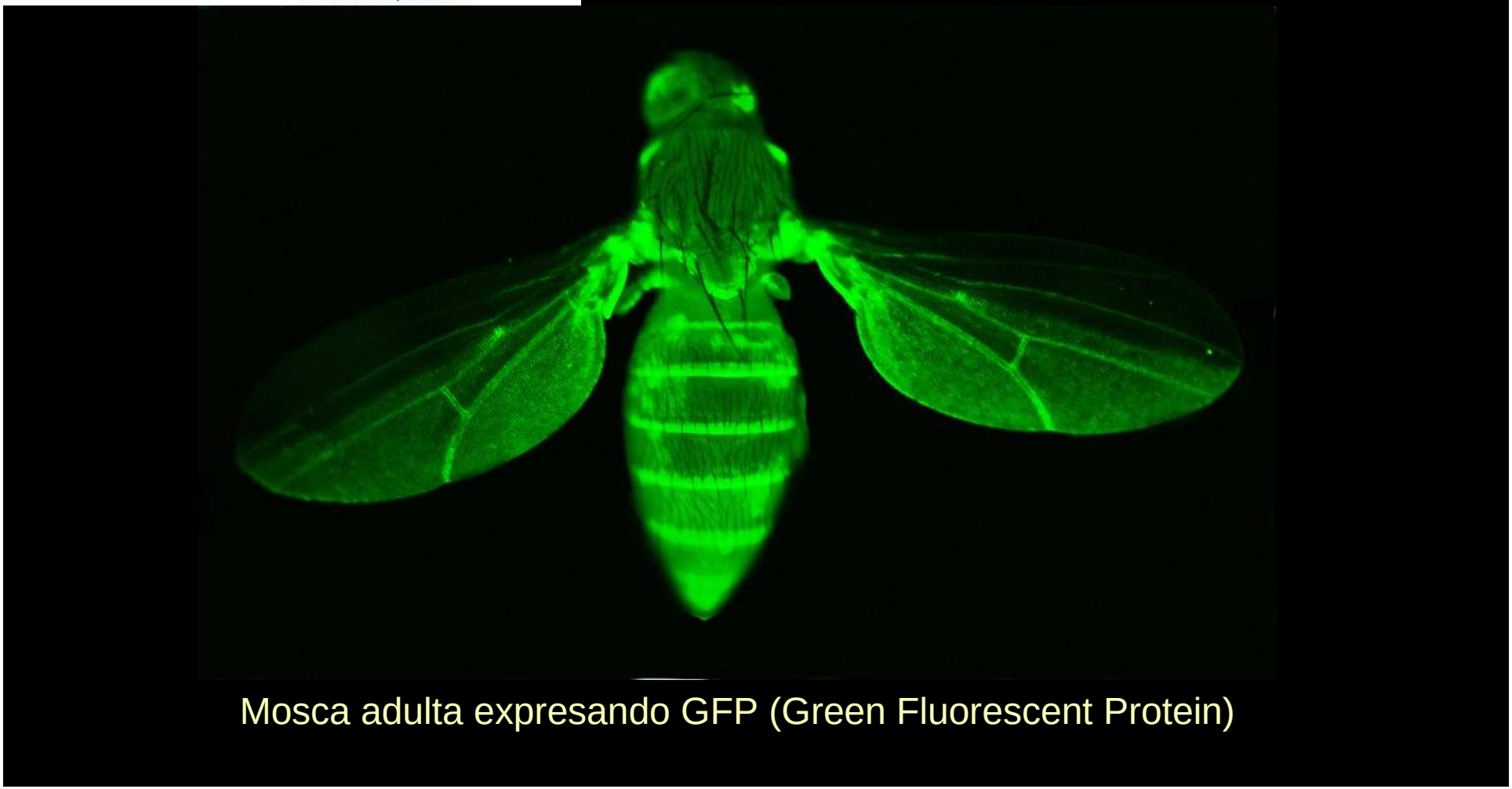
Sistema GAL4-UAS

Sobre-expresión de genes o expresión ectópica

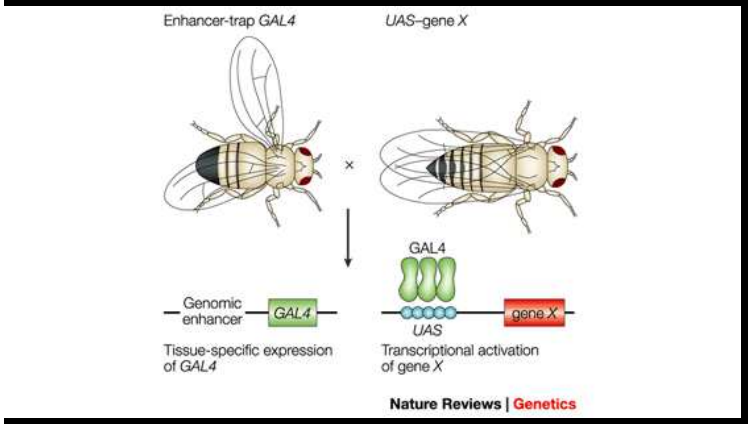




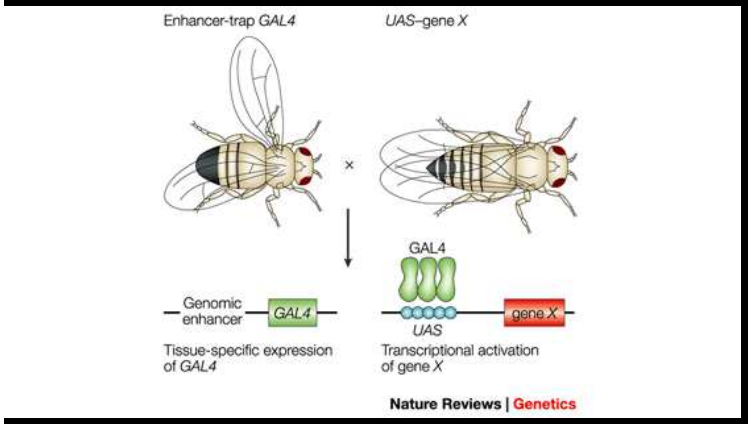




Mosca adulta expresando GFP (Green Fluorescent Protein)



Embrión expresando GFP en el corazón



Mosca adulta expresando el gen eyeless en las patas