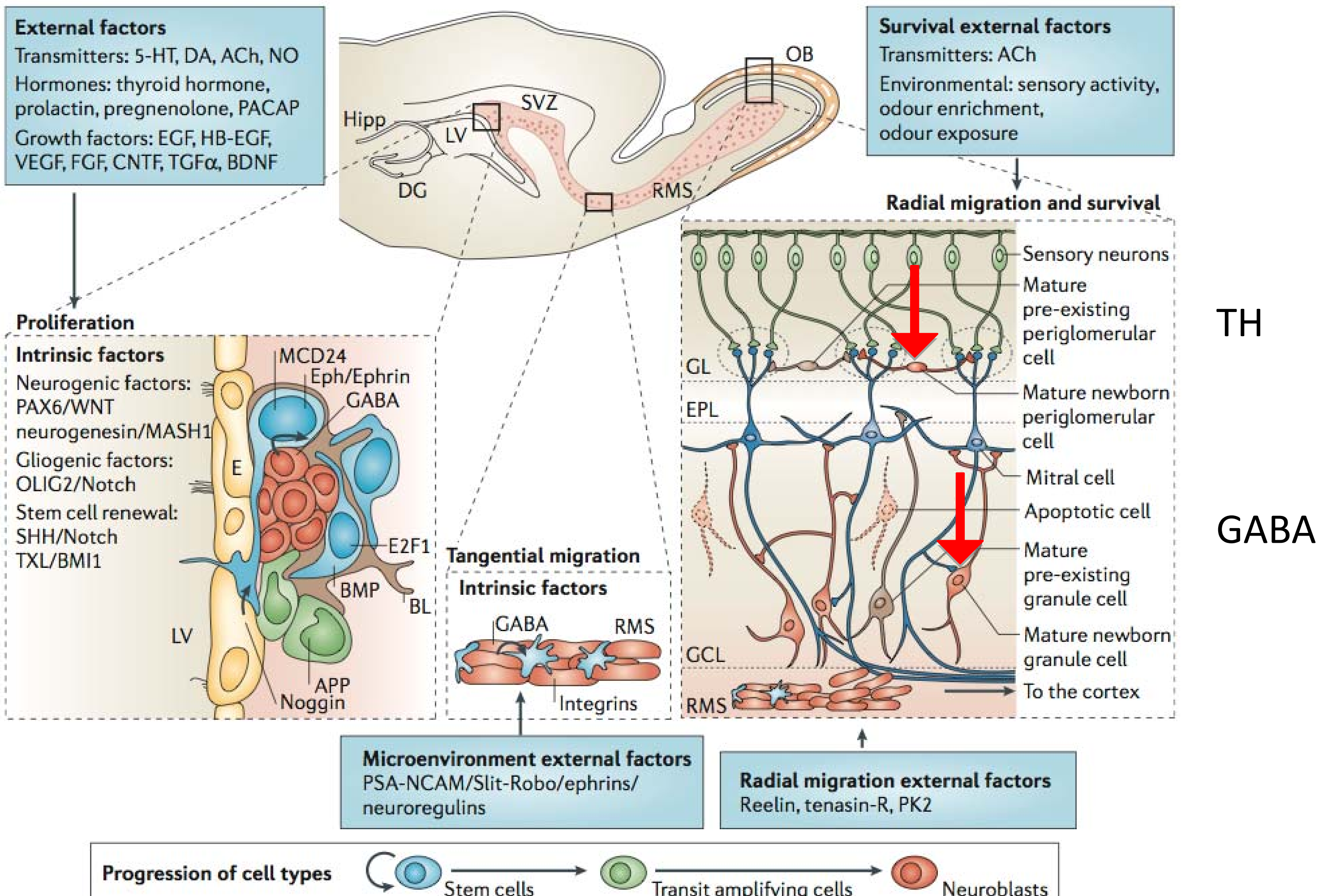
Cours 18-11-2013

Adult neurogenesis and functional plasticity in neuronal circuits

Nat Rev Neurosci
2006 vol. 7 (3) pp. 179–93

Lledo P, Alonso M, Grubb M



The telomere syndromes

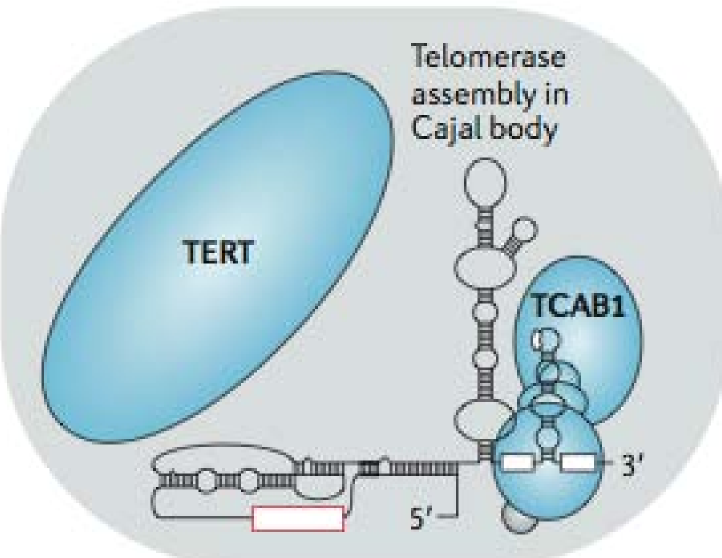
Nature Reviews Genetics
2012 vol. 13 (10) pp. 693-704

Armanios M, Blackburn EH

Telomere shortening in neural stem cells disrupts neuronal differentiation and neuritogenesis

J Neurosci
2009 vol. 29 (46) pp. 14394-407

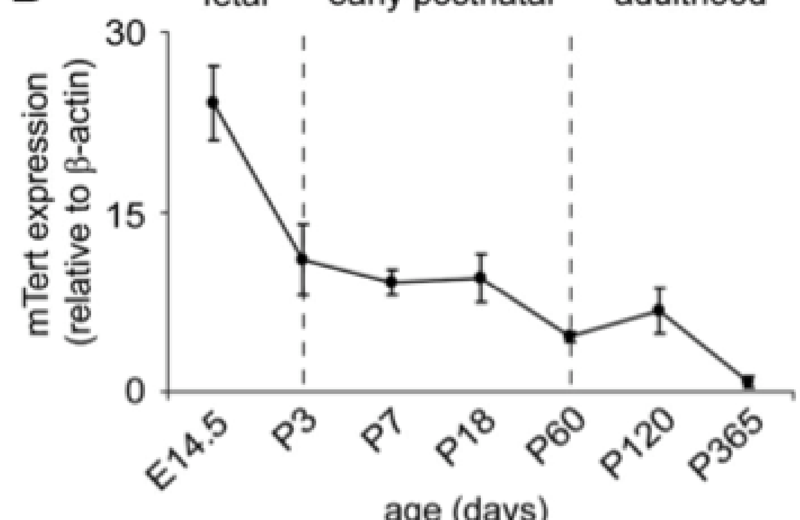
Ferrón SR, Marqués-Torrejón MA, Mira H, Flores I, Taylor K, Blasco MA, Fariñas I



B

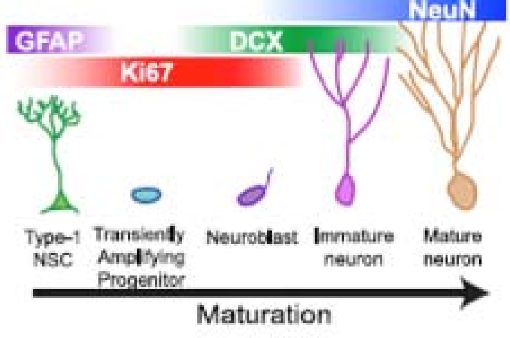
	OB (granular layer)	
age (months)	2	12
LRC	43.9 ± 6.6	14.4 ± 1.8*
%LRC/CR	5.1 ± 0.6	1.6 ± 0.2**

D



E

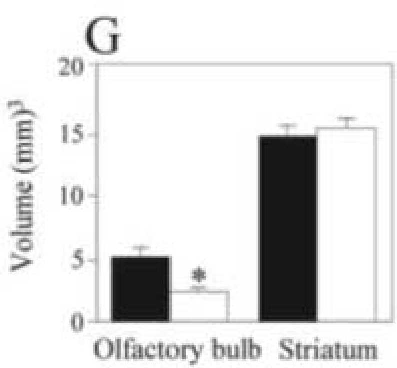
	neurospheres	
age (months)	2	12
mTert expression (a.u)	2.2 ± 0.4	1.3 ± 0.3**
telomere length (a.u)	67.9 ± 3.2	52.5 ± 3.4*



Telomere shortening and chromosomal instability abrogates proliferation of adult but not embryonic neural stem cells

Ferrón S, Mira H, Franco S, Cano-Jaimez M, Bellmunt E, Ramírez C, Fariñas I, Blasco MA

Development
2004 vol. 131 (16) pp. 4059-70



Telomere shortening in neural stem cells disrupts neuronal differentiation and neuritogenesis

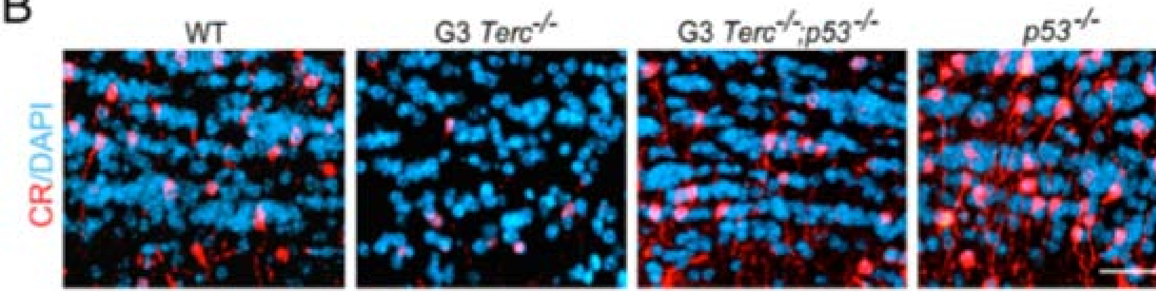
J Neurosci
2009 vol. 29 (46) pp. 14394-407

Ferrón SR, Marqués-Torrejón MA, Mira H, Flores I, Taylor K, Blasco MA, Fariñas I

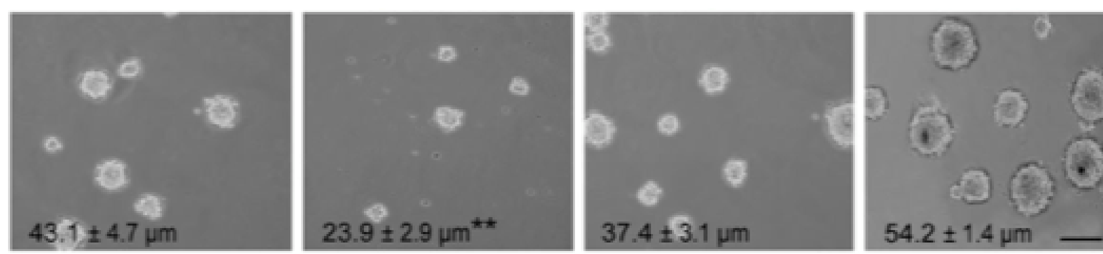
A

	LRC		% CR/LRC	
layer	granular	periglomerular	granular	periglomerular
WT	53.3 ± 5.9	3.4 ± 0.4	5.7 ± 0.6	3.4 ± 0.7
G3 *Terc*$^{-/-}$	10.2 ± 0.6**	1.3 ± 0.2*	0.9 ± 0.1**	1.2 ± 0.2*
G3 *Terc*$^{-/-}$;*p53*$^{-/-}$	56.1 ± 2.9	3.6 ± 0.4	4.9 ± 0.1	3.9 ± 0.1
p53$^{-/-}$	118.8 ± 8.1**	5.6 ± 0.1**	6.3 ± 0.3	4.8 ± 0.5

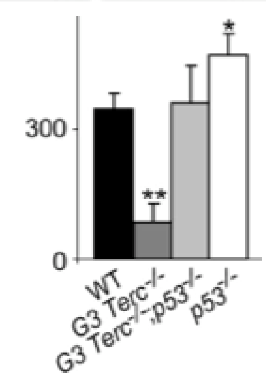
B



F



Nombre de sphères primaires



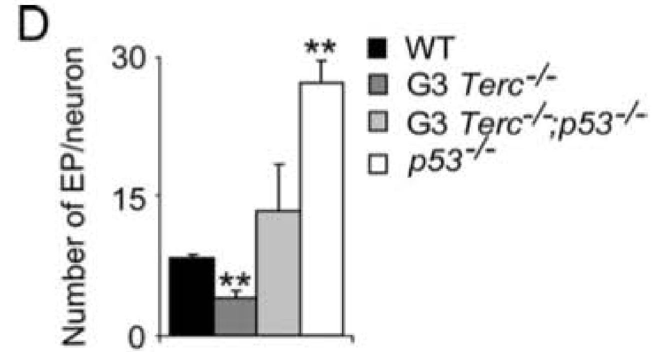
Telomere shortening in neural stem cells disrupts neuronal differentiation and neuritogenesis

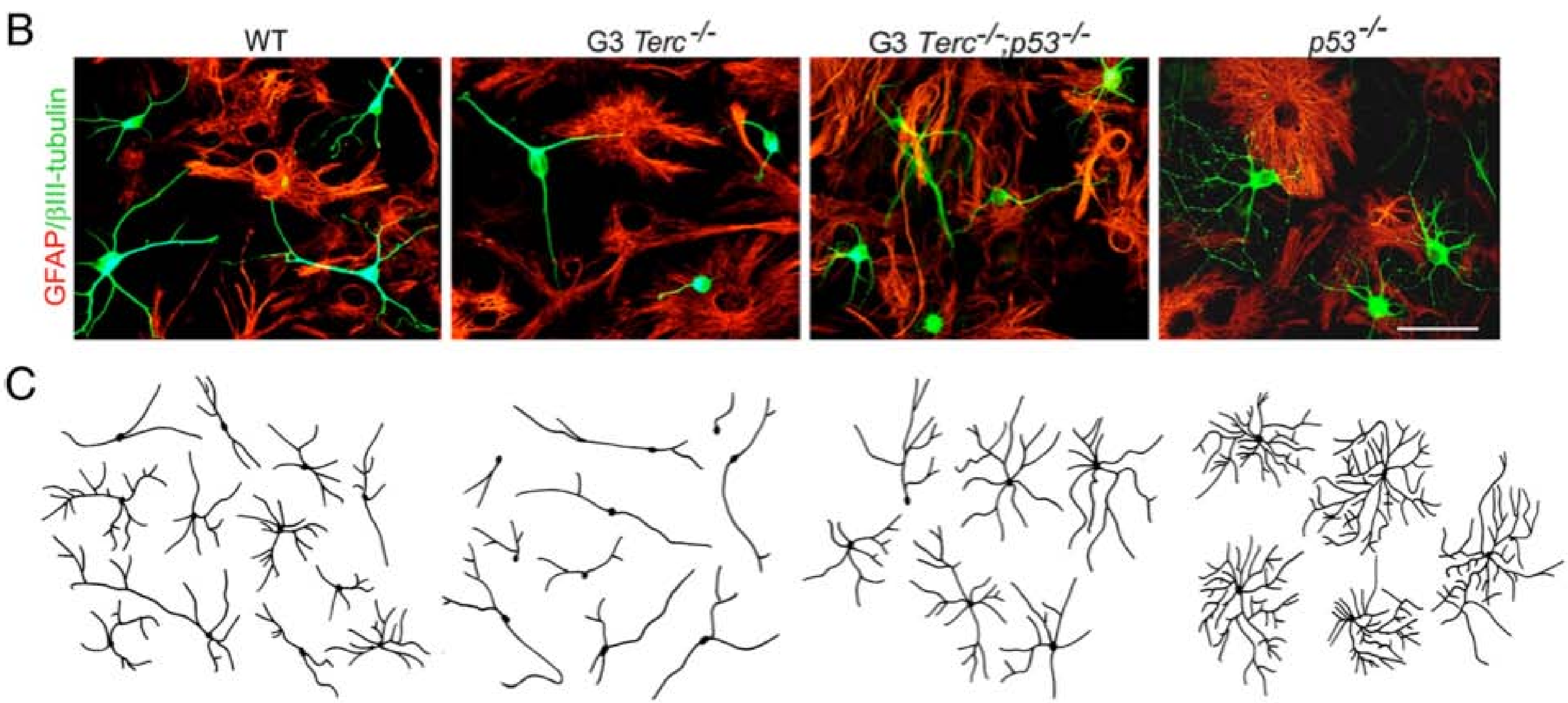
J Neurosci
2009 vol. 29 (46) pp. 14394-407

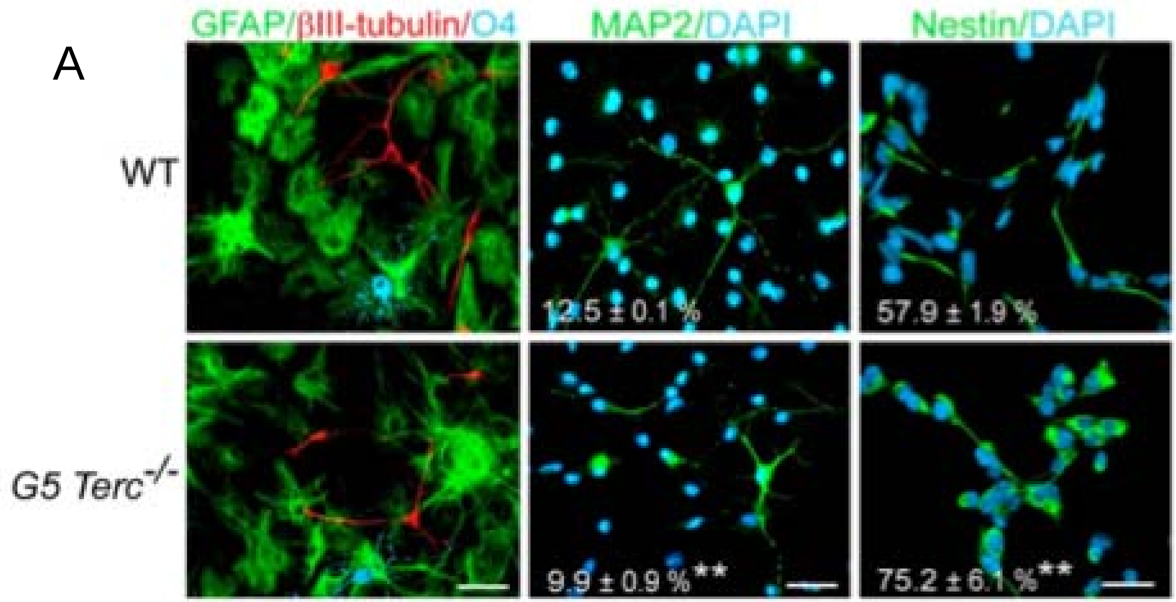
Ferrón SR, Marqués-Torrejón MA, Mira H, Flores I,
Taylor K, Blasco MA, Fariñas I

A

percentage of cells	GFAP	S100β	βIII-tubulin	O4
WT	72.1 ± 4.3	13.5 ± 0.4	11.6 ± 0.9	5.4 ± 1.1
G3 *Terc*$^{-/-}$	62.2 ± 2.1	15.6 ± 0.2	5.9 ± 0.6**	6.1 ± 0.7
G3 *Terc*$^{-/-}$;*p53*$^{-/-}$	70.9 ± 3.8	14.6 ± 0.3	10.1 ± 1.6	6.6 ± 0.3
p53$^{-/-}$	63.6 ± 1.8	12.1 ± 0.1	15.2 ± 1.8	5.9 ± 0.7



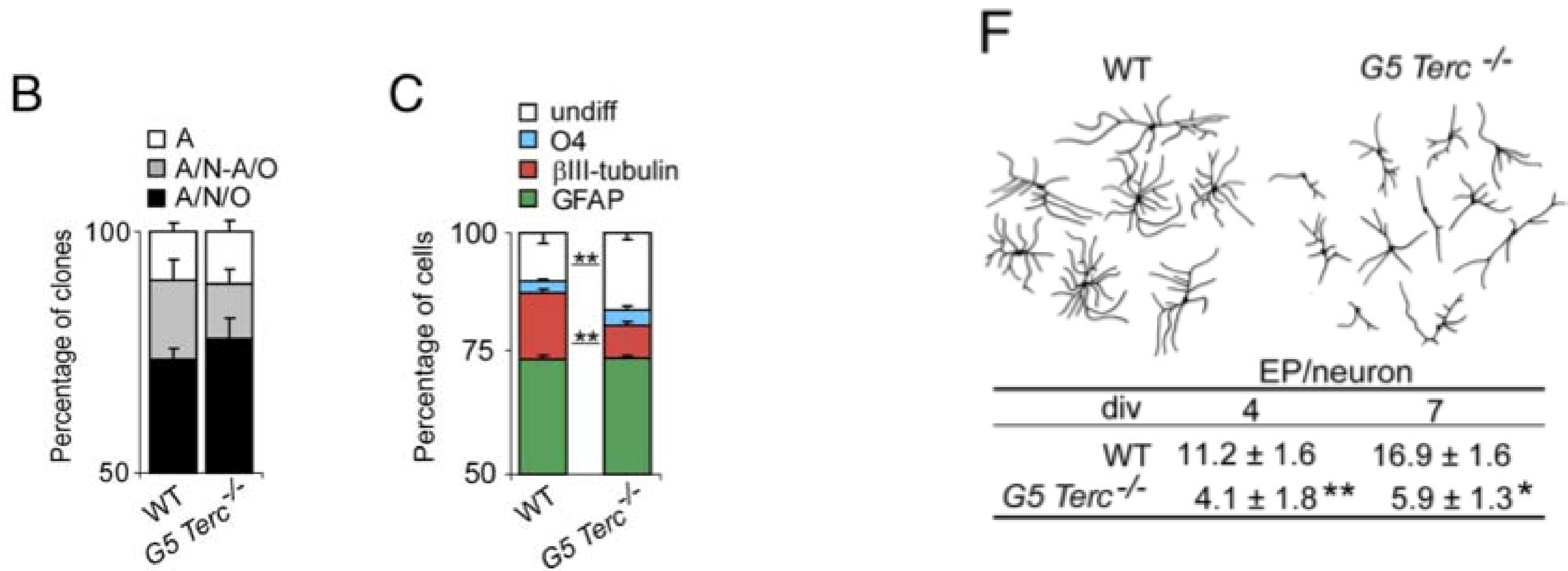




Telomere shortening in neural stem cells disrupts neuronal differentiation and neuritogenesis

Ferrón SR, Marqués-Torrejón MA, Mira H, Flores I, Taylor K, Blasco MA, Fariñas I

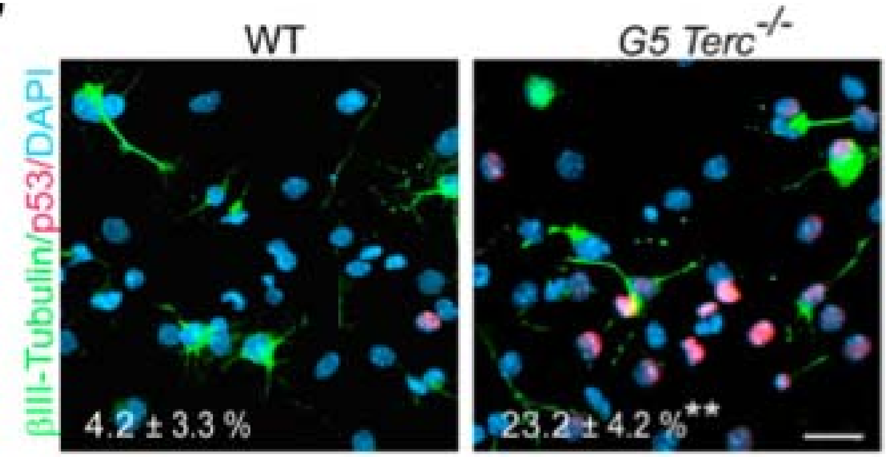
J Neurosci
2009 vol. 29 (46) pp. 14394-407



Telomere shortening in neural stem cells disrupts neuronal differentiation and neuritogenesis

J Neurosci
2009 vol. 29 (46) pp. 14394-407

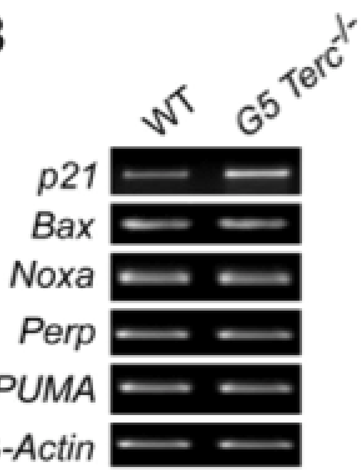
Ferrón SR, Marqués-Torrejón MA, Mira H, Flores I, Taylor K, Blasco MA, Fariñas I



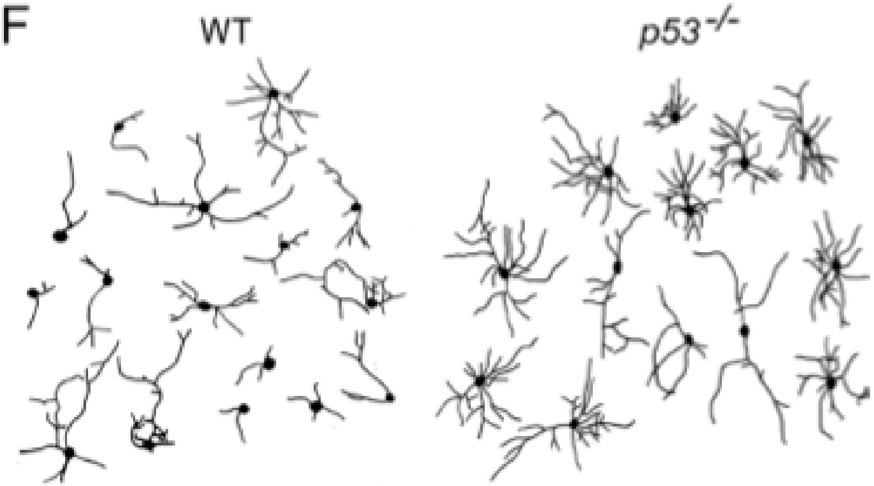
A

	Luciferase activity	
	Proliferation	*Differentiation*
WT	5.2 ± 2.8	1.7 ± 0.3
G5 Terc$^{-/-}$	28.5 ± 7.9*	9.2 ± 0.5**

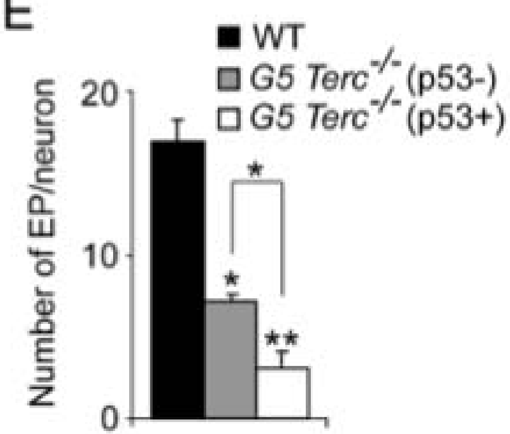
B



F



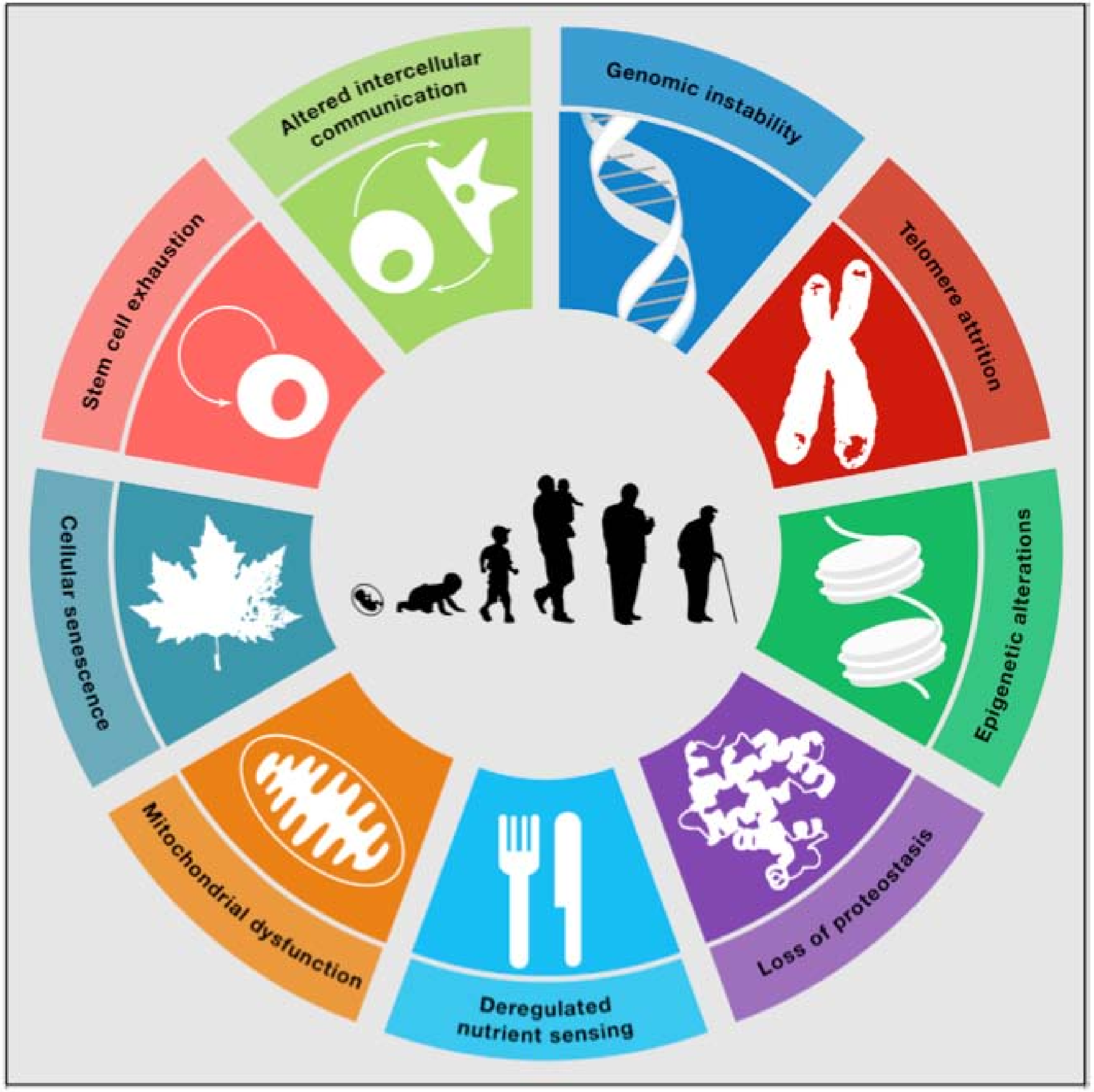
E



The Hallmarks of Aging

Cell *153*, June 6, 2013 ©2013 Elsevier Inc.

Carlos López-Otín,[1] Maria A. Blasco,[2] Linda Partridge,[3,4] Manuel Serrano,[5,*] and Guido Kroemer[6,7,8,9,10]



Physiologic brain activity causes DNA double-strand breaks in neurons, with exacerbation by amyloid-β

NATURE NEUROSCIENCE VOLUME 16 | NUMBER 5 | MAY 2013

Elsa Suberbielle[1,2], Pascal E Sanchez[1,2], Alexxai V Kravitz[1,2], Xin Wang[1], Kaitlyn Ho[1], Kirsten Eilertson[3], Nino Devidze[1], Anatol C Kreitzer[1,2] & Lennart Mucke[1,2]

Breaking news: thinking may be bad for DNA

VOLUME 16 | NUMBER 5 | MAY 2013 NATURE NEUROSCIENCE

Karl Herrup, Jianmin Chen & Jiali Li

A study in this issue suggests that neuronal DNA double-strand breaks can result from natural behaviors. The breaks occur in the circuits that are activated and are enhanced in a model of Alzheimer's disease. The implications of this finding are far-reaching.

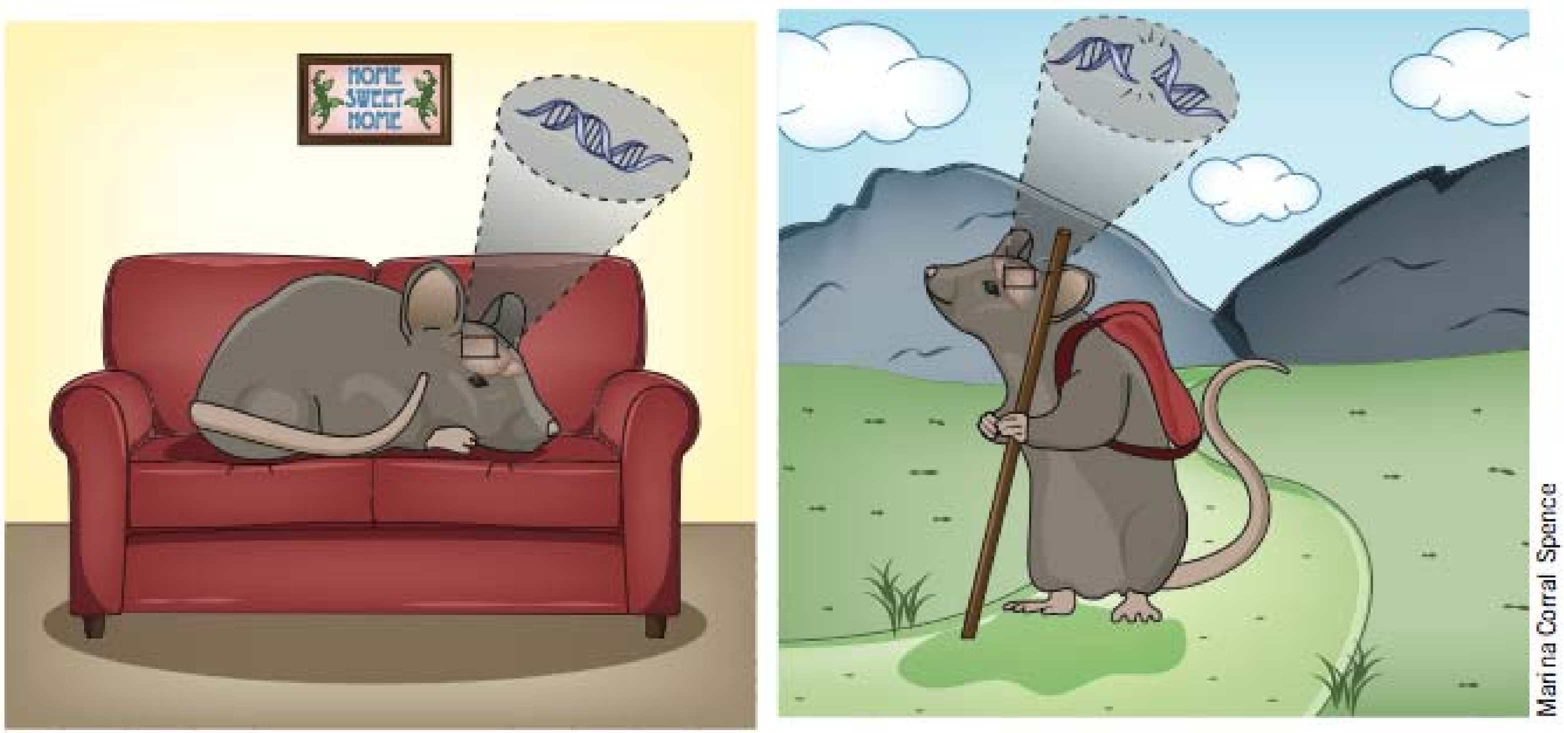
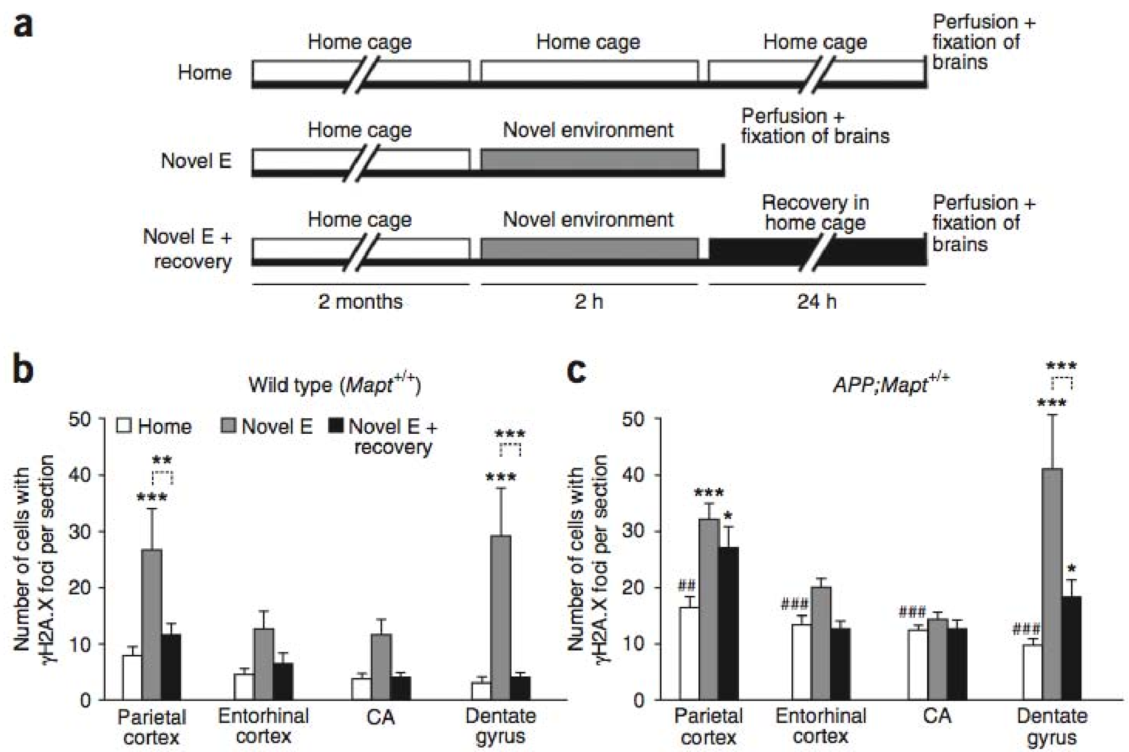


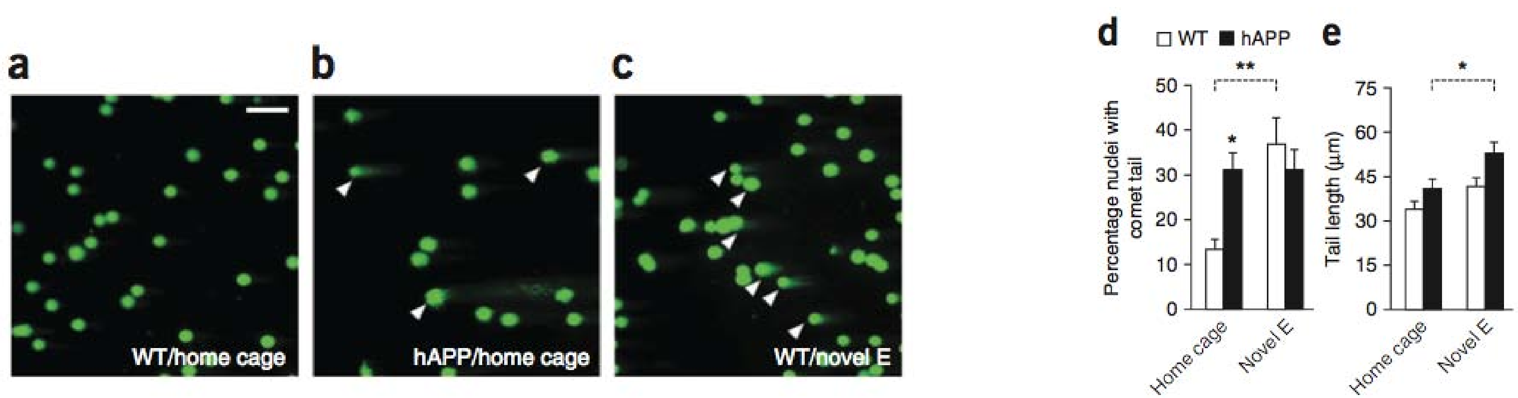
Figure 1 Giving your (neuronal) genome a break. The findings by Suberbielle *et al.*[1] suggest that while our neurons are at rest (left) their genomes are largely intact. However, during enhanced mental activity—either exploration (right) or other tasks—the number of DNA DSBs increases by twofold or more.

Physiologic brain activity causes DNA double-strand breaks in neurons, with exacerbation by amyloid-β

NATURE NEUROSCIENCE VOLUME 16 | NUMBER 5 | MAY 2013

Elsa Suberbielle[1,2], Pascal E Sanchez[1,2], Alexxai V Kravitz[1,2], Xin Wang[1], Kaitlyn Ho[1], Kirsten Eilertson[3], Nino Devidze[1], Anatol C Kreitzer[1,2] & Lennart Mucke[1,2]

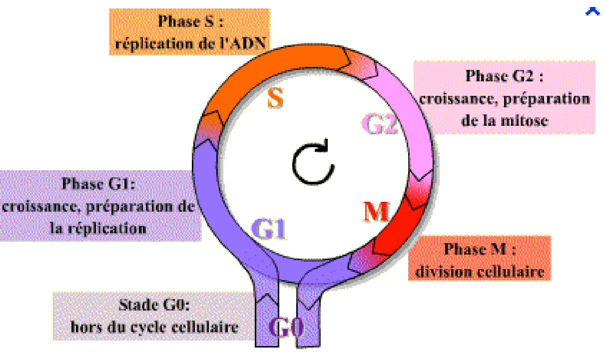


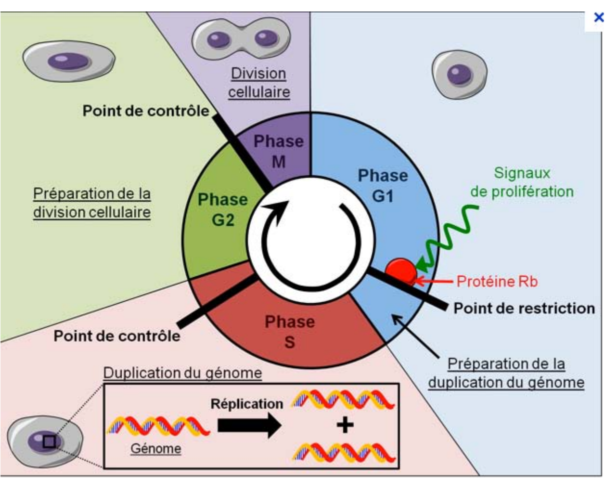


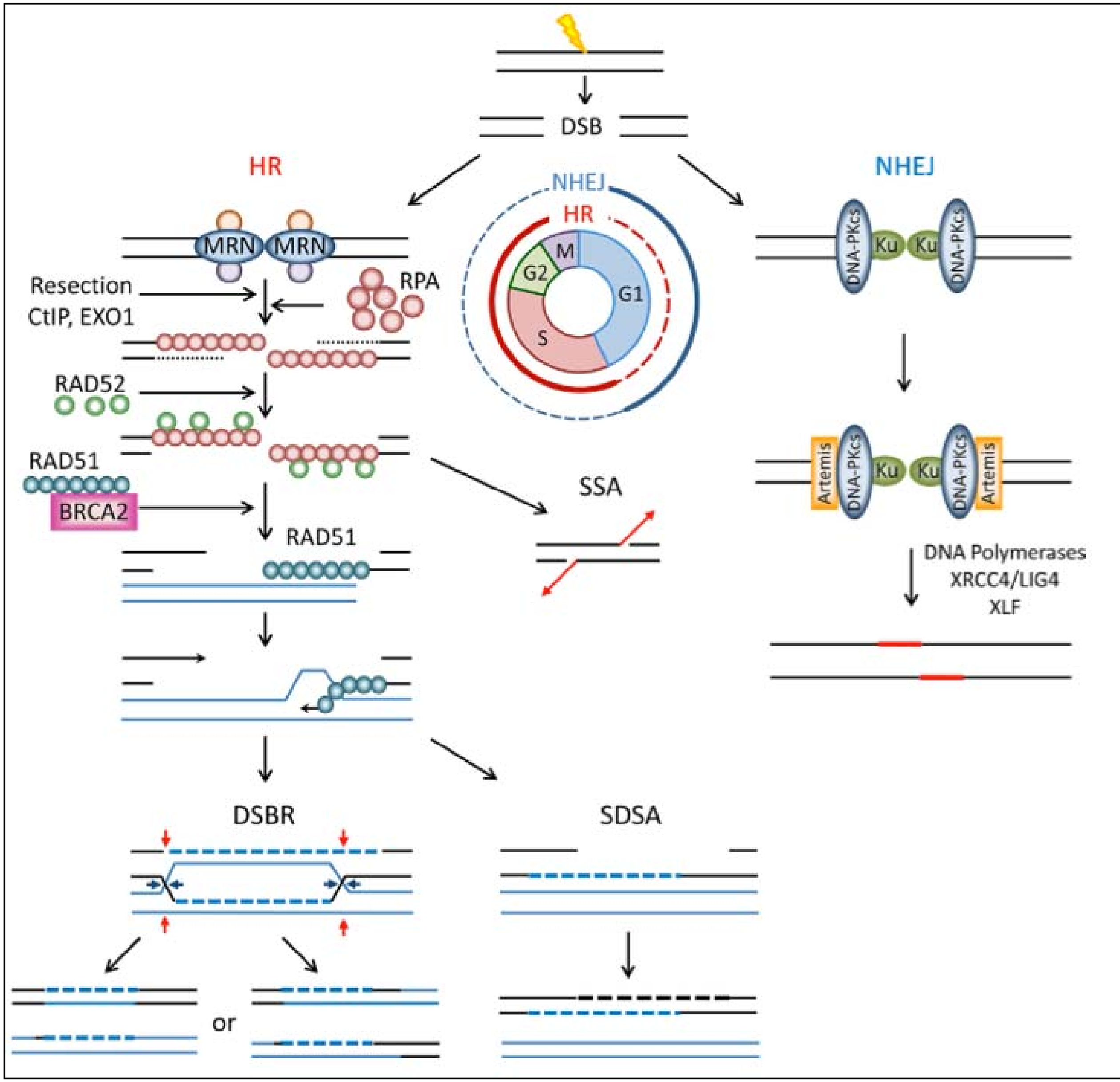
DNA strand break repair and neurodegeneration

Stuart L. Rulten*, Keith W. Caldecott**

DNA Repair 12 (2013) 558–567







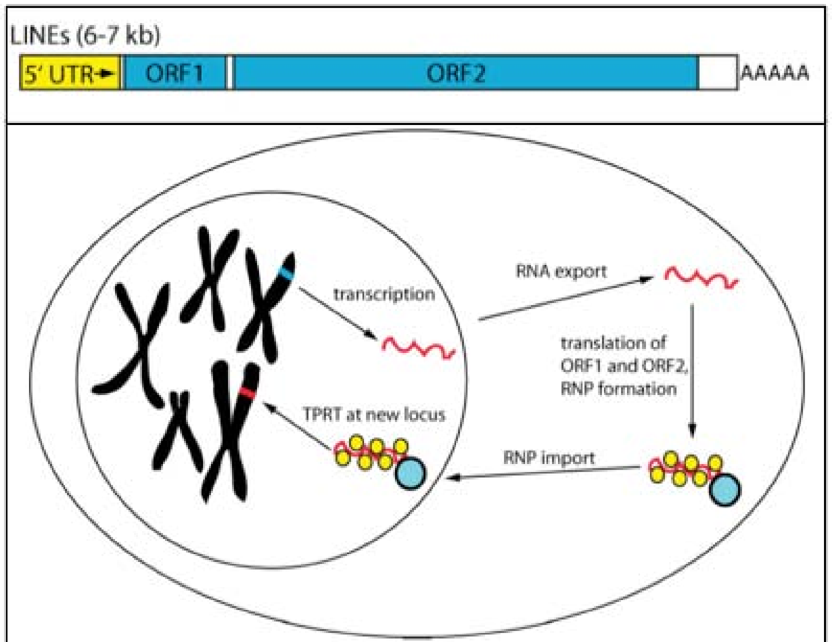
Somatic expression of LINE-1 elements in human tissues

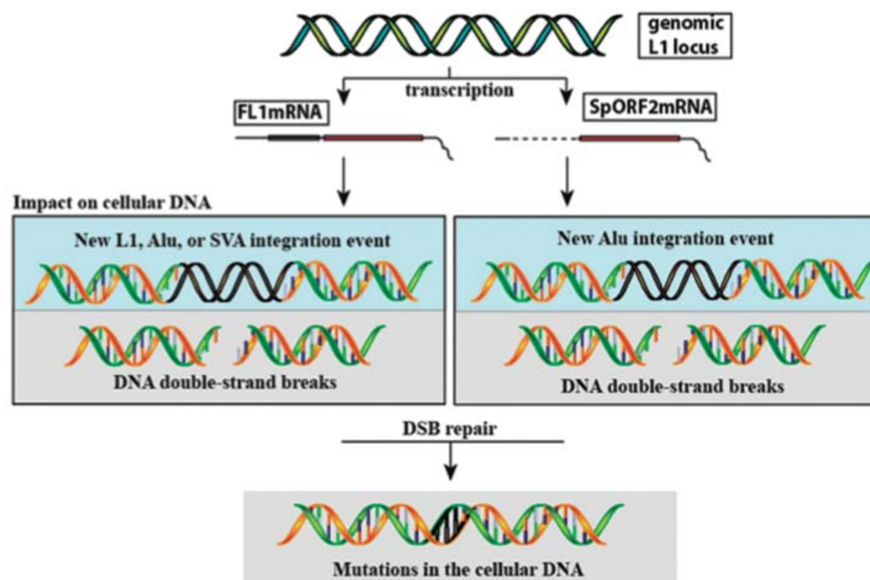
Belancio VP, Roy-Engel AM, Pochampally RR, Deininger P

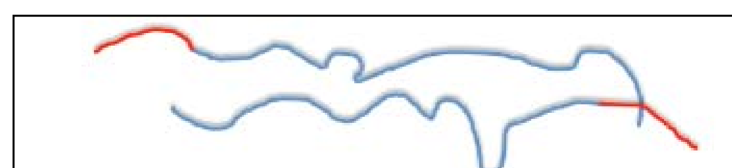
Nucleic Acids Research
2010 vol. 38 (12) pp. 3909-22

LINE-1 retrotransposons: modulators of quantity and quality of mammalian gene expression?

Jeffrey S. Han and Jef D. Boeke* BioEssays 27:775–784, © 2005



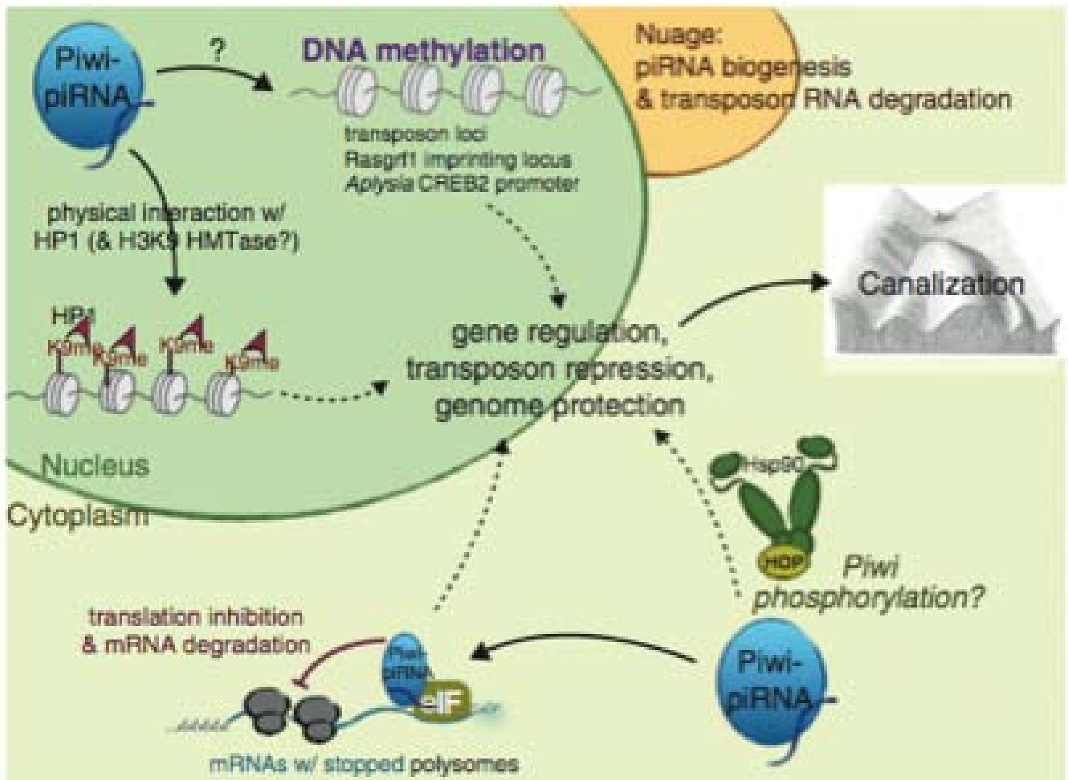




Beyond transposons: the epigenetic and somatic functions of the Piwi-piRNA mechanism

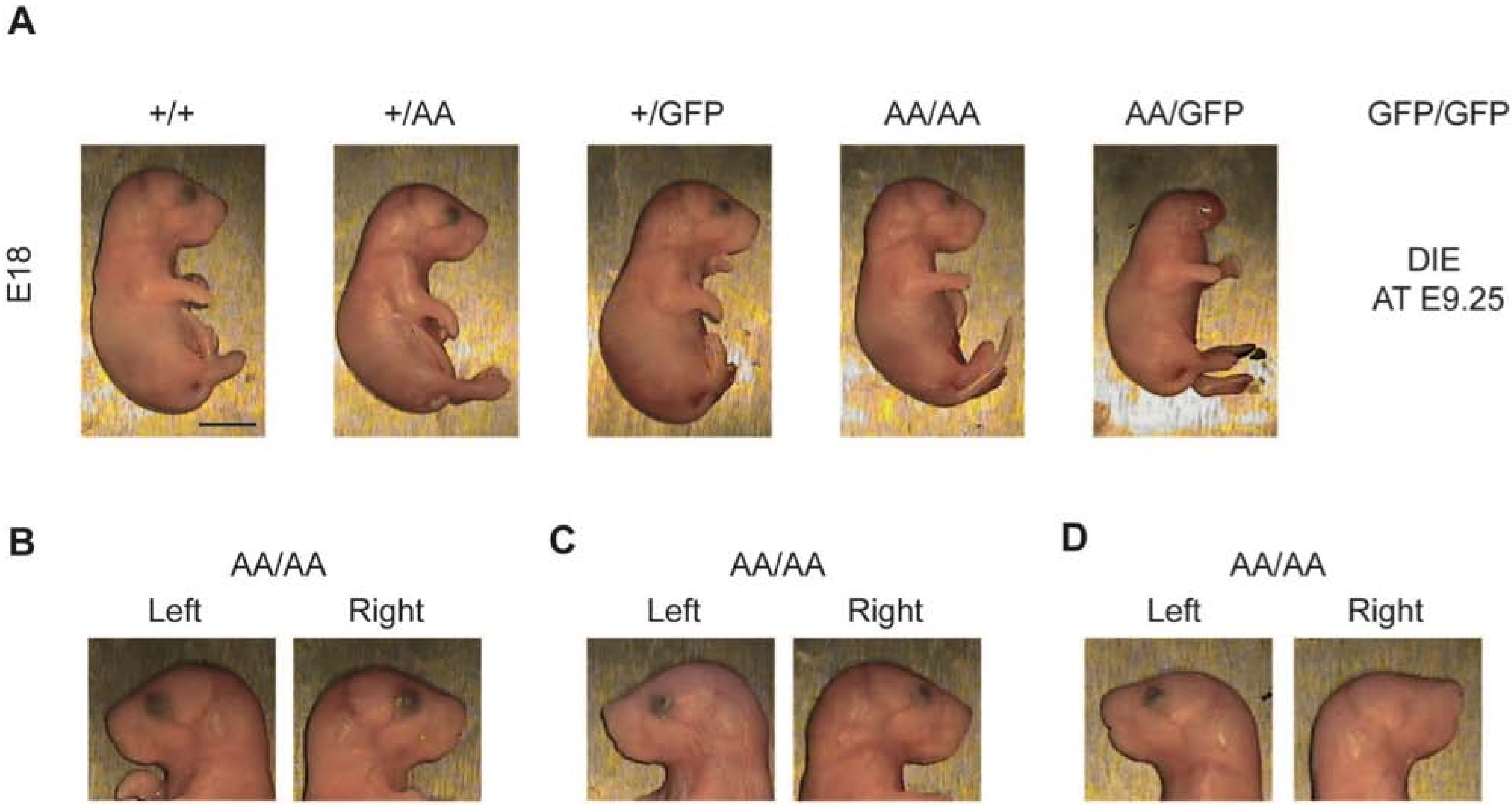
Current Opinion in Cell Biology
2013 vol. 25 (2) pp. 190-4

Peng JC, Lin H



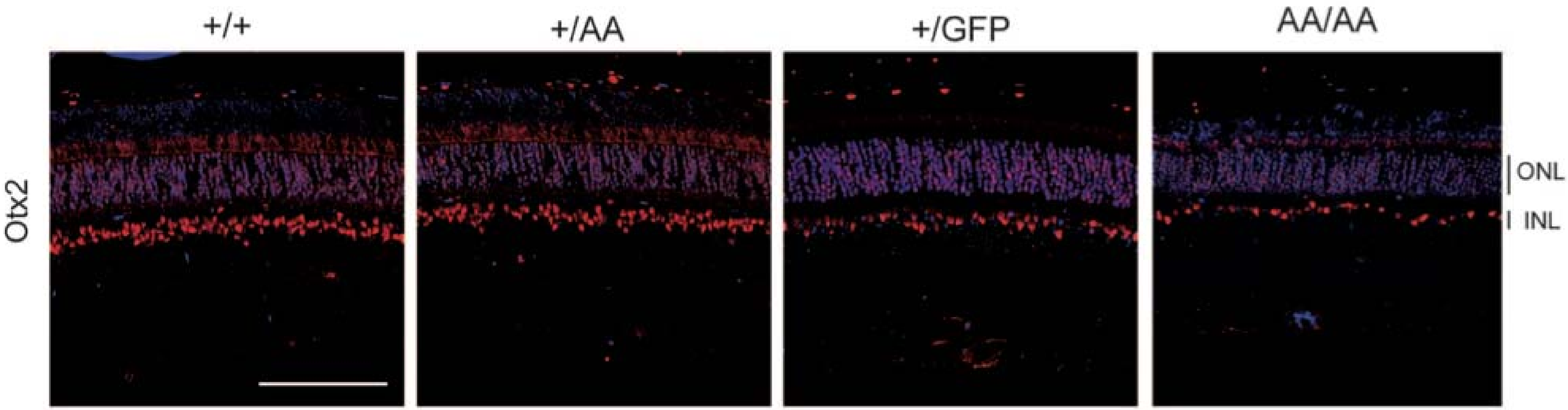
Graded Otx2 activities demonstrate dose-sensitive eye and retina phenotypes

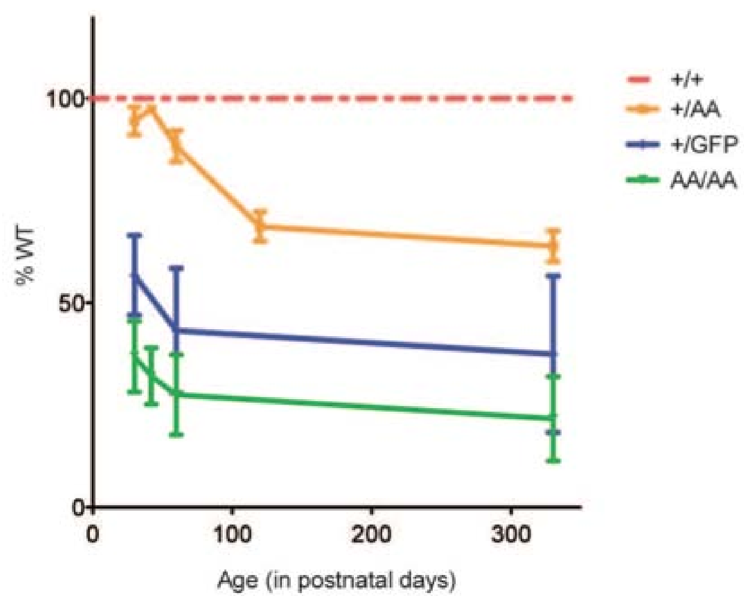
Bernard et al. Human Molecular Genetics, in press



Graded Otx2 activities demonstrate dose-sensitive eye and retina phenotypes

Bernard et al. Human Molecular Genetics, in press

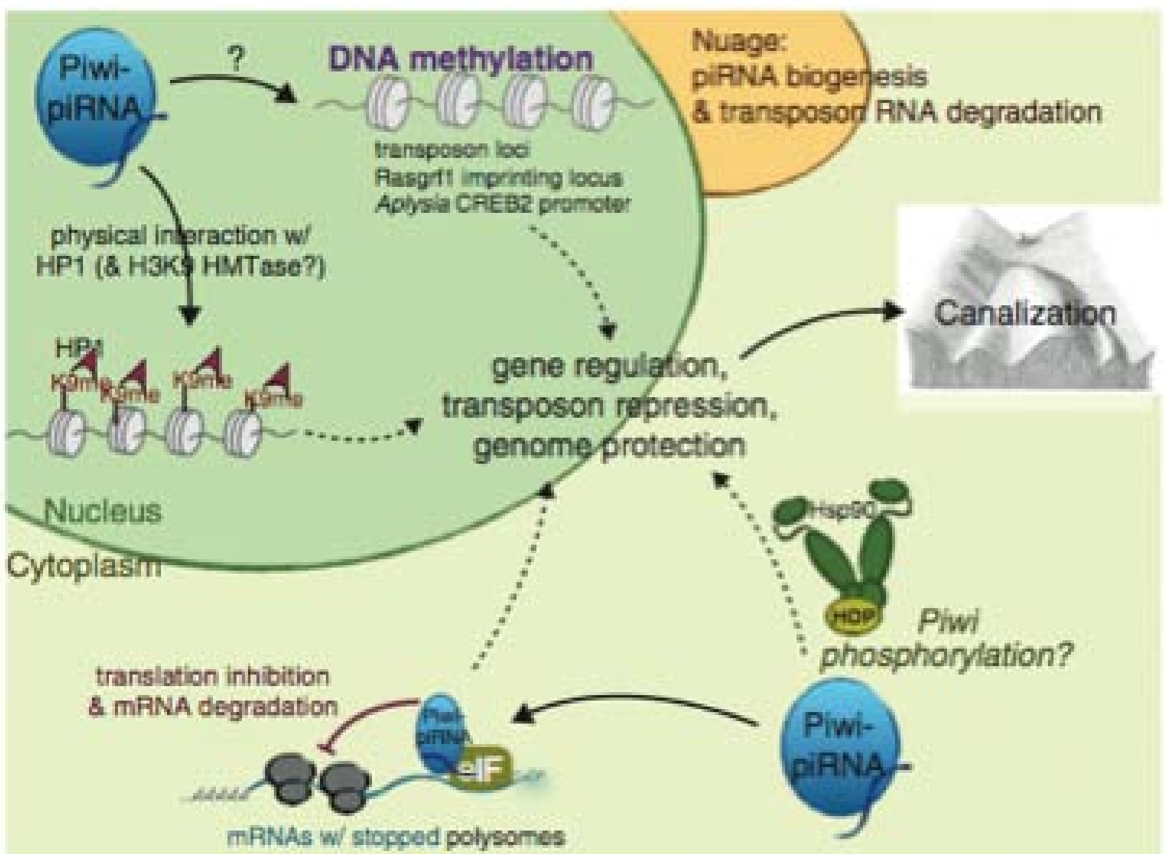




Beyond transposons: the epigenetic and somatic functions of the Piwi-piRNA mechanism

Peng JC, Lin H

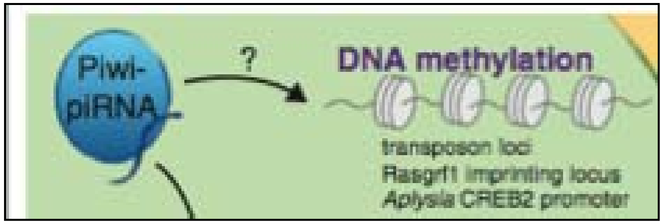
Current Opinion in Cell Biology
2013 vol. 25 (2) pp. 190-4

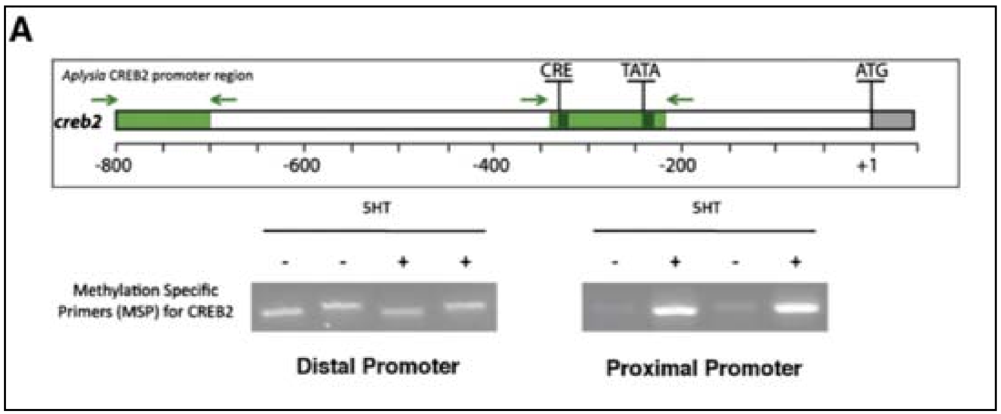


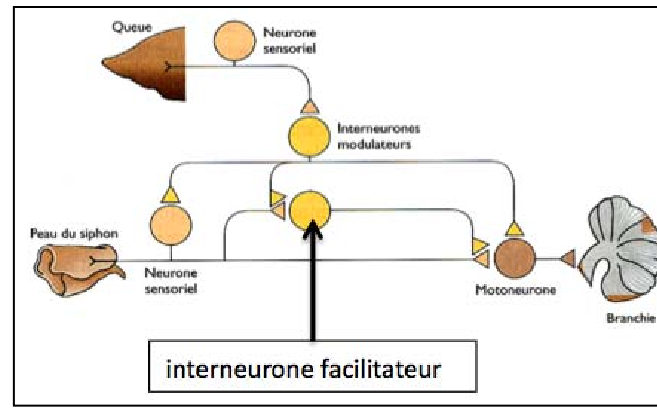
A Role for Neuronal piRNAs in the Epigenetic Control of Memory-Related Synaptic Plasticity

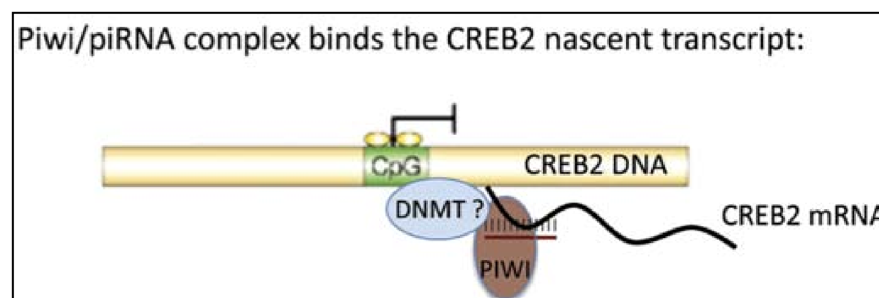
Rajasethupathy P, Antonov I, Sheridan R, Frey S, Sander C, Tuschl T, Kandel ER

Cell
2012 vol. 149 (3) pp. 693-707





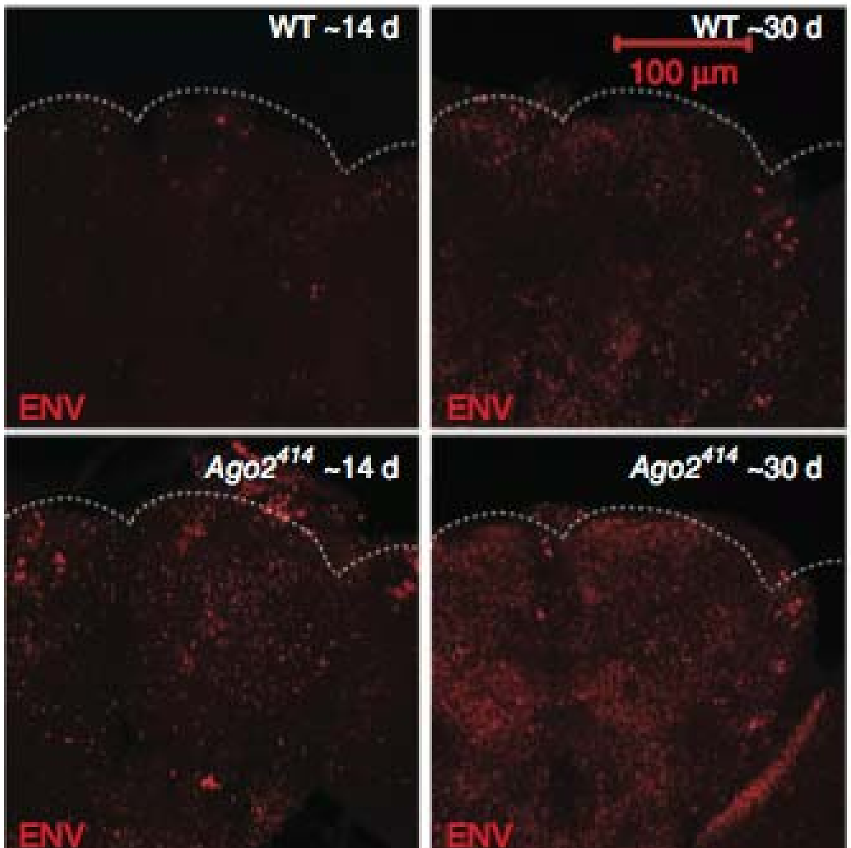




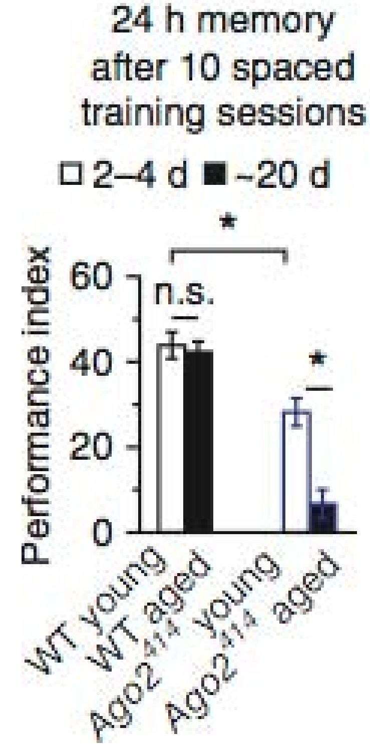
Activation of transposable elements during aging and neuronal decline in Drosophila

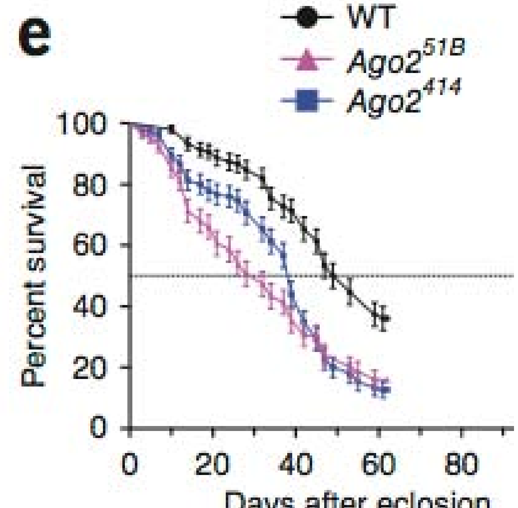
Li W, Prazak L, Chatterjee N, Grüninger S, Krug L, Theodorou D, Dubnau J

Nat Neurosci
2013 vol. 16 (5) pp. 529-31



Expression de ENV de l'élément transposable Gipsy (mutation Argonaute)





The Hallmarks of Aging

Cell 153, June 6, 2013 ©2013 Elsevier Inc.

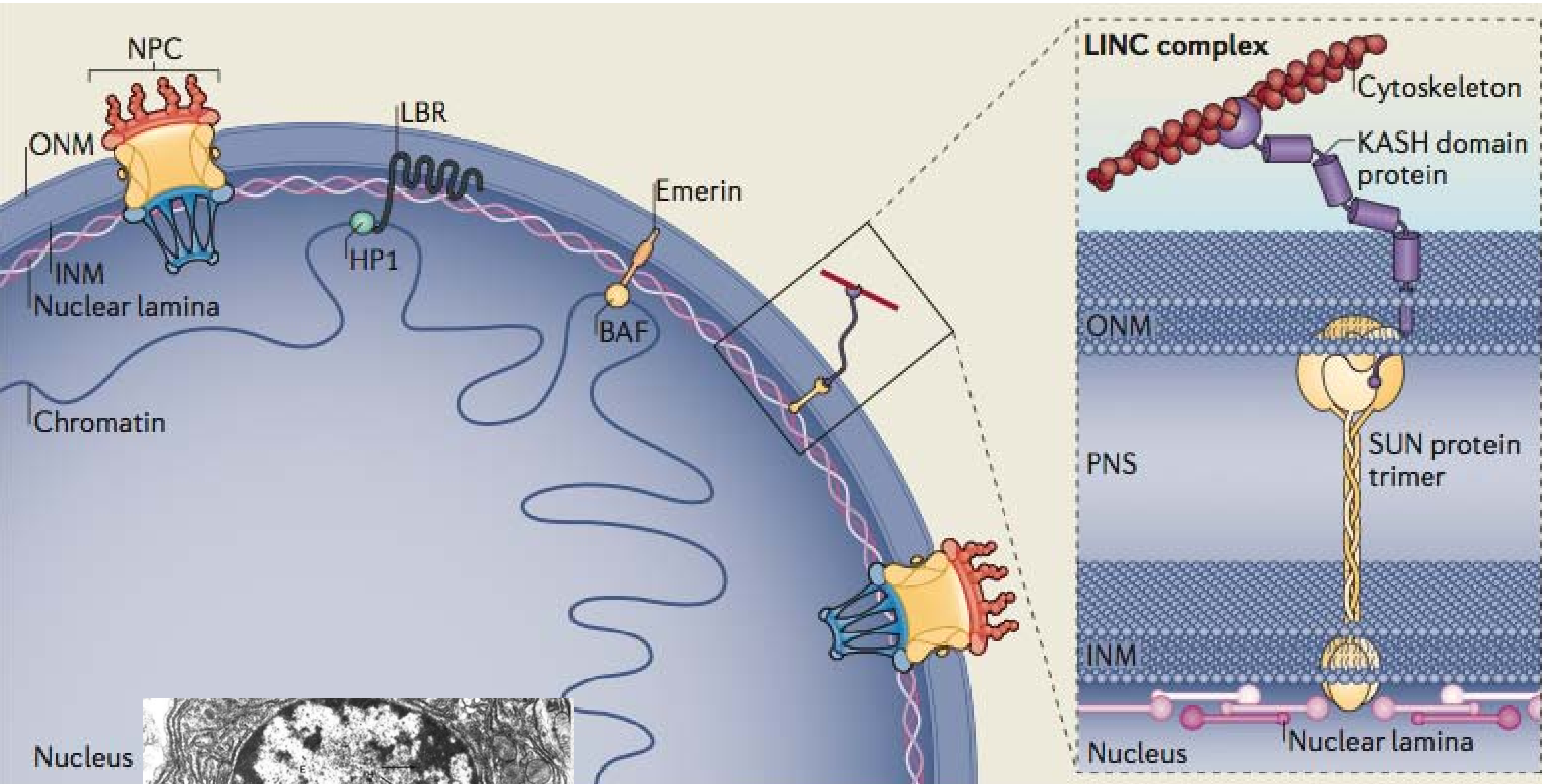
Carlos López-Otín,[1] Maria A. Blasco,[2] Linda Partridge,[3,4] Manuel Serrano,[5,*] and Guido Kroemer[6,7,8,9,10]

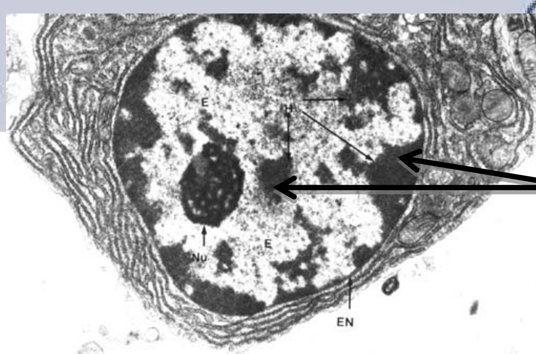
The nuclear lamins: flexibility in function

Nat Rev Mol Cell Biol
2013 vol. 14 (1) pp. 13-24

Burke B, Stewart CL

Institute of Medical Biology, 8A Biomedical Grove, Immunos 06-06, Singapore
138648. Brian.Burke@ imb.a-star.edu.sg



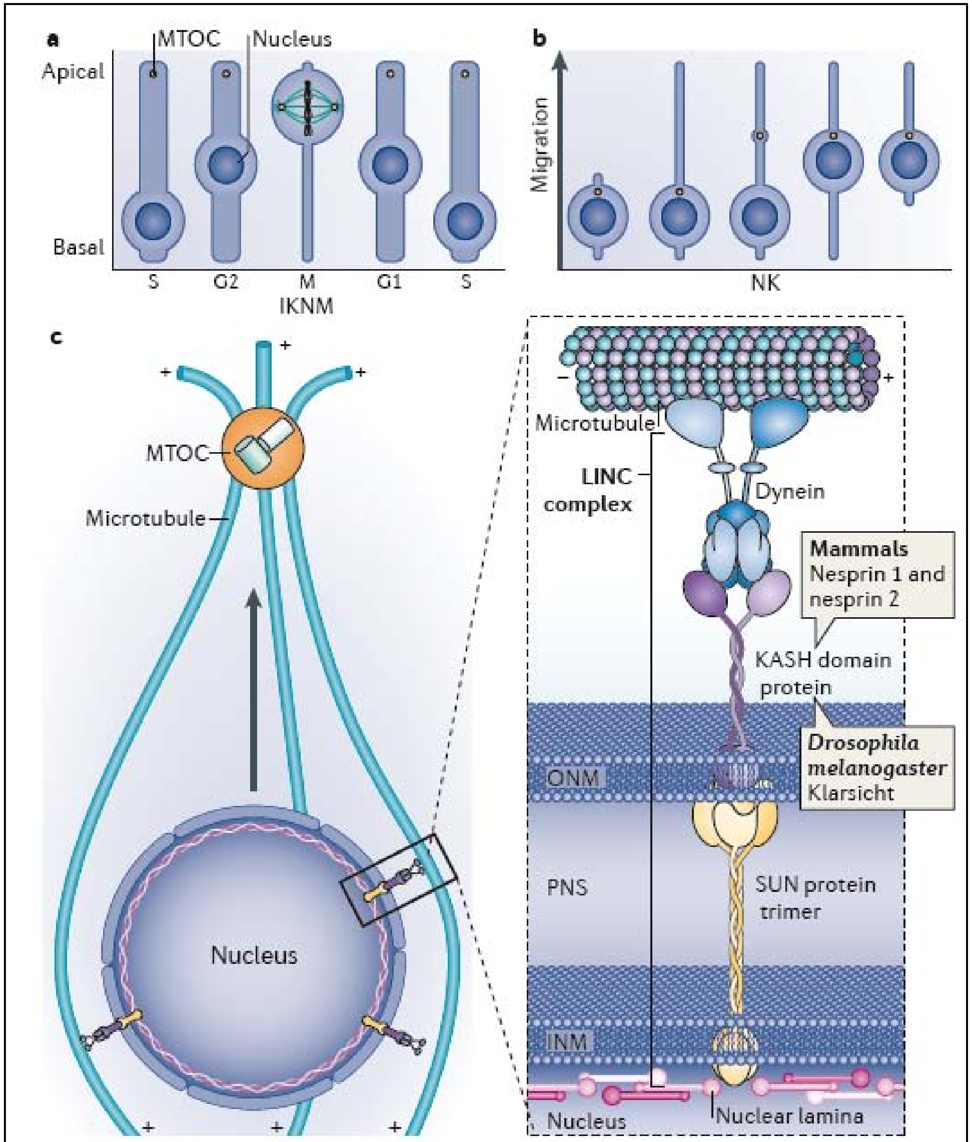


[redacted]

The nuclear lamins: flexibility in function

VOLUME 14 | JANUARY 2013 |
NATURE REVIEWS | MOLECULAR CELL BIOLOGY

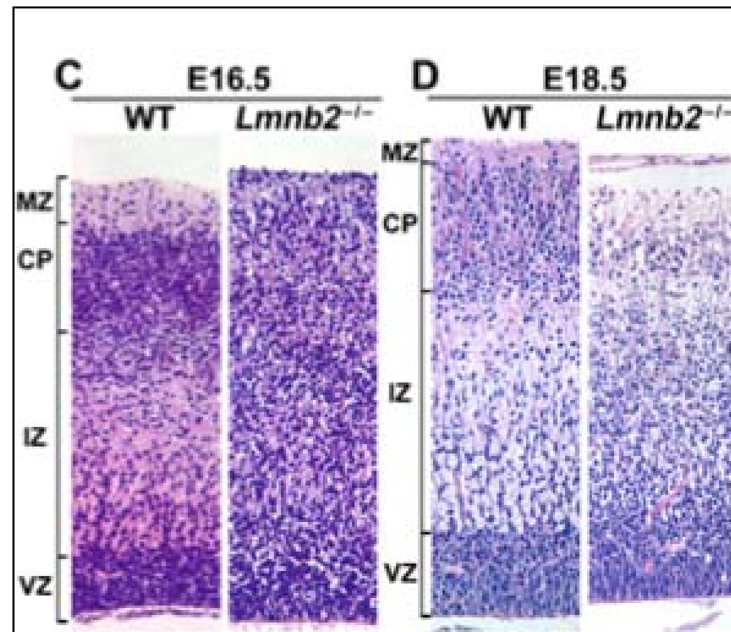
Brian Burke and Colin L. Stewart



Abnormal development of the cerebral cortex and cerebellum in the setting of lamin B2 deficiency

Coffinier C, Chang SY, Nobumori C, Tu Y, Farber EA, Toth JI, Fong LG, Young SG

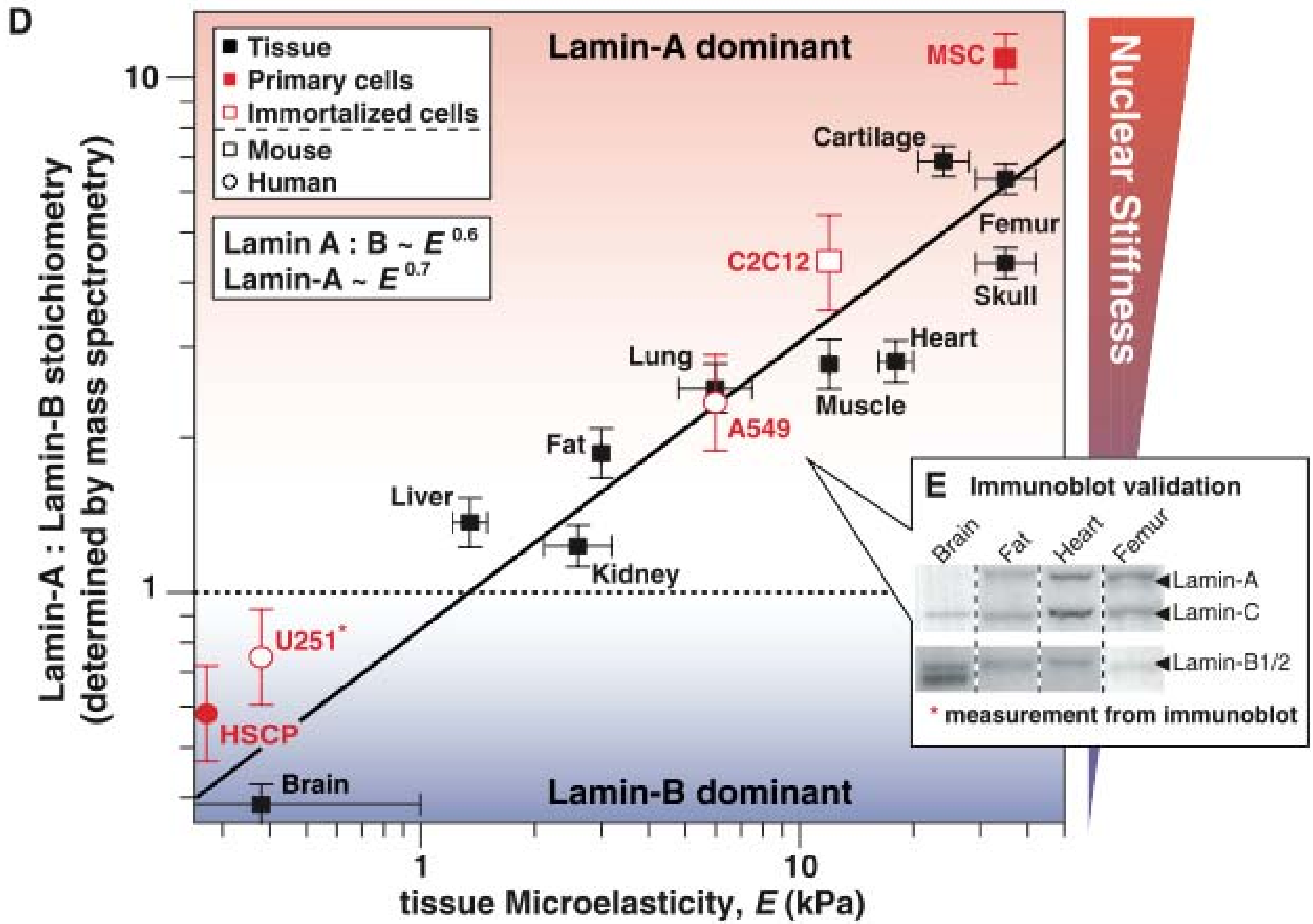
Proc Natl Acad Sci USA
2010 vol. 107 (11) pp. 5076-81



Nuclear lamin-A scales with tissue stiffness and enhances matrix-directed differentiation

Science
2013 vol. 341 (6149) pp. 1240104

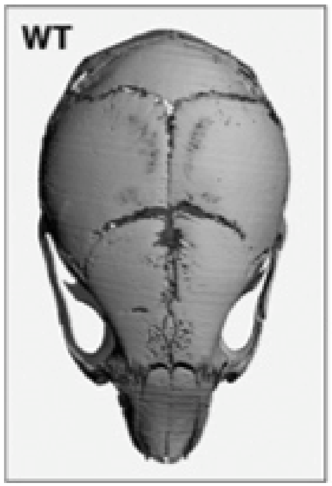
Swift J, Ivanovska IL, Buxboim A, Harada T, Dingal PC, Pinter J, Pajerowski JD, Spinler KR, Shin JW, Tewari M, Rehfeldt F, Speicher DW, Discher DE

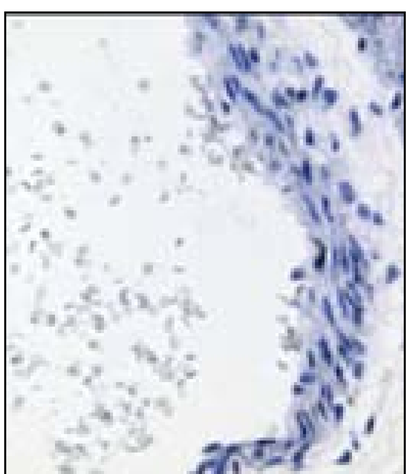


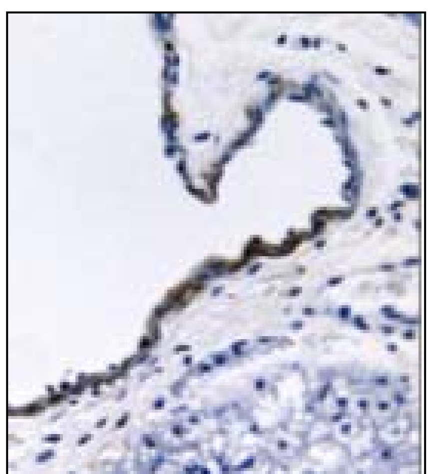
Functional Coupling between the Extracellular Matrix and Nuclear Lamina by Wnt Signaling in Progeria

Developmental Cell 19, 413–425, September 14, 2010 ©2010 Elsevier Inc. 413

Lidia Hernandez,[1,3,8] Kyle J. Roux,[4,8] Esther Sook Miin Wong,[5,8] Leslie C. Mounkes,[1] Rafidah Mutalif,[5] Raju Navasankari,[4,5] Bina Rai,[5] Simon Cool,[5] Jae-Wook Jeong,[6] Honghe Wang,[1] Hyun-Shik Lee,[2,9] Serguei Kozlov,[1] Martin Grunert,[5] Thomas Keeble,[5] C. Michael Jones,[5] Margarita D. Meta,[7] Stephen G. Young,[7] Ira O. Daar,[2] Brian Burke,[4] Alan O. Perantoni,[1] and Colin L. Stewart[1,5,*]







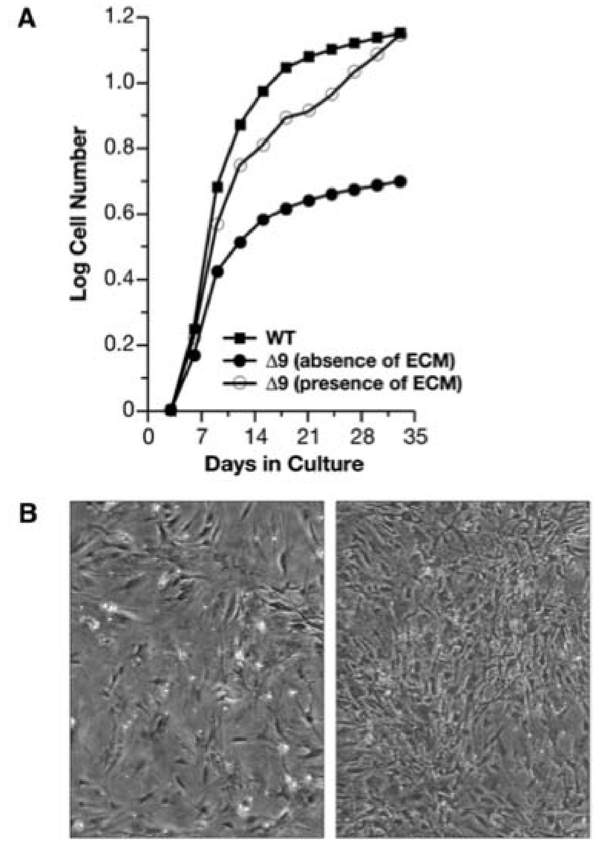


Figure 4. Δ9MAF Growth Is Rescued by WT Extracellular Matrix

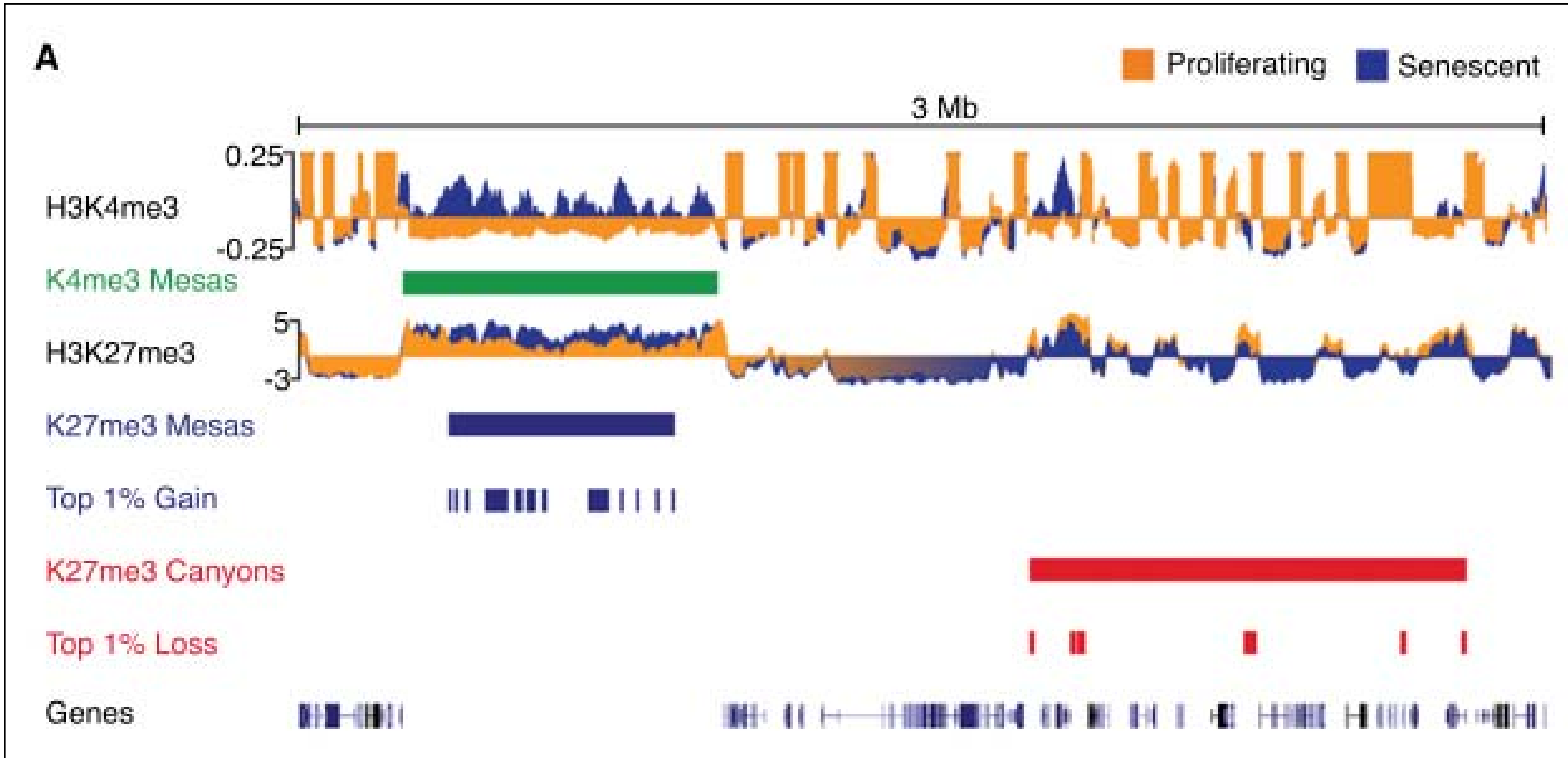
(A) Growth curves of WT MAFs and of Δ9MAFs in the presence or absence of WT MAF ECM.

(B) Left panel Δ9MAFS at p4 with no ECM; right panel Δ9MAFs on ECM. Growth of Δ9MAFs on specific ECM components or with FTIs is shown in Figures S3A and S3B.

Lamin B1 depletion in senescent cells triggers large-scale changes in gene expression and the chromatin landscape

Parisha P. Shah, Greg Donahue, Gabriel L. Otte, et al.

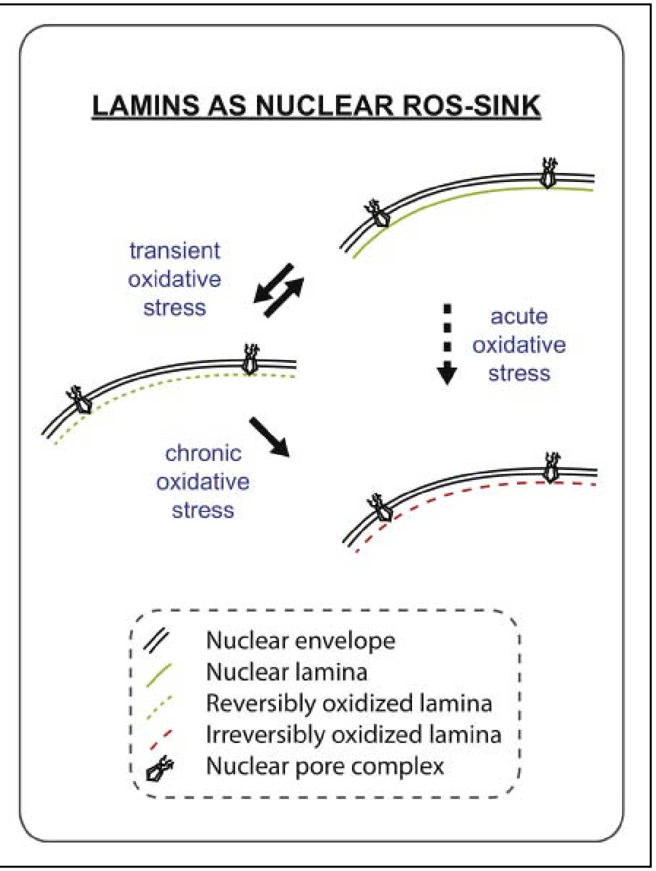
Genes Dev. 2013 27: 1787-1799 originally published online August 9, 2013
Access the most recent version at doi:10.1101/gad.223834.113

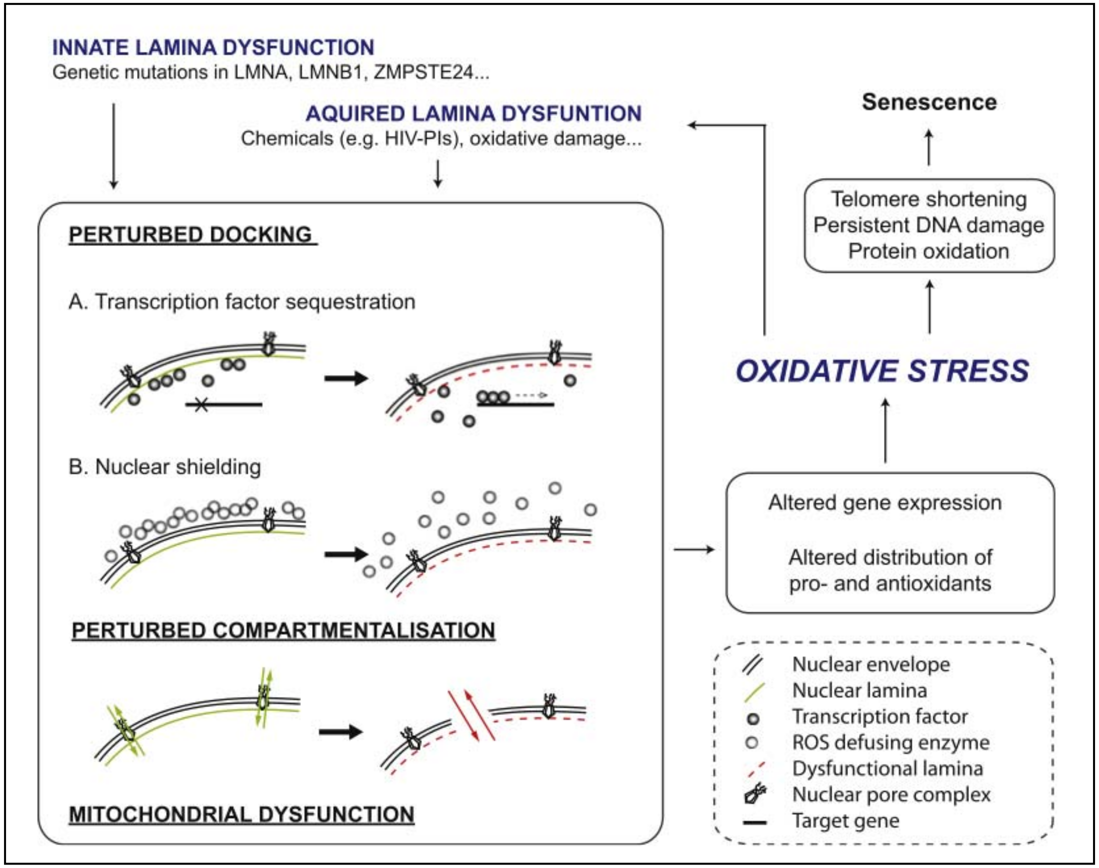


Lamins as mediators of oxidative stress

Biochemical and Biophysical Research Communications 421 (2012) 635–639

Tom Sieprath[a,1], Rabih Darwiche[a,1], Winnok H. De Vos[a,b,*]

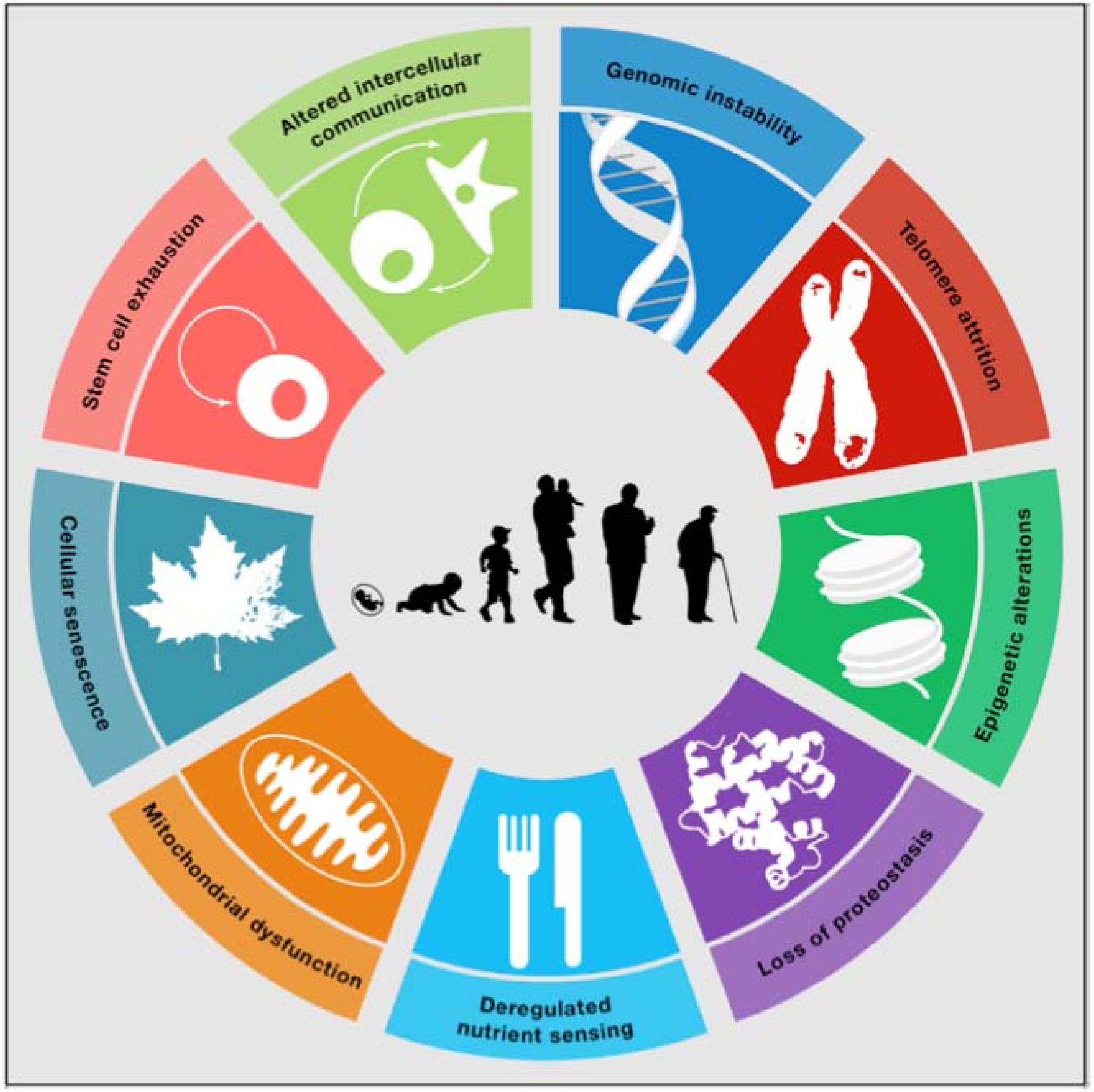




The Hallmarks of Aging

Cell 153, June 6, 2013 ©2013 Elsevier Inc.

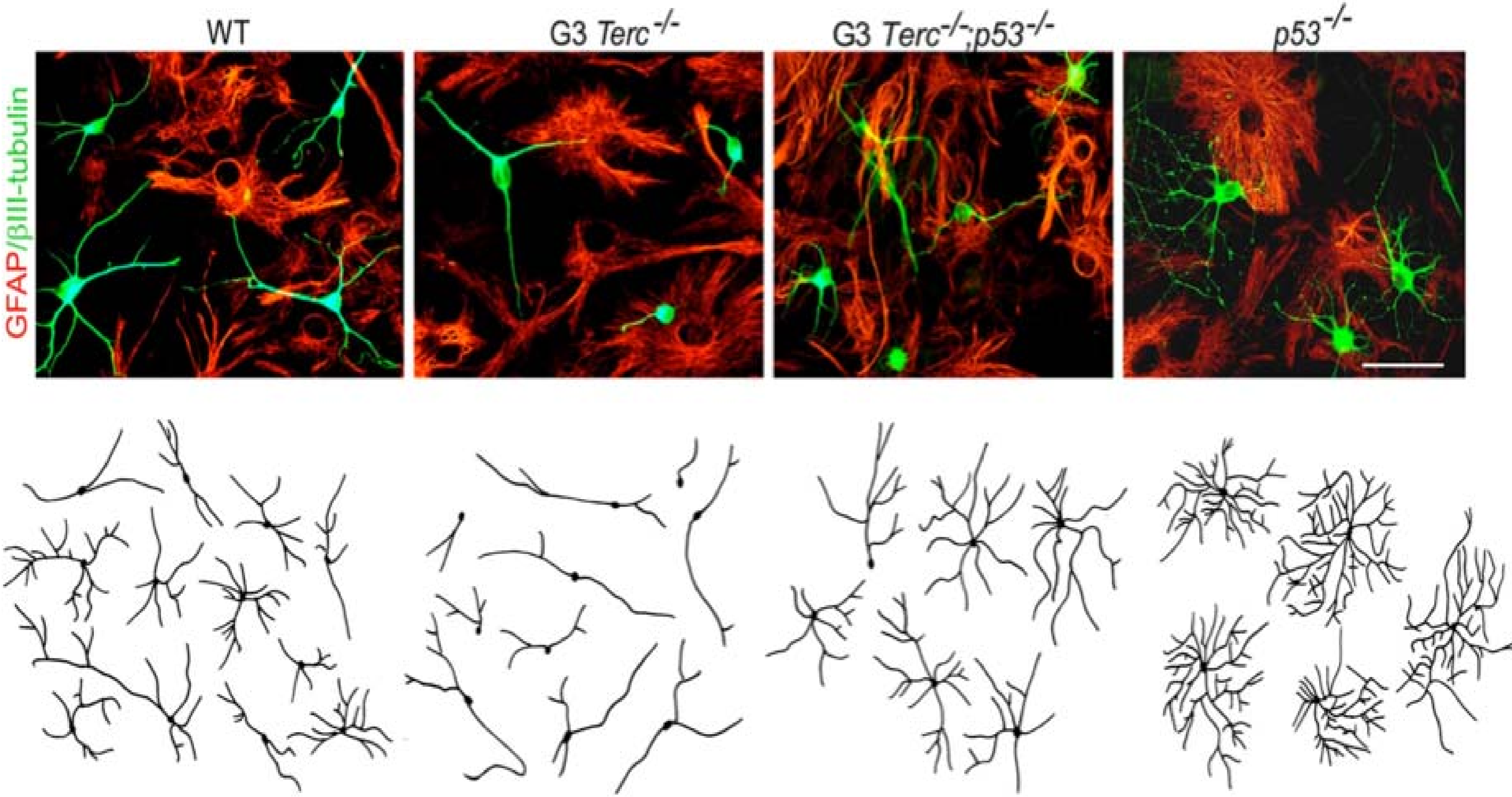
Carlos López-Otín,[1] Maria A. Blasco,[2] Linda Partridge,[3,4] Manuel Serrano,[5,*] and Guido Kroemer[6,7,8,9,10]



Telomere shortening in neural stem cells disrupts neuronal differentiation and neuritogenesis

J Neurosci
2009 vol. 29 (46) pp. 14394-407

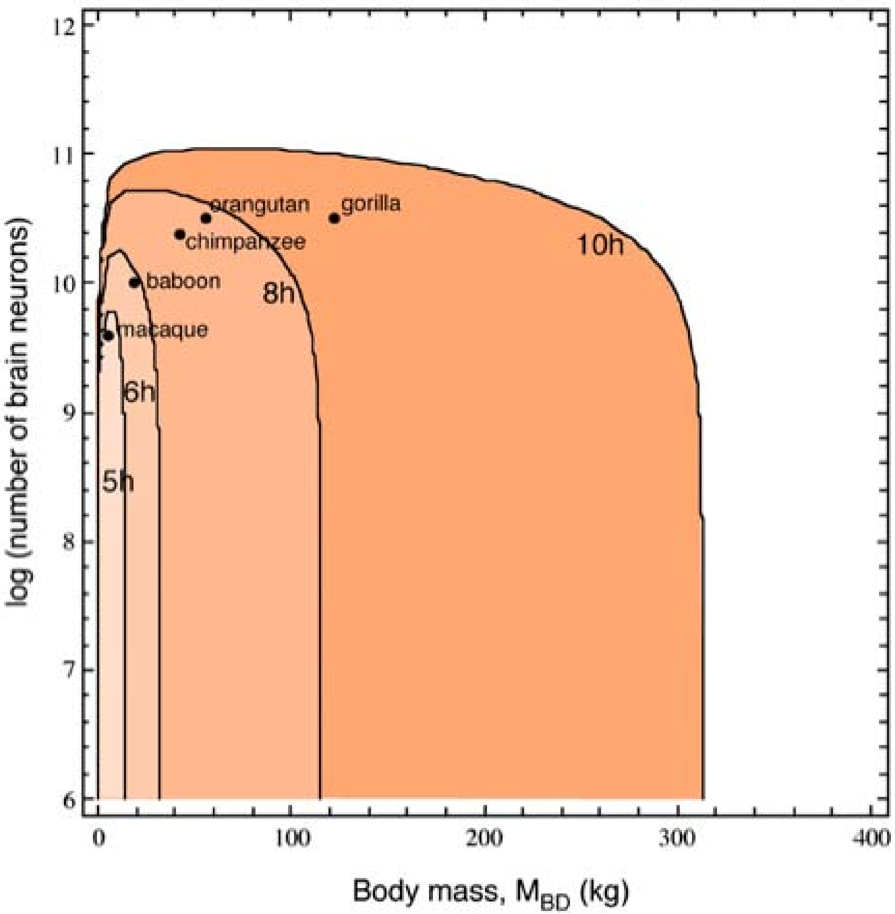
Ferrón SR, Marqués-Torrejón MA, Mira H, Flores I, Taylor K, Blasco MA, Fariñas I

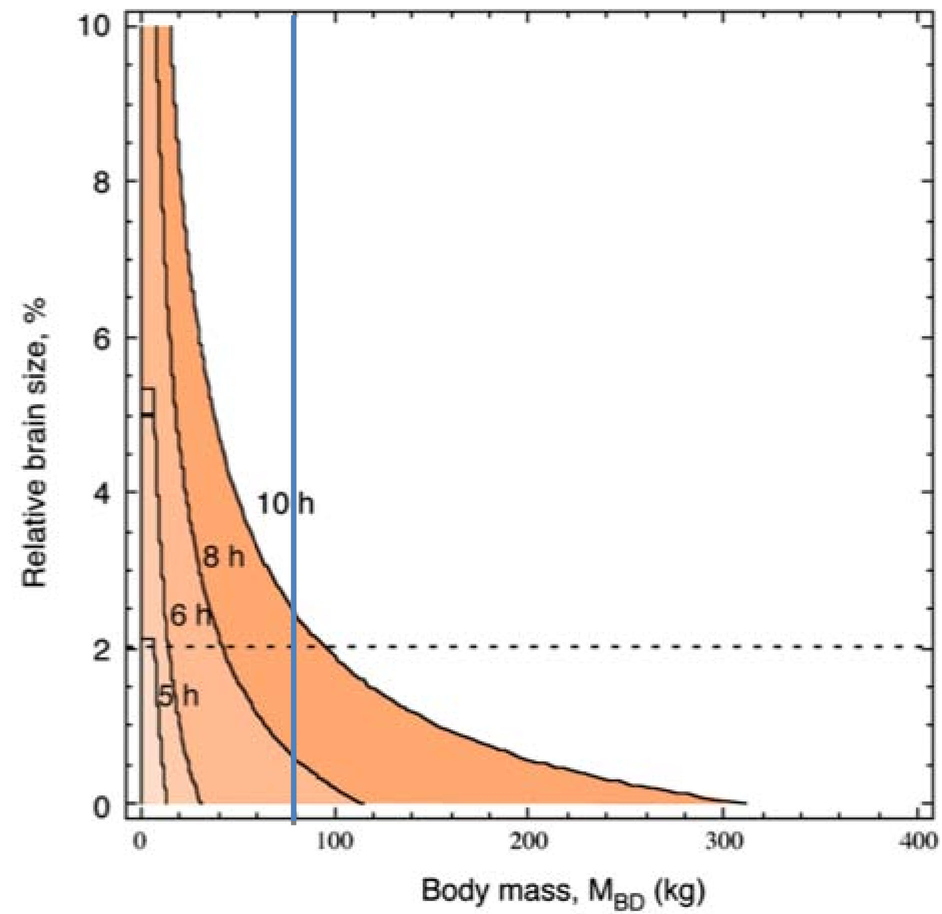


Metabolic constraint imposes tradeoff between body size and number of brain neurons in human evolution

Fonseca-Azevedo K, Herculano-Houzel S

Proc Natl Acad Sci USA
2012 vol. 109 (45) pp. 18571-6

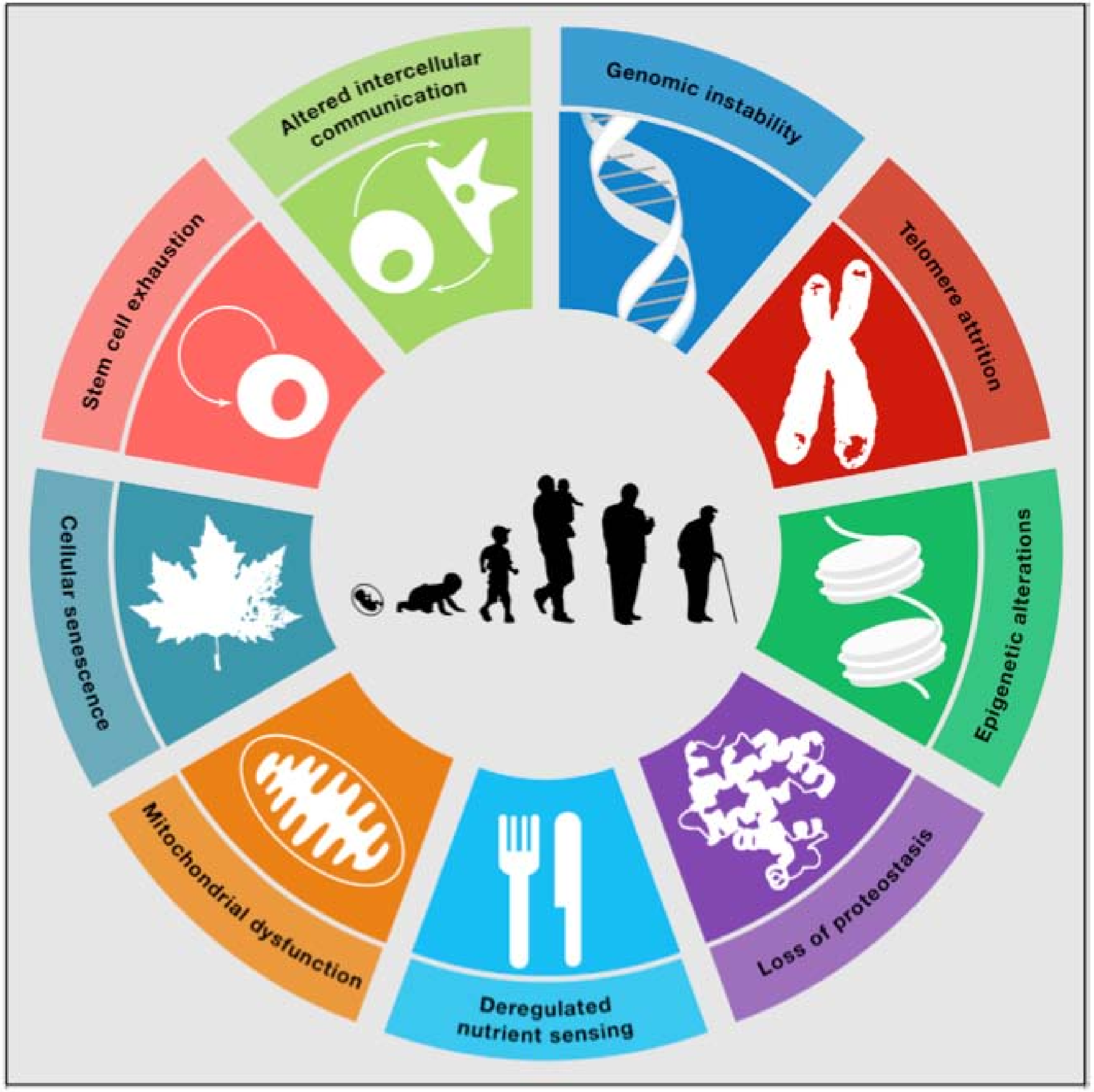




The Hallmarks of Aging

Cell 153, June 6, 2013 ©2013 Elsevier Inc.

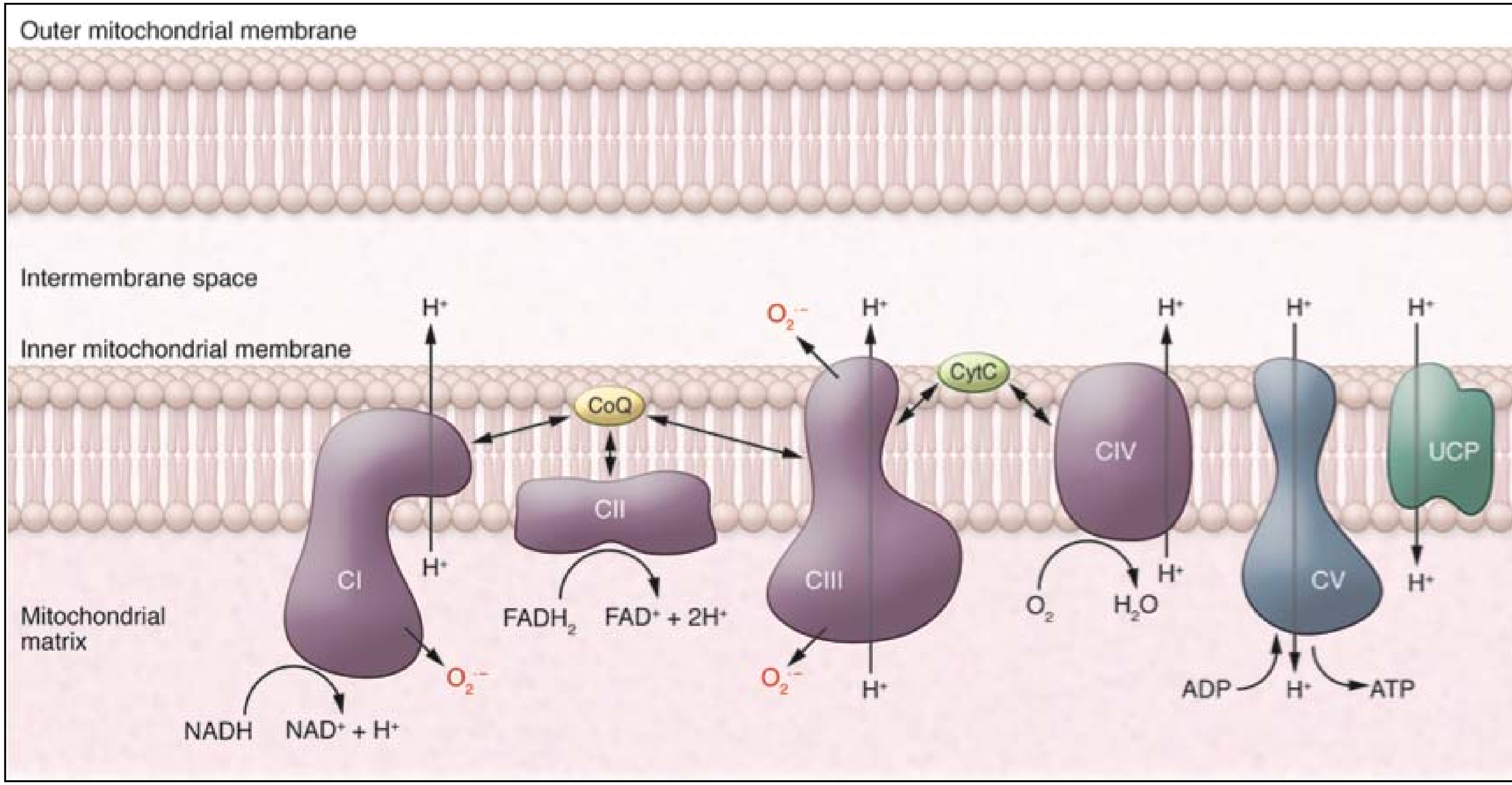
Carlos López-Otín,[1] Maria A. Blasco,[2] Linda Partridge,[3,4] Manuel Serrano,[5,*] and Guido Kroemer[6,7,8,9,10]

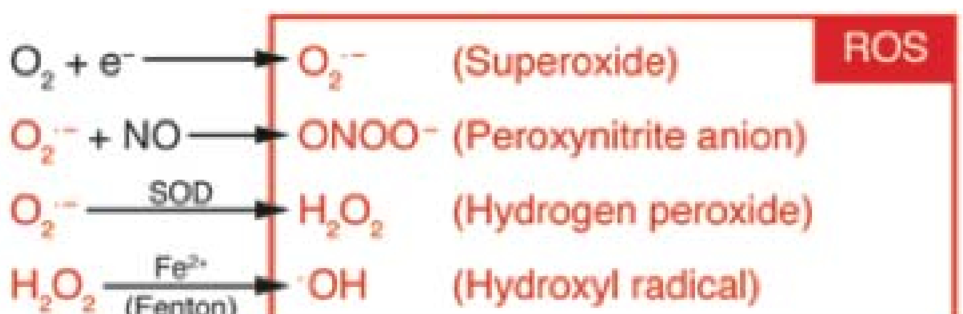


The role of mitochondria in aging

J Clin Invest
2013 vol. 123 (3) pp. 951-7

Bratic A, Larsson N

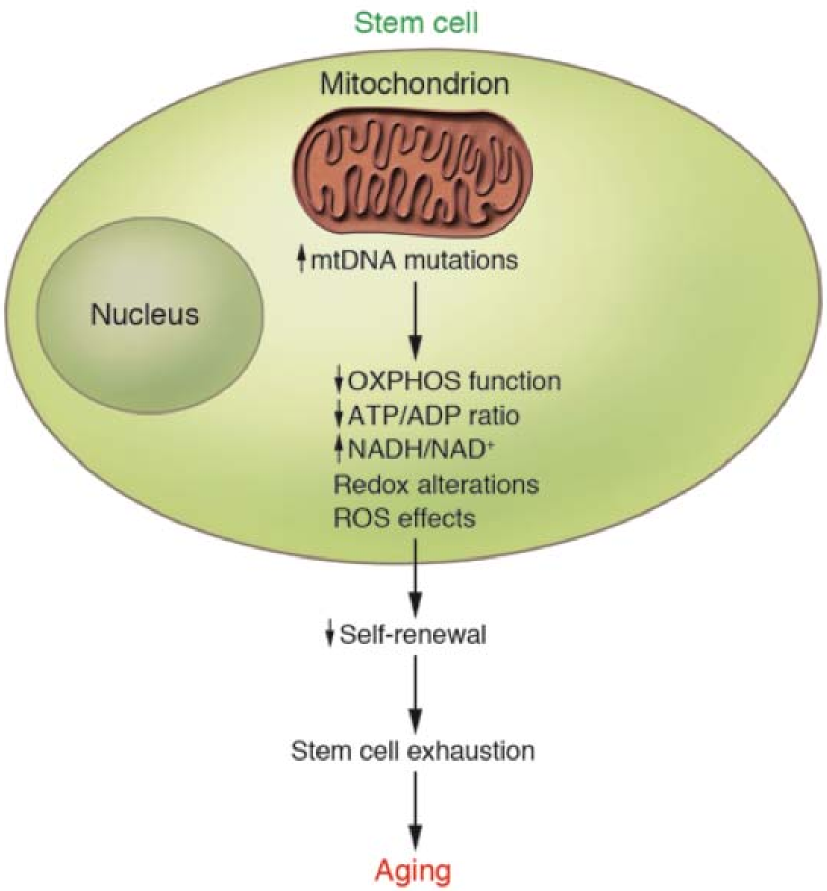




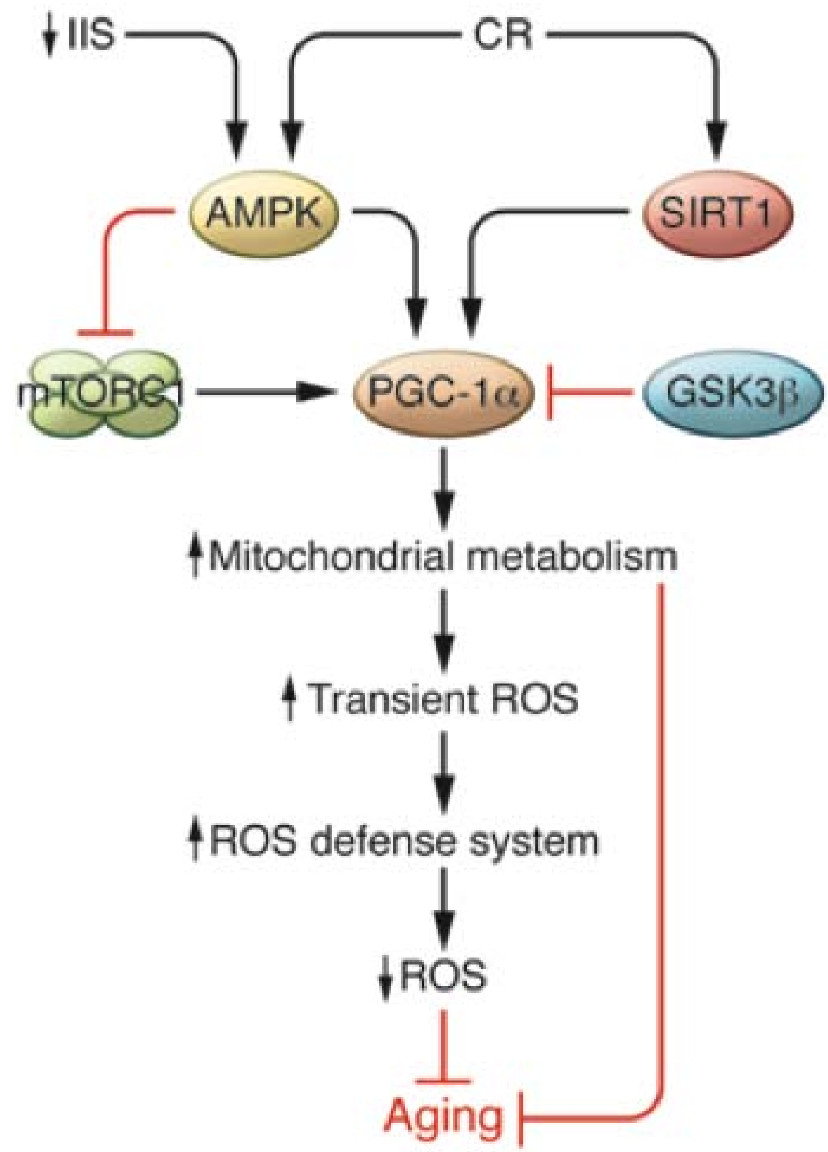
The role of mitochondria in aging

Bratic A, Larsson N

J Clin Invest
2013 vol. 123 (3) pp. 951-7



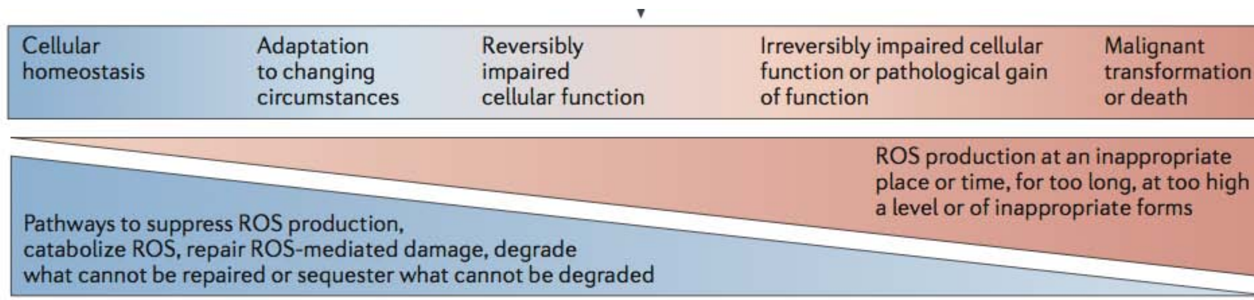
nutrient sensing calory restiction



Beyond oxidative stress: an immunologist's guide to reactive oxygen species

Nathan C, Cunningham-Bussel A

Nat Rev Immunol
2013 vol. 13 (5) pp. 349-61



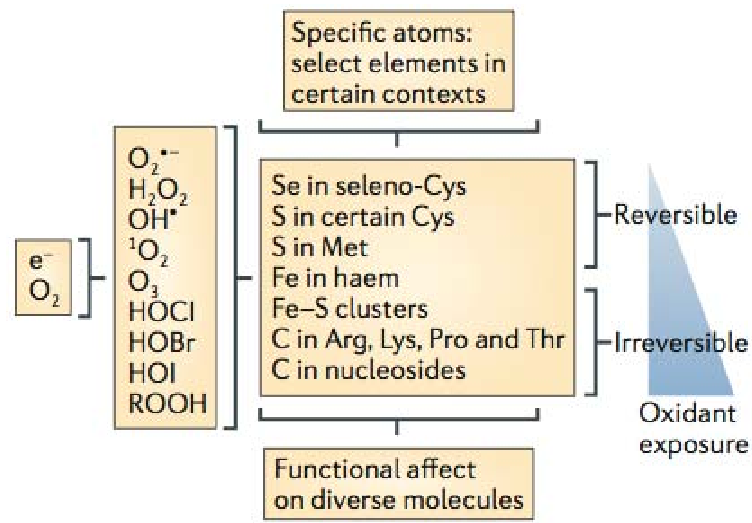
Box 1 | Sources of ROS and mediators of their catabolism

Exogenous sources of ROS
- Smoke
- Air pollutants
- Ultraviolet radiation
- γ-irradiation
- Several drugs

Endogenous sources of ROS
- NADPH oxidases
- Mitochondria
- ER flavoenzyme ERO1
- Xanthine oxidase
- Lipoxygenases
- Cyclooxygenases
- Cytochrome P450 enzymes
- Flavin-dependent demethylase
- Polyamine and amino acid oxidases
- Nitric oxide synthases
- Free iron or copper ions
- Haem groups
- Metal storage proteins

Catabolism by antioxidant systems
- Superoxide dismutases
- Catalases
- Glutathione peroxidases
- Glutathione reductase
- Thioredoxins
- Thioredoxin reductases
- Methionine sulphoxide reductases
- Peroxiredoxins or peroxynitrite reductases

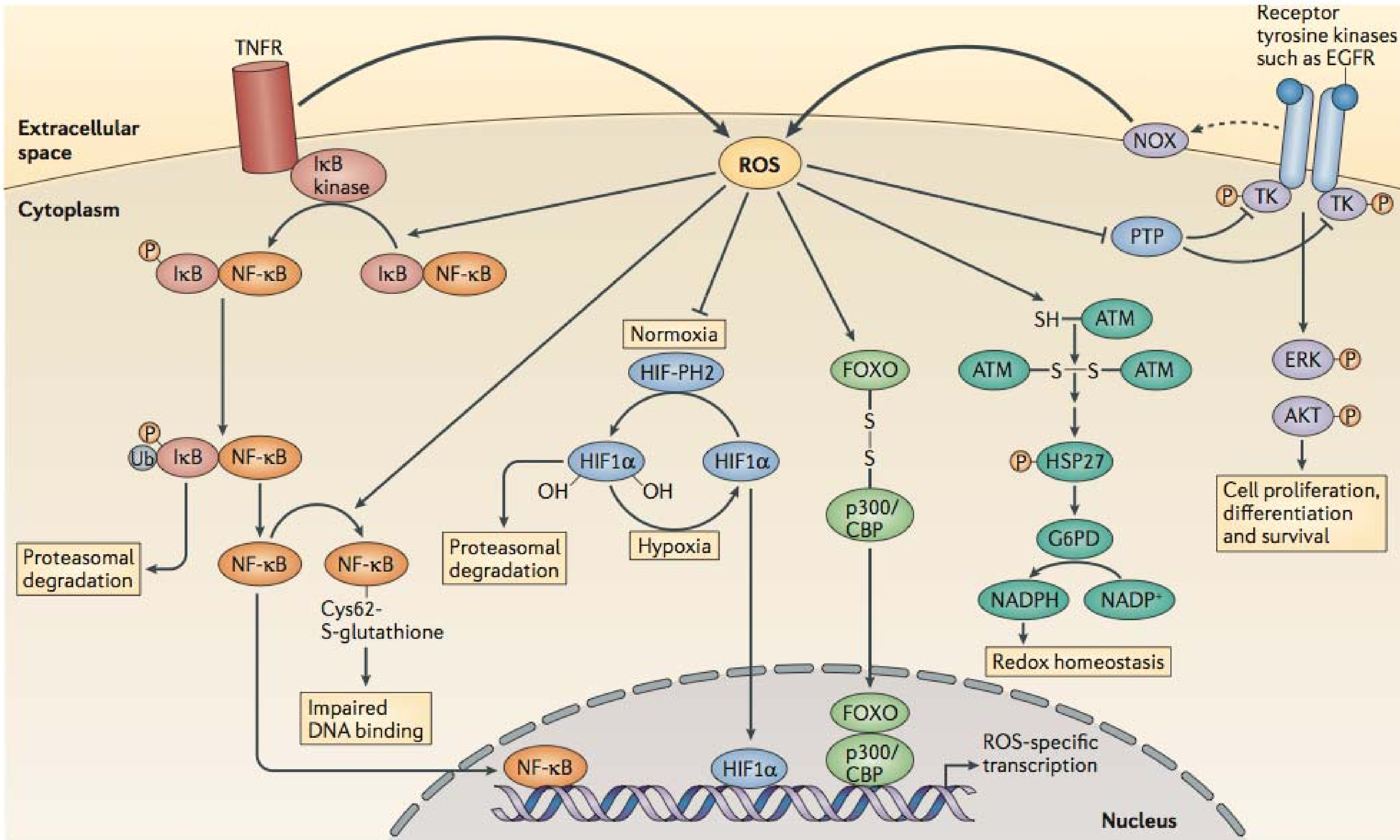
Catabolism by small molecules that react with ROS non-enzymatically
- Ascorbate
- Pyruvate
- α-ketoglutarate
- Oxaloacetate



Beyond oxidative stress: an immunologist's guide to reactive oxygen species

Nat Rev Immunol
2013 vol. 13 (5) pp. 349-61

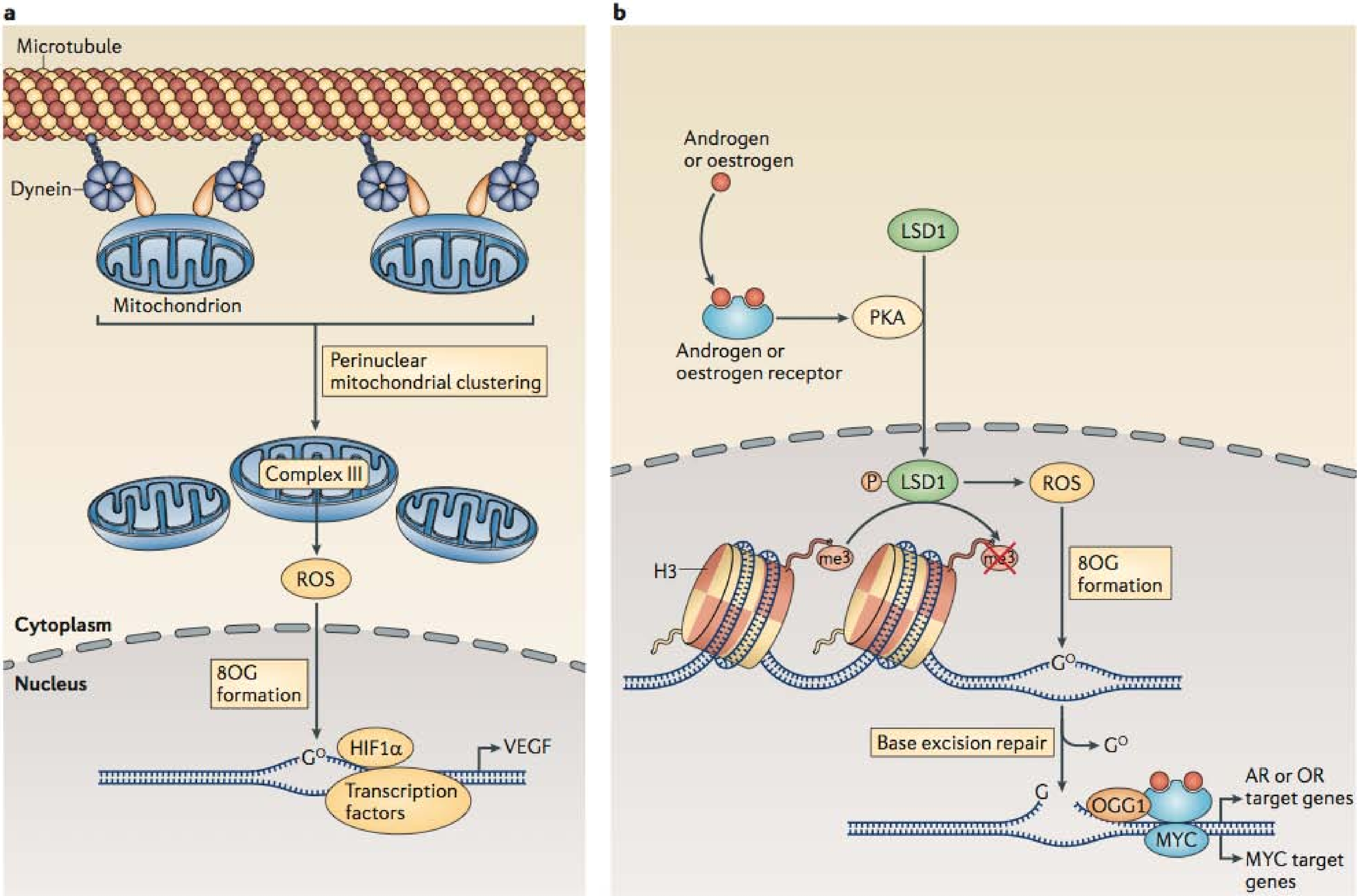
Nathan C, Cunningham-Bussel A



Beyond oxidative stress: an immunologist's guide to reactive oxygen species

Nat Rev Immunol
2013 vol. 13 (5) pp. 349-61

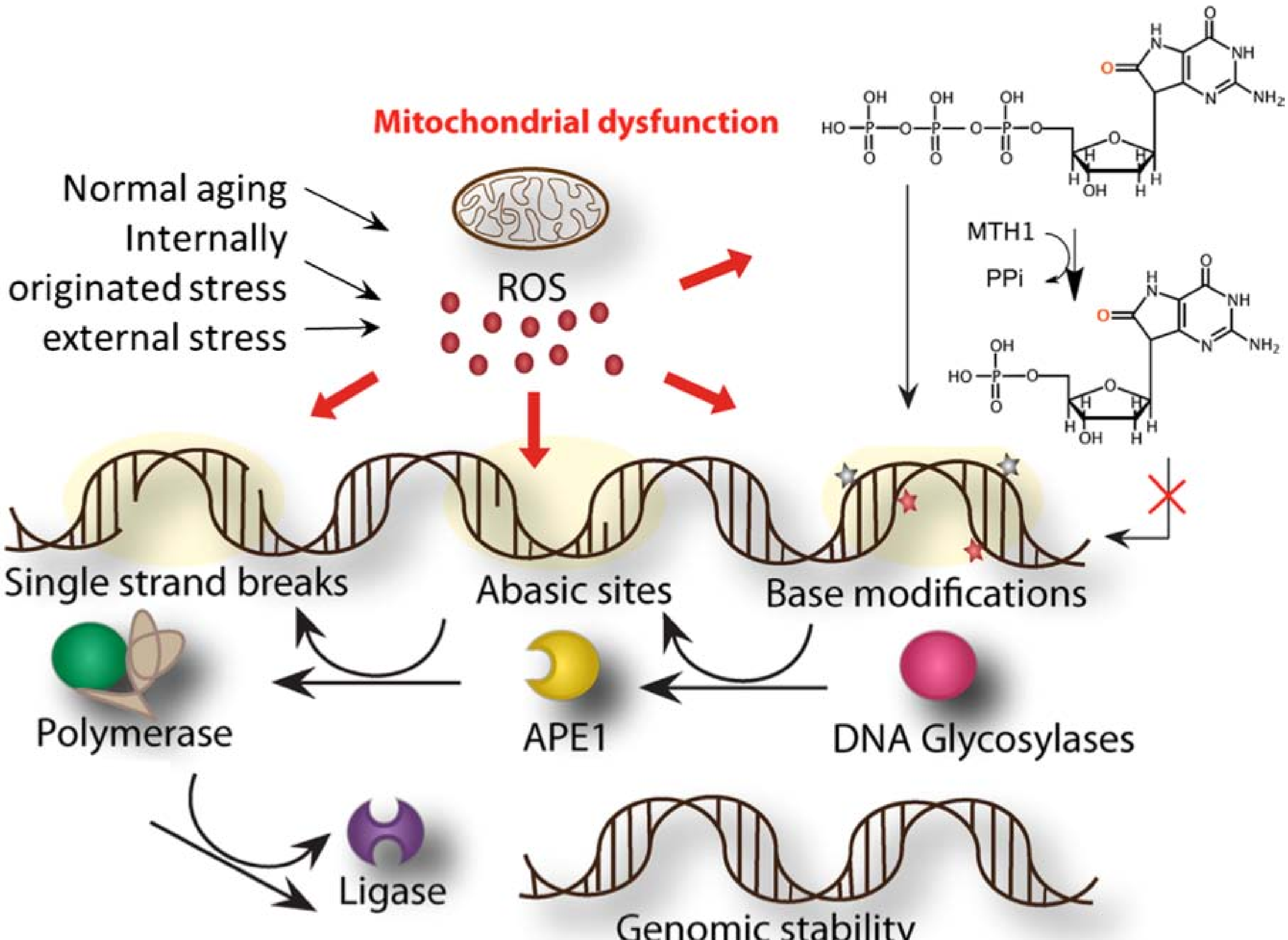
Nathan C, Cunningham-Bussel A



The role of DNA repair in brain related disease pathology

Chandrika Canugovi[a], Magdalena Misiak[a,b], Leslie K. Ferrarelli[a], Deborah L. Croteau[a], Vilhelm A. Bohr[a,*]

DNA Repair 12 (2013) 578–587



The Hallmarks of Aging

Cell 153, June 6, 2013 ©2013 Elsevier Inc.

Carlos López-Otín,[1] Maria A. Blasco,[2] Linda Partridge,[3,4] Manuel Serrano,[5,*] and Guido Kroemer[6,7,8,9,10]

Figure 1. The Hallmarks of Aging
The scheme enumerates the nine hallmarks described in this Review: genomic instability, telomere attrition, epigenetic alterations, loss of proteostasis, deregulated nutrient sensing, mitochondrial dysfunction, cellular senescence, stem cell exhaustion, and altered intercellular communication.