



**UNIVERSITE DE MONTPELLIER**  
**FACULTE DES SCIENCES**



Session : .....1...../.....	Durée de l'épreuve : .....2.....heures
Date : 13 / 01 / 2020	Documents autorisés : .....
Licence            Master <input checked="" type="checkbox"/> X	.....
Mention : Master Biologie-Santé	Matériels autorisés : .....
Parcours : .....	.....
Libellé + Code de l'UE : Vieillessement et Sènescence HMBS362	

**SUJET**

**Vieillessement et sénescence**

**Sujet 1 Madame Gina Devau (/15)**

Klotho et IGF sont des marqueurs du vieillissement. Voici plusieurs figures extraites d'articles indiquant leur rôle dans le métabolisme cellulaire.

1/ Commenter les figures ci-jointes, en indiquant le rôle de Klotho (KL) et de l'insuline-like growth factor (IGF1) dans le vieillissement de manière générale et plus particulièrement sur les maladies neurodégénératives.

2/ A partir de ces connaissances, quels conseils de prévention pourriez-vous donner pour prévenir ou pour ralentir les effets négatifs du vieillissement ?

**Sujet 2 Monsieur Jean-Yves Le Guennec (/5)**

Comment évoluent les propriétés contractiles du cœur avec le vieillissement ? Comment faire le lien entre cette évolution et celle des protéines de la machinerie contractile ?

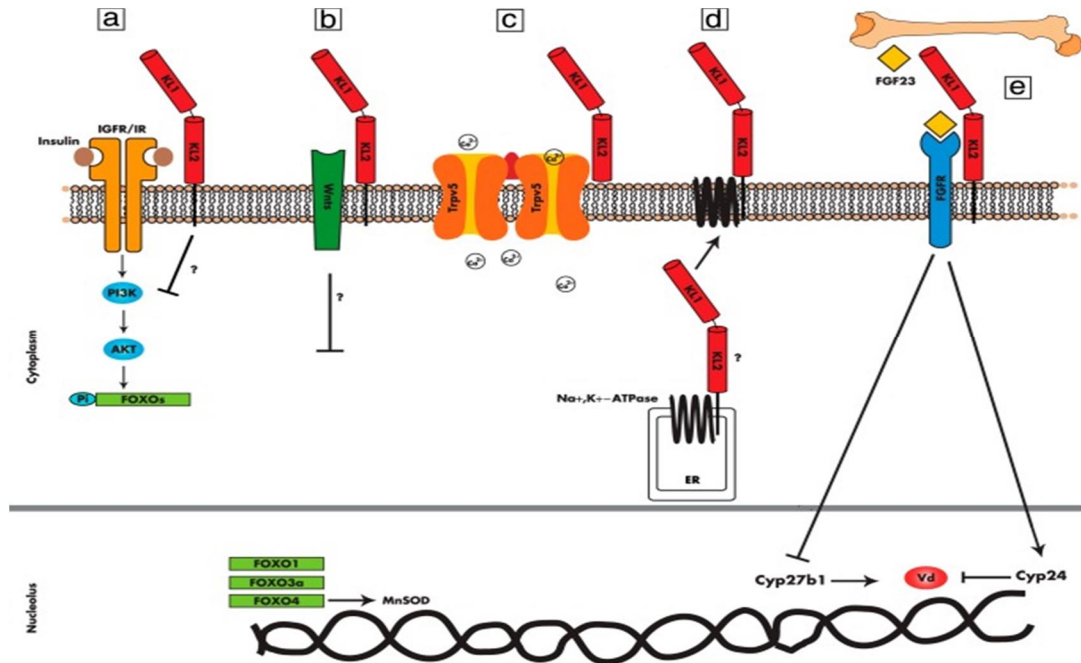
## Molecular Basis of Klotho: From Gene to Function in Aging

Yuechi Xu and Zhongjie Sun

Endocr Rev. 2015; 36(2): 174. 193.

Overview of the functions of Klotho.

a, Klotho inhibits the IGF signaling pathway. The downstream factors FOXO1, -3a, and -4 mediate the function of Klotho. b, Klotho suppresses the Wnt signaling pathway. c, Klotho regulates Trpv5 calcium channels. d, Klotho regulates PTH synthesis. e, The Klotho-FGF23 complex regulates Pi absorption, mineral metabolism, and vitamin D<sub>3</sub> expression and activity.



## Insulin-Like Growth Factor 1: At the Crossroads of Brain Development and Aging

Sarah Wrigley, Donia Arafa and Daniela Tropea

Front Cell Neurosci. 2017 Feb 1;11:14. doi: 10.3389/fncel.2017.00014.

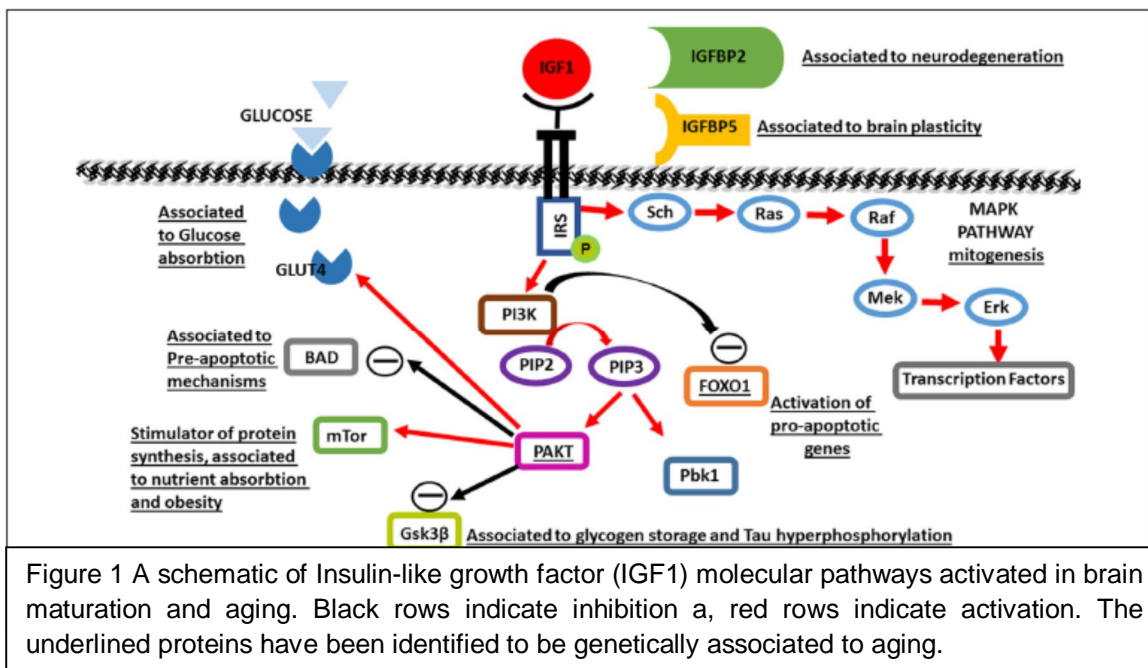
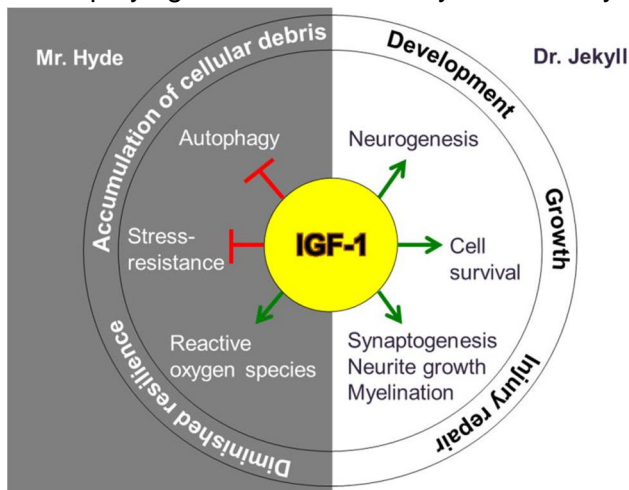


Figure 1 A schematic of Insulin-like growth factor (IGF1) molecular pathways activated in brain maturation and aging. Black rows indicate inhibition a, red rows indicate activation. The underlined proteins have been identified to be genetically associated to aging.

## IGF-1: The Jekyll & Hyde of the aging brain

Sriram Gubbi, Gabriela Farias Quipildor, Nir Barzilai, Derek M. Huffman, and Sofiya Milman  
J Mol Endocrinol. 2018; 61(1): T171. T185. doi:10.1530/JME-18-0093.

IGF-1 playing the roles of Dr. Jekyll and Mr. Hyde in the brain



IGF-1 exerts its beneficial effects on the brain by stimulating neurogenesis, synaptogenesis, neurite growth, myelination, and promoting cell-survival. These processes are important during early life for proper brain development and growth; whereas during aging, they contribute to repair of injured neural tissue, as may result from a stroke. On the other hand, the adverse effects of IGF-1 on the brain include generation of reactive oxygen species, and inhibition of both autophagy and stress responses. Inhibition of these functions results in diminished cell resilience and accumulation of cellular debris, which are characteristic of age-related neurodegenerative conditions such as AD and PD. Je