

综述

## HSP90对低氧诱导因子的调节作用

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摘要

低氧诱导因子 (hypoxia-inducible factor 1, HIF-1) 是一种调节细胞和机体氧稳态的转录因子。在低氧时, HIF-1 蛋白得以稳定, 并活化一系列基因如促红细胞生成素、血管内皮生长因子、糖酵解酶等来增强细胞供能供氧能力, 促使细胞在低氧环境下存活或增殖。在这一过程中, 热休克蛋白90 (heat shock protein 90, HSP90) 对HIF-1起着重要的调节作用, 它能与活化蛋白激酶C受体竞争结合HIF-1 $\alpha$ , 使其免于非氧依赖方式的降解从而维持其稳定, 并影响低氧时HIF-1 $\alpha$ 的核转位、与HIF-1 $\beta$ 的异二聚化及转录活性等。此外, HIF-1也能通过增强热休克因子的转录水平来上调热休克蛋白家族, 进而加强自身的稳定。

关键词 [低氧](#) [细胞存活](#) [低氧诱导因子-1](#) [热休克蛋白90](#)

分类号

## Role of HSP90 in the regulation of hypoxia inducible factor

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Abstract

Hypoxia inducible factor-1 (HIF-1) is a transcriptional activator that regulates cellular and systemic oxygen homeostasis. HIF-1 could be stabilized under hypoxic condition, and promote cell survival and proliferation by increasing transcription of a number of survive genes such as EPO, VEGF and glycolytic enzyme, which can enhance oxygen and energy delivery capacity under hypoxia. HSP90 plays an important role in regulating activity of HIF-1 in this process. HSP90 can compete with the receptor of activated protein kinase C (RACK1) for binding to HIF-1 $\alpha$  to make it be free of O<sub>2</sub>-independent degradation and keep stabilization. HSP90 can also affect HIF-1 $\alpha$ 's nuclear translocation, dimerization with HIF-1 $\beta$  and binding activity with DNA. In addition, HIF-1 can increase the transcriptional level of HSF to up-regulate expression of HSPs including HSP90 which can enhance the stabilization of HIF-1 $\alpha$ .

Key words [hypoxia](#) [cell survival](#) [hypoxia inducible factor-1](#) [heat shock protein 90](#)

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