

研究论文

以透明质酸为骨架的新型谷胱甘肽过氧化物酶(GPX)模拟酶的制备及性质研究

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摘要 用修饰法合成以透明质酸为骨架的两种新型GPX模拟酶: 硒化透明质酸SeHA及碲化透明质酸TeHA. 用红外光谱和核磁共振波谱对模拟酶的结构进行研究, 证明其修饰位点位于透明质酸的N-乙酰氨基葡萄糖的—CH₂OH. 用二硫代双硝基苯甲酸(DTNB)法测定模拟酶的硒含量为1.2%. 通过模拟酶对3种不同底物过氧化氢(H₂O₂)、过氧化氢正丁烷(*t*-BuOOH)和过氧化氢异丙苯(CuOOH)的催化活性的研究表明CuOOH为该反应的最佳底物. 研究模拟酶催化谷胱甘肽(GSH)还原3种过氧化物的动力学发现, 反应速率与底物浓度的双倒数曲线均为平行的直线, 说明模拟酶反应的动力学机制与天然GPX相同, 为乒乓机制. 用2,4-二叔丁基甲基苯酚(BHT)法证明了该催化反应为非自由基机理, 且模拟酶不易被碘乙酸抑制.

关键词 [透明质酸](#) [谷胱甘肽过氧化物酶\(GPX\)](#) [模拟酶](#) [制备](#) [性质](#)

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Preparation and Property Studies on Modified Hyaluronic Acid as Novel Glutathione Peroxidase(GPX) Mimic

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Abstract On the basis of the framework of hyaluronic acid(HA), two novel modified hyaluronic acid compounds, named as SeHA and TeHA, were synthesized to be functioned as mimics of glutathione peroxidase(GPX) by using the method of chemical modification. The structures of the two mimics were characterized by means of IR and NMR with the conclusion that the target —SeH and —TeH were located at —CH₂OH of the *N*-acetyl-*D*-glucosamine. After the new compound was prepared and purified, DTNB method was used to determine the selenium content in SeHA to be 1.2%. The GPX activities of the mimics with H₂O₂, *tert*-butyl hydroperoxide(*t*-BuOOH) and cumenyl hydroperoxide(CuOOH) as the substrates were measured, the result of which illustrates that CuOOH is the optimal substance of the mimics. In the steady-state kinetic studies, a ping-pong mechanism was observed from the data of the double reciprocal plots. All the results show that the mimics behaved similar to the native GPX. BHT and iodoacetate were applied to investigate the catalyzing mechanism of the mimic respectively. It is shown that the catalyzed mechanism is free radical and the mimic cannot be inhibited by iodoacetate.

Key words [Hyaluronic acid](#) [Glutathione peroxidase\(GPX\)](#) [Mimic enzyme](#) [Preparation](#) [Property](#)

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