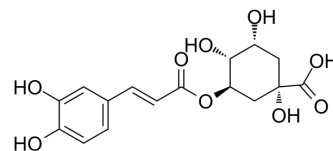


## Chlorogenic acid

|                           |   |          |       |         |  |     |         |            |       |        |  |       |          |
|---------------------------|---|----------|-------|---------|--|-----|---------|------------|-------|--------|--|-------|----------|
| <b>Cat. No.:</b>          | HY-N0055  |          |       |         |  |     |         |            |       |        |  |       |          |
| <b>CAS No.:</b>           | 327-97-9  |          |       |         |  |     |         |            |       |        |  |       |          |
| <b>Molecular Formula:</b> | C <sub>16</sub> H <sub>18</sub> O <sub>9</sub>  |          |       |         |  |     |         |            |       |        |  |       |          |
| <b>Molecular Weight:</b>  | 354.31  |          |       |         |  |     |         |            |       |        |  |       |          |
| <b>Target:</b>            | HIF/HIF Prolyl-Hydroxylase; Reactive Oxygen Species; Bacterial; Influenza Virus; Endogenous Metabolite  |          |       |         |  |     |         |            |       |        |  |       |          |
| <b>Pathway:</b>           | Metabolic Enzyme/Protease; Immunology/Inflammation; NF-κB; Anti-infection   |          |       |         |  |     |         |            |       |        |  |       |          |
| <b>Storage:</b>           | <table border="0"> <tr> <td>Powder</td> <td>-20°C</td> <td>3 years</td> </tr> <tr> <td></td> <td>4°C</td> <td>2 years</td> </tr> <tr> <td>In solvent</td> <td>-80°C</td> <td>1 year</td> </tr> <tr> <td></td> <td>-20°C</td> <td>6 months</td> </tr> </table> | Powder   | -20°C | 3 years |  | 4°C | 2 years | In solvent | -80°C | 1 year |  | -20°C | 6 months |
| Powder                    | -20°C   | 3 years  |       |         |  |     |         |            |       |        |  |       |          |
|                           | 4°C   | 2 years  |       |         |  |     |         |            |       |        |  |       |          |
| In solvent                | -80°C   | 1 year   |       |         |  |     |         |            |       |        |  |       |          |
|                           | -20°C   | 6 months |       |         |  |     |         |            |       |        |  |       |          |



## SOLVENT & SOLUBILITY

### In Vitro

DMSO : 100 mg/mL (282.24 mM; Need ultrasonic)  
 H<sub>2</sub>O : ≥ 20 mg/mL (56.45 mM)  
 \* "≥" means soluble, but saturation unknown.

| Preparing Stock Solutions | Solvent Concentration | Mass      |            |            |
|---------------------------|-----------------------|-----------|------------|------------|
|                           |                       | 1 mg      | 5 mg       | 10 mg      |
|                           | 1 mM                  | 2.8224 mL | 14.1119 mL | 28.2239 mL |
|                           | 5 mM                  | 0.5645 mL | 2.8224 mL  | 5.6448 mL  |
|                           | 10 mM                 | 0.2822 mL | 1.4112 mL  | 2.8224 mL  |

Please refer to the solubility information to select the appropriate solvent.

### In Vivo

- Add each solvent one by one: 10% DMSO >> 40% PEG300 >> 5% Tween-80 >> 45% saline  
Solubility: ≥ 2.5 mg/mL (7.06 mM); Clear solution
- Add each solvent one by one: 10% DMSO >> 90% (20% SBE-β-CD in saline)  
Solubility: ≥ 2.5 mg/mL (7.06 mM); Clear solution
- Add each solvent one by one: 10% DMSO >> 90% corn oil  
Solubility: ≥ 2.5 mg/mL (7.06 mM); Clear solution

## BIOLOGICAL ACTIVITY

### Description

Chlorogenic acid is a major phenolic compound in *Lonicera japonica* Thunb. It is an orally active antioxidant activity, antibacterial, hepatoprotective, cardioprotective, anti-inflammatory, antipyretic, neuroprotective, anti-obesity, antiviral, anti-microbial, anti-hypertension compound<sup>[1][2][3]</sup>.

|                 |  |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
|-----------------|--|---------------|---|---------|-------------------|-----------------|------|---------|---|---------------|---|---------|----------|-----------------|------|---------|--|
| <b>In Vitro</b> | <p>Chlorogenic acid (10 <math>\mu</math>M, 16 h) decreases HIF-1<math>\alpha</math> protein levels in CoCl<sub>2</sub> induced hypoxic A549 cells, but does not affect HIF-1 <math>\alpha</math> mRNA level<sup>[1]</sup>.</p> <p>Chlorogenic acid (10 <math>\mu</math>M, 24 h) inhibits the hypoxia-induced HUVEC cell migration, invasion and tube formation of vascular endothelial cells<sup>[1]</sup>.</p> <p>Chlorogenic acid (25, 50 <math>\mu</math>M, 24 h) inhibits cell proliferation of Huh7 cells, and reduces the number of invading and migrating cells<sup>[4]</sup>.</p> <p>MCE has not independently confirmed the accuracy of these methods. They are for reference only.</p>   |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| <b>In Vivo</b>  | <p>Chlorogenic acid (10 <math>\mu</math>M, s.c.) inhibits VEGF (200 ng/mL)-induced angiogenesis in C57BL/6J mice, by suppression of AKT activation (Matrigel plug assay)<sup>[1]</sup>.</p> <p>Chlorogenic acid (10-100 mg/kg, p.o.) shows protective effects against experimental reflux esophagitis in rats<sup>[3]</sup>.</p> <p>Chlorogenic acid (10 mg/kg, i.v.) prevents endotoxic mortality and induced TNF-<math>\alpha</math> release of LPS-intoxicated C57BL/6 mice, and ameliorates acute liver injury of LPS/GalN-challenged mice<sup>[2]</sup>.</p> <p>Chlorogenic acid (ip, 25-200 mg/kg) inhibits tumor growth in NOD/SCID mice inoculated with Huh7 or H446 cells<sup>[4]</sup>.</p> <p>MCE has not independently confirmed the accuracy of these methods. They are for reference only.</p> <table border="1" data-bbox="347 659 1515 1346"> <tr> <td data-bbox="347 659 617 722">Animal Model:</td> <td data-bbox="617 659 1515 722">Experimental reflux esophagitis (RE) in rats<sup>[1]</sup></td> </tr> <tr> <td data-bbox="347 722 617 785">Dosage:</td> <td data-bbox="617 722 1515 785">10, 30, 100 mg/kg</td> </tr> <tr> <td data-bbox="347 785 617 848">Administration:</td> <td data-bbox="617 785 1515 848">p.o.</td> </tr> <tr> <td data-bbox="347 848 617 995">Result:</td> <td data-bbox="617 848 1515 995"> <p>Reduced esophageal lipid peroxidation (marker: MDA) and increased the reduced glutathione/oxidized glutathione ratio.</p> <p>Inhibited the increases in the serum level of TNF-<math>\alpha</math>, and expressions of iNOS and COX-2 protein.</p> </td> </tr> <tr> <td data-bbox="347 1037 617 1100">Animal Model:</td> <td data-bbox="617 1037 1515 1100">LPS/GalN-challenged mice<sup>[2]</sup></td> </tr> <tr> <td data-bbox="347 1100 617 1163">Dosage:</td> <td data-bbox="617 1100 1515 1163">10 mg/kg</td> </tr> <tr> <td data-bbox="347 1163 617 1226">Administration:</td> <td data-bbox="617 1163 1515 1226">i.v.</td> </tr> <tr> <td data-bbox="347 1226 617 1346">Result:</td> <td data-bbox="617 1226 1515 1346"> <p>Increased survival rates of LPS/GalN-intoxicated mice.</p> <p>Inhibited LPS/GalN-induced phosphorylation of NF-<math>\kappa</math>B p65 or c-Jun, without affecting p-IRF3 levels in the liver lobules.</p> </td> </tr> </table> | Animal Model: | Experimental reflux esophagitis (RE) in rats <sup>[1]</sup> | Dosage: | 10, 30, 100 mg/kg | Administration: | p.o. | Result: | <p>Reduced esophageal lipid peroxidation (marker: MDA) and increased the reduced glutathione/oxidized glutathione ratio.</p> <p>Inhibited the increases in the serum level of TNF-<math>\alpha</math>, and expressions of iNOS and COX-2 protein.</p> | Animal Model: | LPS/GalN-challenged mice <sup>[2]</sup> | Dosage: | 10 mg/kg | Administration: | i.v. | Result: | <p>Increased survival rates of LPS/GalN-intoxicated mice.</p> <p>Inhibited LPS/GalN-induced phosphorylation of NF-<math>\kappa</math>B p65 or c-Jun, without affecting p-IRF3 levels in the liver lobules.</p> |
| Animal Model:   | Experimental reflux esophagitis (RE) in rats <sup>[1]</sup>  |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Dosage:         | 10, 30, 100 mg/kg  |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Administration: | p.o.   |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Result:         | <p>Reduced esophageal lipid peroxidation (marker: MDA) and increased the reduced glutathione/oxidized glutathione ratio.</p> <p>Inhibited the increases in the serum level of TNF-<math>\alpha</math>, and expressions of iNOS and COX-2 protein.</p>  |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Animal Model:   | LPS/GalN-challenged mice <sup>[2]</sup>  |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Dosage:         | 10 mg/kg   |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Administration: | i.v.   |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |
| Result:         | <p>Increased survival rates of LPS/GalN-intoxicated mice.</p> <p>Inhibited LPS/GalN-induced phosphorylation of NF-<math>\kappa</math>B p65 or c-Jun, without affecting p-IRF3 levels in the liver lobules.</p>   |               |   |         |                   |                 |      |         |   |               |   |         |          |                 |      |         |  |

## CUSTOMER VALIDATION

- Food Chem. 2017 Aug 1;228:143-151.
- Int J Biol Macromol. 2019 Sep 1;136:804-812.
- Phytother Res. 2022 Feb 8.
- J Agric Food Chem. 2020 Jul 29;68(30):8050-8056.
- Life Sci. 2020 Aug 1;254:117590.

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## REFERENCES

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- [1]. Huang S, et al. Chlorogenic acid effectively treats cancers through induction of cancer cell differentiation. *Theranostics*. 2019 Sep 19;9(23):6745-6763.
- [2]. Park JJ, et al. Chlorogenic acid inhibits hypoxia-induced angiogenesis via down-regulation of the HIF-1 $\alpha$ /AKT pathway. *Cell Oncol (Dordr)*. 2015 Jan 6.
- [3]. Park SH, et al. IRAK4 as a Molecular Target in the Amelioration of Innate Immunity-Related Endotoxic Shock and Acute Liver Injury by Chlorogenic Acid. *J Immunol*. 2015 Feb 1;194(3):1122-30.
- [4]. Kang JW, et al. Protective Effects of Chlorogenic Acid against Experimental Reflux Esophagitis in Rats. *Biomol Ther (Seoul)*. 2014 Sep;22(5):420-5.
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