Importance of Epigallocatechin and its Health Benefits

Mohamad Hesam Shahrajabian¹, Wenli Sun¹, Qi Cheng¹,²,³,⁴*

ABSTRACT
Natural products have a wide range of diversity of multidimensional chemical structures which play a vital role which show the important nature as golden source for achieving the herbal drug discovery. Literature survey was accomplished using multiple databases including PubMed, Science Direct, ISI web of knowledge and Google Scholar. Epigallocatechin-3-gallate is the most abundant tea polyphenol, followed by other polyphenols, namely, catechin, epicatechin, epicatechin-3-gallate and epigallocatechin. The most important pharmacological activities of EGCG are antineoplastic, HIV infection, hypertension and associated complications, type II diabetes mellitus, its usage as cardioprotective, hepatoprotective, nephroprotective and its application in Alzheimer, Parkinson and Osteoporosis. Natural products have played a key role in drug discovery and development in modern days.

Key words: Natural Compounds, Medicinal Plants, Phloretin, Epigallocatechin.

INTRODUCTION
Traditional herbal medicines have been considered as a source of curative remedy, because chemical components of plants are used to promote health and prevent diseases¹ and plants are invaluable sources of new drugs.¹⁻¹³ Epigallocatechingallate (EGCG), which is also known as epigallocatechin-3-gallate, is a type of catechin and is the ster of epigallocatechin and gallic acid. EGCG is the most abundant in tea and used in many dietary supplements and beneficial to affect human health and disease. The aim of this mini-review article is survey on the most important pharmacological benefits of Epigallocatechin.

EPIGALLOCATECHIN
Epigallocatechin-3-gallate is the most abundant tea polyphenol, followed by other polyphenols, namely, catechin, epicatechin, epicatechin-3-gallate and epigallocatechin.¹⁴ Epigallocatechingallate (EGCG), also known as epigallocatechin-3-gallate, is a polyphenolic flavonoid from tea (Camellia sinensis) possess various pharmacological activities such as anticancer, antimicrobial and antioxidant.¹⁵ Its neuroprotective effect against neural injuries and neurodegenerative diseses is also reported.¹⁶ It can also ameliorate protein and lipid damage induced by hepatotoxin, ethanol.¹⁷ EGCG carriers also appropriate for its wide application in food industry.¹⁸ The interaction mechanism of EGCG and natural α-glucosidase (SCG) can be beneficial to the development of functional foods to prevent diabetes,¹⁹ or develop active and environmental friendly packing materials for food industry.²⁰ Its importance in cancer treatment is because of natural origin, safety and low cost, but EGCG challenge is its low bioavailability with various major limitations in EGCG studies which are study design, experimental bias, inconsistent results and reproductivity among different study cohorts.²¹ It can increase the potency of several chemotherapy such as doxorubicin, cisplating and tamoxifen, in vivo and in vitro, in many cancers,²² and a suitable adjuvant to potentiate anti-glioma therapies.²³ EGCG may help in alleviating Methyl parathion-induced oocyte abnormalities.²⁴ Wu et al.²⁵ showed that epicatechingallate is a potential inhibitor of α-amylose and α-glucosidase, which indicates its importance as a nutrient supplement for the prevention of diabetes mellitus. Its fatty acid derivatives use for the prevention of viral infections.²⁶ Ling et al.²⁷ introduced EGCG as a novel and safe chemopreventive agent for influenza A infection. EGCG has found appropriate as cryopreservation procedures in stallions with low-quality sperm and possibly equine, to avoid or minimize DNA damages and preserve sperm plasma membrane integrity and mitochondrial activity.²⁸ EGCG may improve growth performance and alleviate the oxidant damage by modulating the antioxidant properties of broilers.²⁹ The most important pharmacological impacts of EGCG are presented in Table 1.

CONCLUSION
Epigallocatechingallate is a teacatechin. The most important pharmacological activities of EGCG are antineoplastic, HIV infection, hypertension and associated complications, type II diabetes mellitus,
EGCG may lead to the formation of reactive oxygen species. Its mechanism is based on the formation of EGCG quinone, EGCG dimer quinone and other related compounds and the formation of autoxidized products may contribute to the inhibition of fibrillation. EGCG are found to form covalent adducts with cysteiny1thi0 residues in proteins through autoxidation to subsequently modulate protein function, which can be applied to treat human gastric cancer. The stability and autoxidation of EGCG are related to pH, temperature, metal ion, antioxidant levels, oxygen levels, concentration of EGCG and other ingredients in tea.

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### Anti-inflammatory effect
- a. EGCG may ameliorate OVA-induced airway inflammation by increasing the production of IL-10, the number of CD4/CD25/Foxp3+Treg cells and expression of Foxp3 mRNA in the lung tissue and it can be recommend for treating asthma.
- b. ECGC inhibits the transfection of NF-κB and AP-1 to downregulate the expression of iNOS and COX-2 mainly by scavenging NO, peroxynitrite and other ROS/RNS and decreases the production of inflammatory factors to show the anti-inflammatory effects.
- c. EGCG may inhibit species and it has been pointed out that EGCC may inhibit the IL-8 production of respiratory passage epithelium cell, which may reduce the severity of respiratory passage inflammatory response.

### Anti-angiogenesis
- a. EGCG may inhibit tumor growth and angiogenesis which is possibly involved with the signaling intervention of MAPK/ERK1/2 and PI3K/AKT/HIF-1α/VEGF pathways which is supposed to be a potential therapeutic reagent for anti-angiogenesis treatment of solid tumors.
- b. The modification of the 3′ position methylation of EGCG (MethylEGCG) may reduce cell growth effects at a low concentration in vivo.
- c. EGCC may prevent most of the IR-induced cellular and molecular events.

### Antiobesity
- a. Epigallocatechingallate binds with human peroxisome proliferator-activated receptors gamma (PPAR) gamma at its active site and block its activity and this mode of action may be helpful for antiobesity development.

### Its effects against breast cancer

### Anti Zika virus effect
- a. EGCG may inhibit of ZIKV entry into the host cells

### Spermatogenesis activity
- a. EGCG at the concentration of 5μM has influence on hBMSCs.

its usage as cardioprotective, hepatoprotective, nephroprotective and its application in Alzheimer, Parkinson and Osteoporosis. Its importance in cancer treatment is because of natural origin, safety and low cost, but the main problem is its low bioavailability with various major limitations in EGCG studies.

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**CONFLICT OF INTEREST**

The authors declare that they have no potential conflicts of interest.

**ABBREVIATIONS**

EGCC: Epigallocatechingallate; SCG: Natural α-glucosidase; AD: Alzheimer's disease; PD: Parkinson's disease; HD: Huntington's disease; MPTP: 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine; HIV: Human immunodeficiency virus; HSV: Herpes simplex virus; HCV: Hepatitis C virus; hDPCs: Human dental pulp cells; Methyl EGCC: Methylation of EGCG; PPAR: Peroxisome proliferator-activated receptors.

**REFERENCES**


Dr. Wenli Sun is an assistant researcher working on related topics of traditional Chinese medicine, allelopathic influence and sustainable agriculture. She is also working on topics which are related to Biotechnology and Molecular Sciences.

Dr. Mohamad Hesam Shahrajabian is a senior researcher of Agronomy and Biotechnology. He is interested in crops and herbs which are related to traditional medicine, especially Chinese and Iranian traditional medicine and crops relating to organic farming and sustainable agriculture.

Prof. Dr. Qi Cheng is a professor of Biotechnology and his researches have connected with agrobiotechnology. Presently, he is interested to traditional Chinese medicine and molecular researches.