



GARLIC AND ONION IN DENTISTRY

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ABSTRACT

Onion and garlic are the commonly used ingredients in the kitchen. We are still completely unaware that its health benefits are numerous. They have been tried in vivo in the treatment of deadly diseases like cancer, HIV etc. and are proved to be successful. They both belong to same family of Allium genus. They provide benefit even in morphine withdrawal, diabetes and are known to confer significant immunity to humans. Here, in this review, we discuss the constituents, properties; medicinal uses, Dental applications, adverse effects and contraindications of these naturally available herbs.

Keywords: Onion, Garlic, Allium, Allicin, Oral cancer

INTRODUCTION

When crushed, *Allium sativum* yields allicin, a powerful antibiotic and antifungal compound (phytoncide). It also contains the sulfur containing compounds alliin, ajoene, diallylsulfide, dithiin, S-allylcysteine, and enzymes, vitamin B, proteins, minerals, saponins, flavonoids, and maillard reaction products, which are non-sulfur containing compounds. Phytoalexin called allixin (3-hydroxy-5-methoxy-6-methyl-2-pentyl-4H-pyran-4-one) was found, a non-sulfur compound with a γ -pyrone skeleton structure with anti-oxidative effects, anti-microbial effects, anti-tumor promoting effects, inhibition of aflatoxin B2 DNA binding, and neurotrophic effects.¹⁻³ Sulfur- and non-sulfur-containing chemical constituents have been isolated from *Bulbus Allii Cepae*; the sulfur compounds are the most characteristic. The organic sulfur compounds of *Bulbus Allii Cepae*, including the thiosulfates, thiosulfonates, cepaenes, S-oxides, S,S-dioxides, monosulfides, disulfides, trisulfides, and zwiebelanes occur only as degradation products of the naturally occurring cysteine sulfoxides.¹

Properties

Oral administration of a butanol extract of *Bulbus Allii Cepae* (200 mg) to subjects given a high-fat meal prior to testing suppressed platelet aggregation associated with a high-fat diet.^{1,4}

Administration of a butanol extract to patients with alimentary lipaemia prevented an increase in the total serum cholesterol, lipoprotein cholesterol, and lipoprotein and serum triglycerides. A saponin fraction (50 mg) or the bulb (100 mg) also decreased serum cholesterol and plasma fibrinogen levels. However, fresh onion extract (50 gm) did not produce any significant effects on serum cholesterol, fibrinogen, or fibrinolytic activity in normal subjects.^{1,4}

Onions are known to contain anthocyanins and the flavonoids quercetin and kaempferol.^{5,6} However,

anthocyanin pigments, concentrated in the outer shell of red onions, are only minor constituents of the edible portion.⁶ Kaempferol, while detectable in certain onion varieties, is present in much smaller quantities than quercetin.^{5,7} Therefore, quercetin is the major flavonoid of interest in onions. Mechanisms of action include free radical scavenging, chelation of transition metal ions, and inhibition of oxidases such as lipoxygenase.⁸⁻¹⁰

Antihyperglycaemic activity of *Bulbus Allii Cepae* has been demonstrated in clinical studies. Administration of an aqueous extract (100 mg) decreased glucose-induced hyperglycaemia in human adults. The juice of the drug (50 mg) administered orally to diabetic patients reduced blood glucose levels. Addition of raw onion to the diet of non-insulin-dependent diabetic subjects decreased the dose of antidiabetic medication required to control the disease. However, an aqueous extract of *Bulbus Allii Cepae* (200 mg) was not active. The immediate and late cutaneous reactions induced by injection of rabbit anti-human IgE-antibodies into the volar side of the forearms of 12 healthy volunteers were reduced after pretreatment of the skin with a 50% ethanol. Immediate and late bronchial obstruction owing to allergen inhalation was markedly reduced after oral administration of a 5% ethanol onion extract 1 hour before exposure to the allergen.^{1,4}

In a clinical trial done in 12 adult subjects, topical application of a 45% ethanolic onion extract inhibited the allergic skin reactions induced by anti-IgE.^{1,4}

GARLIC IN DENTISTRY

Oral cancer

The chemoprotective effect of garlic oil on 7, 12-dimethylbenzanthracene (DMBA) induced carcinogenesis in sub-maxillary salivary glands of male wistar rats was studied. There is evidence from the study that beta-carotene can indeed function as a non-conventional antioxidant at low oxygen pressures and thus render

protection against cancer by preventing lipid peroxidation *in vivo*.¹¹

In a 7, 12-dimethylbenz[a]anthracene (DMBA)-induced hamster buccal pouch carcinogenesis model, water extracts of fresh garlic induced apoptosis of malignant cells and completely prevented the onset of oral carcinoma.¹²

Aphthous ulcer

The major component of garlic is allicin, which could effectively decrease inflammatory factors secretion, reduce the migration of neutrophils, inhibit bacterium and virus, antagonize oxidation and regulate immunity. By these bioactivities of anti-inflammation, anti-microbial activity, anti-oxidation and immunomodulation, the allicin may be an effective therapeutic candidate to control the pain, promote ulcer healing and prevent the recurrence of RAU.¹³

Herpes simplex virus infection

Fresh garlic extracts in which allicin is known to be the main active component have been shown to have *in vitro* and *in vivo* antiviral activity. The viruses that are sensitive to garlic extracts are the human cytomegaloviruses and herpes simplex virus type 1.¹⁴

Kaposi sarcoma

Preliminary human studies suggest that regular consumption of garlic (particularly unprocessed garlic) may reduce the risk of developing several types of cancer. Some studies use multi-ingredient products, which makes it difficult to determine if garlic alone may play a beneficial role. Further, well-designed human clinical trials are needed to conclude whether consuming garlic or taking garlic supplements may prevent or treat cancer.¹⁵

Warts

In a preliminary trial, topical application of garlic cloves was used successfully to treat warts in a group of children. A clove was cut in half each night and the flat edge of the clove was rubbed onto each of the warts, carefully cleaning the surrounding areas, so as not to spread any garlic juice. The areas were covered overnight with Band-Aids or waterproof tape and were washed in the morning. In all cases, the warts cleared completely after an average of nine weeks.^{16,17}

In another study, 23 people with warts applied an oil-soluble garlic extract twice a day to the warts. Complete recovery was seen in every case after one to two weeks. A water-soluble garlic extract was less effective. Side effects after application of the oil-soluble extract included blistering, redness, burning, and increased pigmentation of the skin around the application area, which usually disappeared completely in one to two weeks.^{16,17}

ONION IN DENTISTRY

Oral cancer

A study in which using data from an integrated network of Italian and Swiss case-control studies, the relation between frequency of onion and garlic use and cancer at several sites analyzed. The study showed an inverse association between the frequency of use of allium vegetables and the risk of several common cancers.¹⁸

Periodontitis

Onion extracts possess an effect on all test bacterial strains (*S. mutans* JC-2, *S. sobrinus* OMZ176, *P. gingivalis* ATCC 33277 and *P. intermedia* ATCC 25611),

and the effects were bactericidal against cultured and resting bacterial cells. The activity of the onion extracts was stable even after 48 hours in the culture medium.¹⁹

Bone Health

Onions inhibit bone resorption by 20% when consumed at a rate of 1g per day per kg of body weight. This was slightly higher than the rate of bone resorption obtained from the calcitonin that is typically used to treat postmenopausal osteoporosis. These findings suggest that onion intake may be an useful dietary approach to improve bone health.^{20,21}

Probiotic Effects

Onions store their carbohydrates as fructans, which are fructose polymers held together by beta linkages. They may offer useful probiotic effects in the skin of red onion have been reported to have antioxidant activity, but no appreciable amounts remain in the edible portion once the outer skin has been removed. In view of these findings, conditions may be manipulated and certain strains chosen to produce onions with superior phytochemical properties.^{20,22}

Diabetes

Use of S-methylcysteine sulfoxide and S-allylcysteine sulfoxide (200mg/kg/day) gave results comparable to treatment with insulin or glibenclamide but without the negative side effect of cholesterol synthesis stimulation. It was found that a 3% onion powder diet also reduced hyperglycemia, circulating lipid peroxides, and blood cholesterol (LDL-VLDL exclusively).^{23,24} *In vivo* analysis of the effects of quercetin on human diabetic lymphocytes showed a significant increase in the protection against DNA damage from hydrogen peroxide at the tissue level.¹⁰

HIV

It was also shown that quercetin may diminish virus replication by inhibiting *vpr* function. At 10 μ M dosage, quercetin provided 92% inhibition of *vpr*-induced cell cycle abnormality.^{20,25}

Immunosuppression

Quercetin was shown to suppress both immune and non-immune injury responses, the key risk factors in chronic graft loss. It has also shown to prevent immunosuppression induced by UV exposure to mice. The researchers noted the conflict in findings with other studies and offered an explanation that the immune response was reduced by anti-inflammatory activity via the arachidonic acid pathway.^{20,26}

Morphine Withdrawal

Onion capsaenes and thiosulfates have been shown to inhibit cyclooxygenase and 5-lipoxygenase activity suggesting one mechanism for benefit. The anticholinergic effects of quercetin also were hypothesized to attenuate morphine withdrawal, normally thought to be exacerbated by acetylcholine stimulation.^{27,28}

Dosage

People who wish to consume garlic and have no aversion to its odor can chew from one to two whole cloves of raw garlic daily. Clinical trials have used 600-900 mg (delivering approximately 5-6 mg of allicin) per day in two or three divided amounts. Aged-garlic extracts have been studied in amounts ranging from 2.4-7.2 grams per

day. Unless otherwise prescribed: a daily dosage is 50 gm of fresh onion or 20 gm of the dried drug; doses of preparations should be calculated accordingly.^{1,2}

Side Effects

- Heartburn and flatulence.
- Because of garlic's anti-clotting properties, people taking anticoagulant drugs should check with their doctor before taking garlic. Those scheduled for surgery should inform their surgeon if they are taking garlic supplements.
- Garlic appears to be safe during pregnancy and breast-feeding. In fact, two studies have shown that babies like breast milk better from mothers who eat garlic.
- Garlic is known for causing halitosis as well as causing sweat to have a pungent 'garlicky' smell which is caused by Allyl methyl sulfide (AMS). AMS is a gas which is absorbed into the blood during the metabolism of garlic; from the blood it travels to the lungs (and from there to the mouth causing bad breath) and skin where it is exuded through skin pores. Washing the skin with soap is only a partial and imperfect solution to the smell.
- Raw garlic is more potent and therefore cooking garlic reduces the effect.^{1,2}

PRECAUTIONS

Drug interactions

Patients on warfarin therapy should be warned that garlic supplements may increase bleeding times. Blood clotting times have been reported to double in patients taking warfarin and garlic supplemental.¹

Carcinogenesis, mutagenesis, impairment of fertility

Bulbus Allii Sativi is not mutagenic *in vitro* (*Salmonella* microsome reversion assay and *Escherichia coli*). For Bulbus Allii Cepae no general precautions have been reported, and no precautions have been reported concerning drug interactions, drug and laboratory test interactions, nursing mothers, paediatric use, or teratogenic or non-teratogenic effects on pregnancy.¹

CONCLUSION

Onion and garlic are the two species with uncountable medicinal properties which are easily available in kilograms with less cost than the medicine. Side effects of these medicinal entities are less even though if used for longer duration. These studies show that onion and garlic can be helpful to treat those diseases which are still incurable. Still further studies are required with this and other naturally available elements in order to explore their medicinal properties so that mankind can have a healthier and disease free world.

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