

Medicinal Importance of Garlic and Onions on Autonomic Nervous System

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Abstract

Garlic and onion have been of medicinal value in the treatment of hypertension and they are also used by people who wanted to lose weight. This research discusses the effects of these bulbs on the entire nervous system, mechanism of action, and complications of over use. This research highlights the chemistry of the active components in these bulbs and its role in regulating body's autonomic functions and other possible prospects. This research also evaluates the effects of these bulbs on some selected organ systems.

Keywords: Garlic; Onion; Autonomic nervous system; Allicin; Muscarinic cholinergic agonist; Cholinesterase inhibitor; Blood pressure; Alzheimer's disease; Gastrointestinal motility

Introduction

Nature has been a source of medicinal treatments for thousands of years, and plant-based system continues to play an essential role in primary health care of 80% of world's population [1]. In the beginning, these were the main source of the folk or ethnomedicine [2]. According to the World Health Organization, about 65 to 80% of the world's population especially in the rural areas in developing countries [3].

Garlic (*Allium sativa*) and onion (*Allium cepa*) have been suspected to be of medicinal importance by the ancient scientists such as Pasteur in 1858 who worked on the antibacterial activities of garlic [4].

The production of tears triggered by slicing of onions and garlic made us suspect their effect on the body's autonomic nervous system, which is responsible for their medicinal importance in regulating certain body's functions and in the restoration of body's system from a pathological state to the usually physiological state.

The organosulphur compounds found in these bulbs are responsible for their effects on the autonomic nervous system. The organosulphur compounds also have a similar but a bit milder in effect as the organophosphate compounds found in species of mushroom and some other plants.

Survey on medicinal usage of garlic and onion

A mini survey was made on local medicinal usage of garlic and onion among selected people in Osun State, Nigeria and our judgement was based on those related to autonomic nervous system functions.

Methodology

Questionnaires were distributed and about 50 were properly answered, while majority were females. The questionnaires revealed the age, purpose of usage, effect and noticeable side effects of garlic and onions which serve as basis for our research.

The results were grouped into age groups and the common purposes of usage, effects and side effects in each age group were recorded.

Results and Discussions

The result drafted in this study is being highlighted in Table 1. It was recorded that garlic and onion are used as management therapy of hypertension with subjects testifying that their blood pressure reduces

drastically on checking after being on diet containing garlic and onions or after oral usage of garlic and onions for about two weeks while people having hypotension were made to abstain from diet containing garlic and onion.

Some said they use them in the management and prevention of obesity, they were said to aid easy digestion of food and also quickening of defecation; so they are used immediately after meal so that most meal taken will be passed out as faecal masses and also for this they are used locally during constipation.

For any side effect of the usage of garlic and onion, we got a response from someone who said she could not feel heart beat and lose her consciousness after usage of about a litre of her concoction made from mixture of garlic and onion. This was due to acute bradycardia.

Chemistry of the organosulphur compounds

The chemistry of the organosulphur compounds found in both garlic and onion can be described as follows. Allicin (isoallicin in onion) is the active organosulphur compound found garlic and onion which contains sulphuric group attached to cysteine residue gotten from alliin precursor by the action of enzyme alliinase which is released by crushing or slicing of the bulbs which act by hydrolysis.

Allicin which is diallyl thiosulphate or 2-propene-1-sulphithioic acid S-2-propenyl ester is an unstable compound and readily metabolise to stable diallyl disulphide in garlic and propenyl propyl disulphide in onion.

Mechanism of action on autonomic nervous system

According to research made by Suresh Kumar which reveals the dual inhibition exhibited by allicin on acetylcholine esterase and butrylcholine esterase, this unveils the mechanism by which these bulbs act on the autonomic nervous system by serving as indirect acting cholinergic agonist; which is done by organosulphur compounds inhibiting enzymes that aid in the breaking of acetylcholine and

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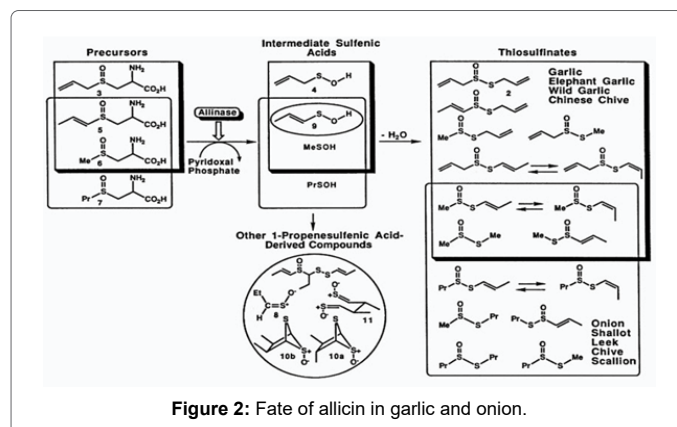
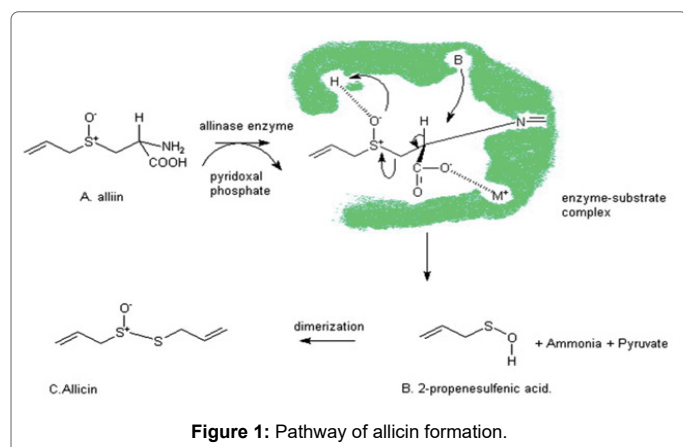
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Age group	Purposes of usage	Effects	Side effects
<17	Resolve constipation	Increase bowel movement, relieve constipation	Hyper-defication, mouth odour, nausea and vomiting
17 - 40	Weight loss	Aid digestion, burns fat	Hyper-defication, increase sweating
40 - 60	Management of hypertension	Reduce Blood pressure and related symptoms	Diarrhoea, Generalized weakness, increase sweating
>60	Management of hypertension and insomnia	Reduce Blood pressure and aid sleeping	Diarrhea, Generalized weakness, increase sweting, acute bradycardia and loss consciousness

Table 1: Results of the study.



butrylcholine, these compounds are agonist for cholinergic receptor thereby stimulating the effect of parasympathetic nervous system [5].

Clinical importance

The organosulphur compounds (allicin and isoallicin) of these bulbs will be of great therapeutic importance in the treatment of some diseases of the eye (e.g glaucoma), cardiovascular system (e.g hypertension, tachycardia), neuromuscular junction (e.g myasthenia gravis), and nervous system (e.g Alzheimer's disease) and also in the treatment of atropine toxicity [6].

Effect on the eye

Glaucoma is a disease characterized by increased intraocular pressure in which cholinesterase inhibitor like alliin for these bulbs reduces the intraocular pressure by causing ciliary muscles contraction thereby facilitating outflow of aqueous humour.

Effect on the gastrointestinal and urinary tract

They can be helpful in the treatment of constipation due to their effect of increasing gastrointestinal tract mobility. They can also be indicated in the treatment of reflux oesophagitis because they cause increase in tone of contraction of the lower oesophageal sphincter.

They can also be indicated in patients with urinary retention as they cause contraction of the smooth detrusor muscles of the urinary bladder [7].

Effect on the neuromuscular junction

Disease of neuromuscular junction such mysathenia gravis which is a condition of the body producing autoimmunity against acetylcholine can be treated by the administration of the organosulphur compounds of garlic and onion which prevent breaking down of available acetylcholine that will bind to the available receptors at the neuromuscular junction.

Effect on the cardiovascular system

They can be used in the management of hypertension due to their effect of vasodilating the blood vessels thereby causing decrease in the total peripheral resistance ultimately leading to decrease in blood pressure and they can be used in the treatment of supraventricular tachycardia due to its negative chronotropic and negative ionotropic effect on the heart (Figure 1).

Effect on the central nervous system

Alliin has been reported to have therapeutic value in the treatment of Alzheimer's disease just as tacrine which is also an anticholinesterase [5].

Toxicity and side effects

The toxic effect of garlic and onion like other cholinesterase inhibitor is seen over usage.

Signs of acute intoxication are muscarinic excess such as miosis, salivation, sweating, bronchial constriction, vomiting, diarrhea, hypotension, acute bradycardia, convulsion, syncope, coma, and polyuria.

The treatment is the use of atropine parenterally so as to neutralize the toxicity (Figure 2).

Conclusion

This research suggests that alliin present in garlic and isoallicin present in onion being organosulphur compounds like organophosphate compounds are indirect acting muscarinic and nicotinic cholinergic agonists which are of great therapeutic importance which can be used to subserve the functions of parasympathetic stimulation and will also be of good use in the treatment of myasthenia gravis, hypertension, Alzheimer's disease, etc.

This research also justify the traditional medicinal use of these bulbs in the treatment of some dysfunctions of the autonomic nervous

system but also identified some adverse effect of these medicine if proper precautions are not taken. It also reveals the mechanism of actions of these bulbs using their effect on the autonomic nervous system which might not have been described earlier.

Researches that will look into the reversibility of the inhibition exhibited on the cholinesterase enzymes and that will reveal the therapeutic index of these bulbs in regards to their functions in the autonomic nervous system that will facilitate the conversion of these bulbs into synthetic chemotherapy for the betterment of humanity are suggested.

Conflict of Interests

The authors have not declared any conflict of interests.

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