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Tanacetum Parthenium: Medicinal Applications

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Abstract

Tanacetum parthenium is a medicinal herb which is used to cure many of the prevailing incurable diseases. It is commonly known as feverfew plant. An organic compound named as 'parthenolide' is extracted from feverfew plant which is of great medicinal and therapeutic importance. The parthenolide and sesquiterpene lactone isolated from feverfew has been successful in curing diseases like migraine, apoptosis of breast cancer cells, antileishmanial activity, neurogenic vasodilation, rheumatoid arthritis, platelet production cum activation and many more. The parthenolide for curing migraine acts upon the TRPA1 channels, which acts as stimulant to trigger migraine attacks, inactivates the TRPA1 channels and makes the nerve unresponsive towards these channel. The apoptosis mediated cytotoxic effect of parthenolide on breast cancer cell line is attributed to the presence of α -methylene- γ -lactone skeleton. It is the occurrence of lactone skeleton which leads to apoptosis of cancer cells. It has been examined that in vitro conditions allow the production of platelets from human megakaryocyte cell line, the platelet production is achieved via inhibiting nuclear factor- κ B signalling in the megakaryocytes by the action of parthenolide. The parthenolide is a sesquiterpene lactone which inhibits the growth of *Leishmania amazonensis*. The sesquiterpene is made up of three isoprene and one lactose group attached to it. Using the organic components of feverfew plant- 'parthenolide' and 'sesquiterpene lactone' we can surely combat the frightening diseases emerging in the world. The use of feverfew must be encouraged as the production of medicines from it is a less hectic task. Although parthenium is an exotic variety of weed in India but its species have an incredible quality for saving the life of people.

Keywords: Parthenolide, sesquiterpene lactone, TRPA1 channels, CGRP, NF- κ B, I κ B- β , namely Jun N-terminal kinase (JNK), mitogen activated protein kinase (MAP), VTA DA cells

Introduction

Tanacetum parthenium commonly known as feverfew plant is a member of Asteraceae/compositae family. Feverfew is a traditional medicinal herb grown in India and also grown occasionally for ornament. The ancient Greeks called feverfew "parthenium" because, according to legend, it was used to save the life of someone who had fallen from the Parthenon, the Doric temple of the virgin goddess Athena on the Acropolis in Athens (Hobbs, 1989). However, its name may be more likely based on feverfew's traditional use for alleviating menstrual cramps in young girls. Feverfew is a herbaceous and perennial plant that grows into a small bush with citrus scented leaves and is covered by flowers reminiscent of daisies. Feverfew is usually collected when it is in bloom. However, different commercial preparations can vary widely in active ingredients depending on where the plant was growing, its condition at the time of harvest, and the parts of the plant used. Parthenolide is an active ingredient in feverfew that may be partly responsible for its effects in preventing and treating migraine. Many feverfew products are standardized to contain between 0.1-0.2% parthenolide. No serious side effects have been noted in individuals taking feverfew for a period of years. Feverfew should not be used during pregnancy or while breast-feeding. Since parthenolide and sesquiterpene lactone stability can vary with storage conditions, feverfew should be stored in a cool, dry, dark environment.

Action of Feverfew against Migraine and Dilation of Nerves

Parthenolide extracted from Tanacetum parthenium or feverfew has been known to cure migraine attacks. The 0.2% intake of parthenolide would prove efficient in reducing migraine pain. The migraine pain starts when a molecule named CGRP i.e. calcitonin gene related peptide is released from trigeminal neurons. The CGRP peptides consists of special

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receptors, the TRP channels. The agents responsible for enhancing migraine attack might have inhaled from external surrounding or would have been produced inside the body like TRPA1 factor. The parthenolide specifically targets TRPA1 sites and shows its effect on it. The parthenolide binds with TRPA1 channel and inactivates it along with making the TRPA1 expressing nerve terminal non-responsive to any of these channels. The release of CGRP from trigeminal neurons is inhibited by action of parthenolide on TRPA1 and neural inactivation caused by it. Ultimately the parthenolide attack on TRPA1 and the inactivation of its neural terminal leads to inhibition of CGRP production in the trigeminal vascular system. In this way the effect of migraine can be minimized.

The freeze dried capsules of feverfew are generally recommended to be taken for curing migraine. On an average a daily dosage of 250 milligrams is enough. The feverfew plant is easily available and it can be grown in one's house itself. The plant can be taken by directly chewing the leaves of feverfew or in medicinal form. Feverfew can only be taken as preventive for migraine, to be fully effective it needs to be taken everyday. For avoiding any harmful effect of feverfew it should not be taken with other NSAIDs.

Lowering the Production of Cancer Cells by the Activity of Parthenolide

Parthenolide extracted from *Tanacetum parthenium* (feverfew) is a sesquiterpene lactone. The activation of nuclear factors like NF- κ B and I κ B- β is inhibited by the action of Parthenolide. The subunit β - I κ B of the I κ B- β is chiefly inhibited by the Parthenolide. The expression of multiple cytokine gene involved in cell proliferation, cellular inflammatory, immune responses and tumor development is only by the presence of NF- κ B factor. The regulation of genes responsible for metastasis and tumor invasion is done by it. The expression of genes responsible for regulation of apoptosis and cell proliferation is activated by NF- κ B when it moves into the nucleus. Some cancer cells have active form of NF- κ B. The antitumor effect of Parthenolide is done basically by the active form of two enzymes namely Jun N-terminal kinase (JNK) and reduction in mitogen activated protein kinase (MAP) along with formation of reactive oxygen species. By altering the activity of the factors involved in formation of tumor cells Parthenolide is used as an ideal agent in chemotherapy by reducing antiapoptotic genes.

Parthenolide Blocks the Cocaine's Effect

The uptake of cocaine leads to inhibition of re uptake of the receptor named catecholamine, this leads to abnormal behaviour of a person. The excess intake of cocaine blocks the Ventral Tegmental Area Dopaminergic (VTA DA) cells. The parthenolide has been shown to inhibit the effect of cocaine. The drugs like cocaine when taken leads to extracellular concentrations of dopamine at the somatodendritic area resulting in an activation of impulse-regulating auto receptors thus inhibiting the movement of neuronal cells and activity of VTA DA cells. When parthenolide taken at a dose of 0.125 mg/kg functions more effectively at inhibiting its effect on cocaine's mechanism of action. The main target for cocaine is the monoamine transporter (MAT) which includes the dopamine transporter (DAT), the serotonin transporter (SERT) and the norepinephrine transporter (NET). The main function of the

MATs is to carry out neurotransmitter reuptake to the pre synaptic terminal, hence regulating neurotransmission. When drugs such as cocaine interact with the DAT, the dopamine concentration increases in the synaptic cleft; this increase causes a direct hyperactivation of postsynaptic dopamine receptors as well as extrasynaptic dopamine autoreceptors. In fact, one of the main roles of the DAT seems to be the regulation of dopamine spillover to these autoreceptors. In humans, the main target for cocaine is the DAT. This application of parthenolide finds a great place in the pharma field.

Conclusion

Above mentioned eminent medicinal applications of *tanacetum parthenium* (feverfew) really find a great place in today's scenario for combating various issues that are being raised in the medical field. Of everything we see in the world there is a merit and a demerit too. Likewise, the feverfew also has some demerits- its allergic reactions for some people, excess dose is required etc. The most important application of feverfew is only in curing migraine and it is the best herb for migraine besides it also has medicinal applications. The two important extracts of feverfew-parthenolide and sesquiterpene lactone are of immense medicinal applications. With further modifications in the sesquiterpene lactone with some other chemicals or new techniques it can have a future of treating many diseases or apoptosis of any type of cancer cells.

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