

Evaluation of the Anti-Inflammatory Activity of the Oil from the Pequi (*Caryocar Brasiliensis Camb*) in Mice

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Abstract

Introduction: Pequi is found in Brazilian Cerrado and belongs to the Caryocaceae family and *Caryocar* genus. In folk medicine, the oil is used as an anti-inflammatory, to heal wounds, and for the treatment of rheumatic and muscle pains.

Objective: The present study aims to investigate the effect of Pequi oil on inflammatory response about murinho model of paw edema.

Methodology: The mice were divided in groups, where the group 04 01 received pequi oil (OP) at a concentration of 100 mg/Kg; 02 Group received a concentration of 200 mg/Kg; the 03 Group received only the Tween® 80-vehicle of dilution (negative control); and the 04 group was treated with in domethacin at a dose of 10 mg/Kg (positive control). After induction of the edema and the paws were treatments measured with the aid of a digital caliper until the sixth hour and later 48 hours and 24.

Results and Discussion: The results show that the OP on concentration 100 mg/Kg showed anti-inflammatory effect in the fourth and fifth time when compared to the positive control (Indomethacin) and significant when compared to 48 hours, and in relation to the negative control in the fifth and sixth time. The concentration of 200 mg/Kg did not present anti-inflammatory effect.

Conclusion: Oral treatment with OP was not efficient to reduce edema.

Keywords: Inflammation; Paw edema; Caryoca Brasiliense; Cascade; Prostaglandins

Introduction

Inflammation is a pathological phenomenon known and studied since ancient times, being defined as a "tissue reaction to an irritant". The clinical signs that characterize the inflammation, defined by Celsius (30 BC – 38 ad) are: "flushing, et calore et dolore cum. tumor" translated expression means: "flushing and swelling, accompanied by heat and pain". These signs and symptoms are known as the cardinal signs of inflammation [1].

The flushing is caused by a large increase in on-site blood influx inflamed. The swelling comes not only from this event, but also the presence of substances that spill out of the blood vessels to the surrounding tissues. The heat also is due to increased blood circulation, which transports the heat in the higher temperatures of the internal parts of the body to the periphery of the body. The pain is attributed to increased pressure on the nerve endings, but can also include as determining factors in the perception of pain the annoying effects of toxic chemicals and synthesized mediators in inflammatory process [1]. The loss of the function will be included by Galen as the fifth Cardinal sign of inflammation, during the second century after Christ [2]. The reflex inhibition of muscle movement, initiated by pain, swelling and tissue destruction are events that contribute to the loss of function [1].

For centuries the inflammation will be recognized through these signs [3], which are guaranteed by cellular and vascular components that occur in the injured tissue. Tissue level, the term refers to the inflammation vascular dilatation, capillary permeability changes with increased exudation of fluids and proteins to the inflammatory site, accumulation of Defense cells and appearance of granulation tissue in some circumstances.

The inflammatory response represents one of our body's defense mechanisms. The word inflammation can be properly referred to as an inflammatory cascade, and consisting of a long chain of reactions and cellular activities in order to repair the fabric of an injury or cell destruction occurring cellular activities increased from arterioles and venules as well as increased vascular permeability and blood flow, as a result, the accumulation of fluid. This inflammation, acute, usually is the initial response to the offender and may become uncomfortable to the patient due to edema and pain.

In addition to the fight against the offending agent in order to avoid your spread to other regions of the body, the inflammatory response is intended to eliminate

products of cell destruction, thereby promoting optimal conditions for the repair of damaged tissue. This whole process of restitution of normalcy is completed to repair tissue, inseparable phenomenon of inflammation [4].

Assuming that didn't exist the inflammatory process, we would have serious consequences: there would be a lack of control of the infection, there would be no healing of wounds in addition to the destructive process in the organs attacked would be permanent. Inflammatory reactions, for example, are the pillar of chronic diseases, such as rheumatoid arthritis, atherosclerosis and pulmonary fibrosis, as well as potentially fatal hypersensitivity reactions to insect bites, drugs and toxins.

There are a number of biological phenomena involved in the inflammatory process, which associate with and complement each other to form cascade reactions involve the complex interaction between the inflammatory cells such as macrophages, neutrophils and lymphocytes [4]. These phenomena can be triggered by many factors, called flogogênicos agents. One of kinds flogogênicos are:

- a) physical agents, in that physical factors, such as excessive heat (Burns), the exaggerated cold (freezing), trauma, fractures, incisions, ultraviolet Ray and ionizing radiation are important causes of inflammation ;
- b) chemical agents, in this case, the inflammation is determined by very varied nature chemicals such as caustic substances, acids, alkalis, Croton oil, turpentine, formaldehyde, carrageen an.
- b) Infectious agents, in that the triggering factor of inflammation is of biological origin, such as bacteria, fungi, viruses, and protozoa.

In 1793, John Hunter, a Scottish surgeon, noted that inflammation is not a disease, but rather a nonspecific response that has a salutary effect on your host.

The inflammatory reaction is characterized from two theories postulated: the theory cellular and theory humoral. The first preached that the initial response would leave the blood and tissue fluids, rich in complex enzyme systems, responsible for several inflammatory reaction related events, while the second, postulated by Metchnikoff, preached that the white blood cells that appeared during the inflammatory reaction were responsible for protecting the body against infections. However, the fact that the inflammation produced by different agents and keep the same characteristics suggest that the chemical messengers that are generated at the site of the reaction cause symptoms.

Inflammation is a cellular and humoral response of varying intensity with local repercussions, loco-regional or systemic in that the cascade of events triggered after an assault or stimulus results in increased vascular caliber, increased vascular permeability, recruitment of leukocytes, as a result of a complex interaction between different cellular types resident in the tissues and various pro-inflammatory mediators [5].

The Species *Caryocar Brasiliensis* Camb

The pequi tree, known by the common names of pequi, *caryocar coriaceum*, pequá, thorn almond, horse grain or almond Brazil is an arboreal species native to the Cerrado in the family *Caryocaraceae*. Occurs in almost all the country's systems and agroecos has paid off greatly appreciated and used in the cuisine of the Central-West region, North and northeastern part [6].

The pulp and the almond fruit is extracted oil that offers great versatility as for your use, with applications ranging from regional cuisine to the cosmetic industry, in the production of soaps and creams [7], in addition to potential use for the production of fuels and lubricants [6]. In folk medicine, are assigned various property data to the plant and medicinal fruit, the bark of the tree and the fruit are used in infusions as antifebrin and diuretics, the leaves in the treatment of colds, flus, edema and the oil of the fruit is used for treatment of sunburn, as aphrodisiac [8], and as balm in cases of rheumatism.

The therapeutic value of pequi tree attributed to popular medicine me has been researched and a wide range of scientific experiments confirms your real effectiveness. Epicular wax extract extracted from leaves of pequi tree has shown antifungal activity by inhibiting the growth of *Cryptococcus neoformans* [9], and mulcida activity to combat the intermediate host causes the esquitossomose [10], leishmanicida effect by

inhibiting the proliferation of promastigota form of *Leishmania amazonensis* and antimicrobial activity by inhibiting the growth of enterobacteria [11]. The oil extracted from the pulp was found natural antioxidants decreased oxidative stress and, therefore, protection against DNA damage [12].

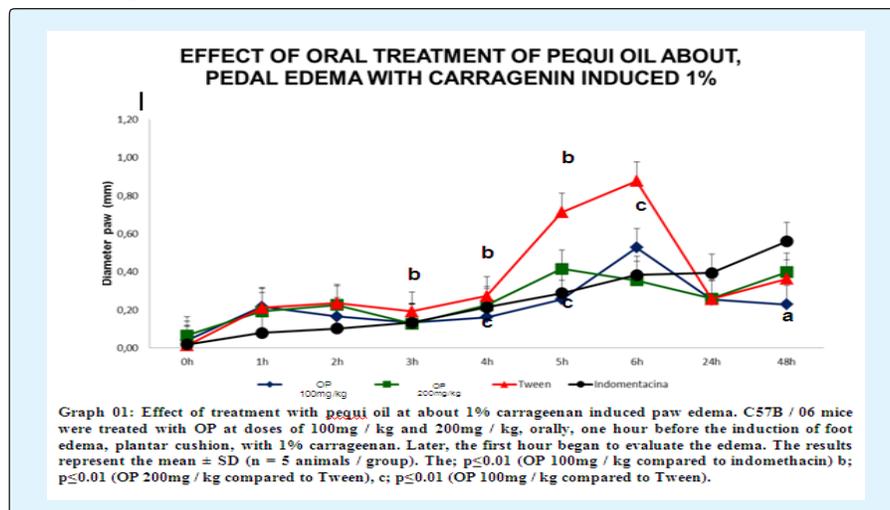
Despite being described the use of pequi tree in treating a wide variety of enfermi activities, with regard to your use as anti-inflammatory little has been seen in the scientific literature, the present study aims to investigate the effect of pequi oil on inflammatory response about murinho model of paw edema.

Materials and Methods

For experimental methodology, we used mice, females weighing 20 grams of C57BL/6 line, divided in groups, where the group 04 01 received pequi oil (OP) at a concentration of 100 mg/Kg; 02 Group received a concentration of 200 mg/Kg; the 03 Group received only the Tween® 80-vehicle of dilution (negative control); and the 04 group was treated with Indomethacin at a dose of 10 mg/Kg (positive control). After induction of the edema and the paws were treatments measured with the aid of a digital caliper until the sixth hour and later 48 hours and 24.

Results and Discussion

The results show that the OP on concentration 100 mg/Kg showed anti-inflammatory effect in the fourth and fifth time when compared to the positive control (indomethacin) and significant when compared to 48 hours, and in relation to the negative control in the fifth and sixth time. The concentration of 200 mg/Kg did not present anti-inflammatory effect, Graph 01.



Treatment with OP at concentrations of 100 and 200 mg/Kg, not significantly reduced the carrageen an-induced edema, when compared to the indomethacin group until the first 24 hours. However, there was a one-off for reduction, 100 mg/Kg, just in time to 48 hours when compared to all other treatments, this time featuring a chronic inflammatory response. It was observed, that the two orders of OP significantly reduced the swelling when compared to Tween® group, 200 mg/Kg in third, 4 and 5th hour and at a dose of 100 mg/Kg 4th, 5 and 6th hour.

Carrageen and triggers the inflammatory process mediated by prostaglandins, showing the peak between 2 to 3 hours after application. The inhibition of edema caused by carrageen an-related mechanism involves the synthesis of prostaglandins, in particular, PGE₂α and PGF₂α, being the activity compared to non-steroidal anti-inflammatory. Previously, it was shown that topical anti-inflammatory activity of *Calendula officinalis* is involved mainly the monoester triterpenoids of farandole. These studies have demonstrated that standardized extracts, on the presence of triterpenes produced anti-inflammatory activity similar to prostaglandin inhibitors, however, the Association of extracts of *C. officinalis* and *M. Recutita* the GECOMR® inhibited both the edema by carrageen an, dextran as, and antagonized the effect of histamine.

The anti-inflammatory activity of OP was confirmed by the model of carrageen an-induced paw edema, by reducing the volume displaced and reduction in edema. As an inflammatory agent, carrageen an induces inflammation by releasing prostaglandins, causing the formation of edema. Non-steroidal anti-inflammatory, such as indomethacin, inhibit cyclooxygenase, lowering prostaglandin biosynthesis. The oil OP tested has similar anti-inflammatory action in high concentrations as tested to 500 mg/kg but more tests are needed to verify this assertion. Other studies should be performed in order to better elucidate the possible mechanisms of action of OP on other different models of induction of inflammatory process.

Conclusions

Oral treatment with OP was not efficient to reduce edema, compared with the positive control (Group of indomethacin). In general the oil didn't influence on the reduction of edema, but other routes will still be tested.

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