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Original contributions

Effects of propolis in an experimental rat model of allergic rhinitis☆

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ABSTRACT

Purpose: The aim of this study was to determine the anti-allergic activity of propolis in an ovalbumin-induced rat model of allergic rhinitis.

Materials and methods: This prospective experimental study was conducted at Hakan Çetinsaya Clinical and Experimental Animal Research Center with 30 rats. After sensitization of all rats with 0.3 mg intraperitoneal ovalbumin plus 30 mg aluminum hydroxide for 14 days (first phase), rats were divided to five groups. In the second phase of the study 10 μL of ovalbumin was applied to each nostril for 21 days. Together with second phase, ketotifen (n:6), oral propolis (n:6), intranasal propolis (n:6) and intranasal mometasone furoate (n:6) were given to rats. A control group (n:4)(salin) and sham group (n:2) were planned. Symptoms were assessed on days 19, 22, 25, 30 and 35, resulting in 5 symptom scores: symptom scores 1–5. On day 35, nasal tissue was removed and histological examination was performed.

Results: When rats that received systemic and intranasal propolis were compared to controls, ciliary loss, inflammation, increase in goblet cells, vascular proliferation, eosinophil count, chondrocytes and allergic rhinitis symptom score were found to be decreased ($p < 0.05$).

Conclusions: It was found that propolis had anti-allergic effects on allergic symptom scores and nasal histology.

1. Introduction

Allergic rhinitis is a common disease with increasing incidence that leads to serious public health problems. It presents with rhinorrhea, sneezing, itching and symptoms of nasal congestion, which is characterized by inflammation of the nasal mucosa [1].

Many medical treatment modalities such as antihistamines, steroids, montelukast inhibitors and immunotherapy are used in

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the treatment of allergic rhinitis. In addition, many agents have been reported to have anti-allergic activity in traditional folk medicine in recent years. In contemporary medicine, these agents are being investigated using animal models of allergic rhinitis.

Propolis gains a strong, adhesive structure through the transformation of plant resin by honey bees. Botanical origin identification and chemical analysis studies were performed for Poplar propolis produced in Turkey [2]. Propolis is a pharmacologically active substance and contains flavonoids, phenolic acid and their esters and its components have anti-inflammatory and immunomodulatory effects. It was reported that propolis was used in the treatment of burns and wounds, gastric ulcer and against prostate hyperplasia [3,4]. In addition, it has been reported that propolis also has antimicrobial, anti-viral, antioxidant, anti-inflammatory and immunomodulatory effects [5–8].

In this study, we aimed to evaluate the potential anti-allergic activity of propolis on allergic rhinitis using an ovalbumin-induced rat model through assessing changes in mucosal histology and by a subjective symptom score.

2. Materials and methods

2.1. Animals

The study was conducted with 30 male Sprague–Dawley rats aged ≥6 weeks (weighing 250–300 g) at the Hakan Çetinsaya Clinical and Experimental Animal Research Center after approval of the Local Ethics Committee of Erciyes University on Animal Studies (approval #:2014/113). Rats were housed in cages (n = 5 for each cage) under standard conditions at a temperature of 21 °C, maintaining a 12-h dark–light cycle. All animals were fed with a standard commercial pellet diet and water ad libitum.

2.2. Study protocol and groups

It was planned to conduct this study with 30 rats, with 2 rats initially assigned as a sham group. Subsequently, in the first phase of the study, 28 rats, 0.3 mg of ovalbumin (Sigma–Aldrich, St. Louis, MO, USA) plus 30 mg aluminum hydroxide (in 1 ml saline) were given daily via an intraperitoneal route over 14 days in order to sensitize the rats. Drugs were applied at 12:00–13:00 pm. In the second phase of the study, 10 μL ovalbumin (20 mg/mL) was applied to each nostril using a micropipette during inspiration on alternate days. The rats were separated to five groups according to treatment patterns. Intranasal mometasone furoate (50 μg; Nasonex®, Merck, İstanbul, Turkey) group (n:6), oral ketotifen (10 mg/kg; Zaditen®, Novartis, İstanbul, Turkey) group (n:6), intranasal propolis (200 mg/kg) group (n:6), oral propolis (200 mg/kg) group (n:6) and control group (0.5 ml intranasal saline) (n:4). All medications were given for 21 days after the first phase of the study. Both nasal passages of the rats were included in the study and 60 nostrils (4 sham group) were assessed in total (Fig. 1).

2.3. Drug administration

The propolis sample was collected from Kayseri (Central Anatolia) in Turkey. Hand collected propolis was kept desiccated, in the dark, until processing. Thirty grams of propolis powder was dissolved in 100 ml of 70% ethanol solution for a week at room temperature. After a week, the ethanol extract was filtered and then evaporated using a vacuum evaporator [9]. The chemical content of propolis used in this study had previously been identified by gas chromatography/mass spectrophotometry [10].

Active substances were given in the second phase of the study. Ketotifen (10 mg/kg) was given via gavage until day 35 of the study. In the oral propolis group, 200 mg/kg propolis was given via gavage while propolis (diluted in saline) was applied to each nostril of rats during inspiration using a PPD injector in order to ensure that active substance was delivered to the nasal passage. In the positive control group of topical administration, mometasone furoate (50 μg) was applied to each nostril of the rats during inspiration using a PPD injector. All active substances were given 0.5 h after ovalbumin in order to avoid interaction of substances within the nasal passage. In the control group, saline was applied via an intranasal route. In the sham group, no substance was applied to the nasal passage.

2.4. Symptom assessment

Rats were subjectively monitored on day 16 to rate symptoms. Symptoms were assessed on days 19, 22, 25, 30 and 35, resulting in 5 symptom scores: symptom scores 1–5. An

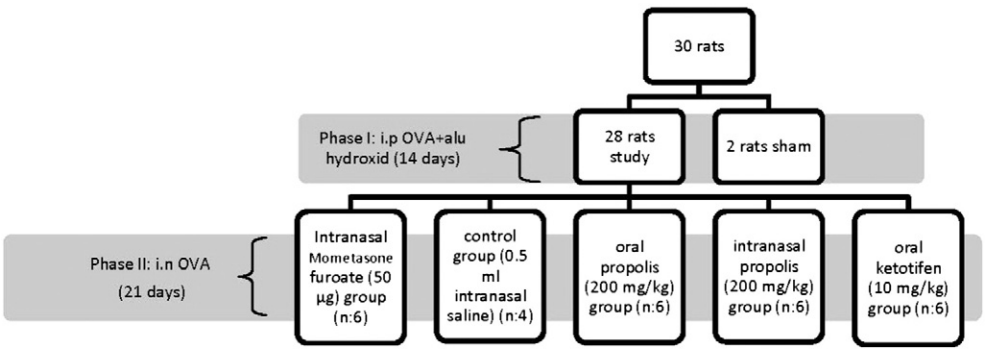

Fig. 1 – Experimental design Aberrations: ***i.p*; intraperitoneal, *i.n*; intranasal, *OVA*; ovalbumin, *alu*; aluminum hydroxide.**