Development and evaluation of an inhalation chamber for *in vivo* tests with drugs administered by pulmonary route

Eduardo Rodrigues da Silva[1], Danilo Ribeiro de Oliveira[1], Humberto Ribeiro Bizzo[2], Valdir Florêncio da Veiga Junior[3], Suzana Guimarães Leitão[1]

[1] Universidade Federal do Rio de Janeiro - Rio de Janeiro, Brazil
[2] Embrapa Food Technology – Rio de Janeiro, Brazil
[3] Universidade Federal do Amazonas - Manaus, Brazil
edu-rodrigues@hotmail.com

Keywords: Inhalation chamber, eugenol, headspace, inhalation.

The popular use of medicinal plants in the world is very diverse, being described in the literature various forms and routes of administration for homemade medicines (1). Among these different forms of use, we can highlight the practice of fumigation, in which the individual may receive varying doses of volatile active ingredients by inhalation. Thus, pharmacological evaluation employing an apparatus specifically designed and validated for this type of administration is extremely important. Many models have been described in the literature for assessment of essential oils by inhalation. However, some structural improvements can bring benefits to these works (2,3). Bearing this in mind and based on pre-existing models and group discussions, an inhalation chamber was developed to carry out pharmacological and toxicological tests on animals. This one has a central structure with five tubes connected. The animals are inserted in each one of these tubes and nebulized air passes directly and continuously through it, by the animal's snout, following then to an outlet at its distal part. Evaluation of its operation was performed using *Caryophyllus aromaticus* L. essential oil, a nebulizer and a flow meter. The air within the chamber was collected by static headspace and analyzed by GC-FID, employing a fast method of analysis developed for this purpose. It was found that the air flow in each of the five outputs of the chamber was 0.92 LPM. Essential oil analysis showed the presence of three major components, eugenol (85.0 %), eugenol acetate (4.8 %) and caryophyllene (10.3 %). Thereafter, some tests were performed increasing oven initial temperature, increase rate of this temperature and gas flow, and decreasing the maximum temperature to be reached by the oven. Thus, the method with 2.5 min duration, in which the oven temperature started from 160 °C increasing at a rate of 20 °C/minute up to 180 °C, without isotherm and gas flow of 5 ml/min, was chosen as the method of analysis. Using the developed method, it could be shown that between each collecting air ten displacements with the piston should be made to prevent the contaminants accumulation into the syringe during static headspace collecting. The chamber has been evaluated for 25 min nebulization, being air samples collected and analyzed each odd minute. The results show a homogeneous and continuous operation of the chamber without volatile material accumulation inside. In this way, it can be concluded that the inhalation chamber works satisfactorily for *in vivo* tests with medicines designed to be administrated by inhalation. Besides, it does not require a waiting time for saturation and subsequent insertion of animals since, from the first minute, the concentration of volatiles in its internal atmosphere does not vary.

1. Craag, M.G.; Newman, D.J. Biochim. Biophys. Acta, 2013, **1830**, 3670-3695.
2. Linck, V.M. et al. Phytomedicine, 2010, **17**, 679-683.
3. Bradley, B.F. et al. Physiol. Behav., 2007, **92**, 931-938.

Acknowledgements: Embrapa Food Technology.