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Fund “Nauka” Project № 25005 Resume – Competition-based Session 2025:
“Investigation of the effects of plant extracts in an imiquimod-induced psoriasis model in experimental animals”
Project leader: Assoc. prof. Silviya Gancheva Marinova, MD, PhD

The aim of the present project is to investigate the effects of Kochia scoparia and Levisticum officinale extracts, administered via an innovative topical drug delivery system, in an imiquimod-induced psoriasis model in rats.

Six hydrophilic liposomal creams will be developed, consisting of three formulations containing Kochia scoparia extract and three formulations containing Levisticum officinale extract, each at concentrations of 1%, 5%, and 10%. Two separate experimental settings will be conducted, one for each extract. Psoriasis will be induced in Wistar rats by daily topical application of 5% imiquimod cream for 10 consecutive days.

In each experimental setting, the animals will be allocated into six groups: one healthy control group and five groups with an induced psoriasis model. Among the latter, one group will remain untreated, one will be treated with a corticosteroid (positive control), and the remaining three groups will receive the developed formulations containing the respective plant extract at concentrations of 1%, 5%, and 10%. The creams will be administered using microneedle patches.

Clinical manifestations of the disease will be dynamically monitored throughout the treatment period by macroscopic evaluation of skin lesions and analysis of pruritic behavior in the experimental animals. Skin tissue samples will undergo histological examination and biochemical analyses to determine the levels of pro-inflammatory cytokines, growth factors, and antioxidant enzymes.

It is expected that the plant extracts, delivered via the innovative drug formulation, will improve the clinical manifestations of the modeled disease and completely or partially prevent the associated pathoanatomical alterations and biochemical disturbances in skin tissue. Dose dependency of the observed effects and their comparability with conventional therapy will also be assessed.

Expected results:

1. A total of six liposomal creams containing the investigated plant extracts at different concentrations will be developed;

2. The potential antipruritic, anti-inflammatory, and antioxidant effects of Kochia scoparia and Levisticum officinale extracts, administered dermally in the form of liposomal creams and delivered via microneedle patches, will be evaluated in an imiquimod-induced psoriasis model with respect to clinical manifestations, pathoanatomical changes, and biochemical alterations. Animals treated with imiquimod but not receiving the plant extracts are expected to develop skin lesions resembling those observed in patients with psoriasis, characterized by erythematous, scaly plaques accompanied by intense pruritus. Histopathological examination of tissue samples is expected to reveal epidermal hyperplasia, parakeratosis, hypogranulosis, and formation of microabscesses. Biochemical analysis of tissue homogenates is anticipated to show increased levels of the pro-inflammatory cytokines TNF-α, IL-6, and IL-17, as well as the growth factor VEGF, along with decreased levels of the antioxidant enzymes superoxide dismutase and catalase. Dermal application of the plant extracts in the form of liposomal creams is expected to improve the clinical manifestations of the modeled disease and to fully or partially prevent the associated pathoanatomical and biochemical alterations. Dose dependency of the observed effects will be assessed, as each extract will be administered at three increasing concentrations;
3. The antipruritic and anti-inflammatory effects of the investigated plant extracts will be compared with those of conventional topical psoriasis therapy using clobetasol, administered dermally as a 0.05% cream;
4. At least two full-text scientific publications will be prepared and published, with at least one appearing in a journal indexed in Web of Science and/ or Scopus;
5. At least two participations in scientific forums will be prepared and realized;
6. The doctoral dissertation of Dr. Gloria Stefanova Dimitrova, a full-time PhD candidate in the doctoral program “Pharmacology (incl. Pharmacokinetics and Chemotherapy)” will be completed.