SulFOX - a new hybrid compound with dermoprotective and dermotherapeutic potential

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Faced with the growing problem of drug resistance in bacteria, which are becoming increasingly resistant to existing therapies, the scientific community is introducing new solutions, among which new combinations of active substances, especially those with antimicrobial properties, seem to meet expectations as they produce the desired therapeutic effects. One promising line of research is the exploration of the possibility of creating hybrid systems of bioactive compounds based on existing substrates, which show the potential to achieve a complex therapeutic and nursing profile.

This poster focuses on research aimed at producing a new hybrid compound, SulFOX, with dermotherapeutic potential, specifically designed for the care and treatment of topical wounds and infectious dermatoses, especially acne lesions and burns.

SulFOX's almost eco-friendly and relatively simple hybrid manufacturing process, based on a patent-pending procedure, confirms its innovation. SulFOX represents a promising step forward in the field of dermotherapy, opening new perspectives in the treatment of local skin infections. The present research work is aimed at demonstrating the activity of the new product, dedicated to combating bacterial disorders, especially opportunistic ones, and promoting skin healing, which is crucial to improving patients' quality of life.

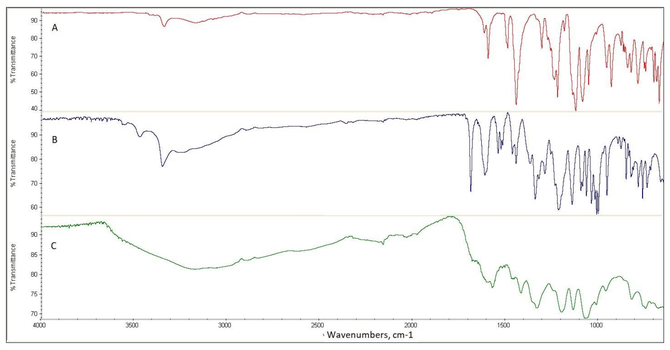

Figure 1: Spectra of substrates A and B and the final product SulFOX

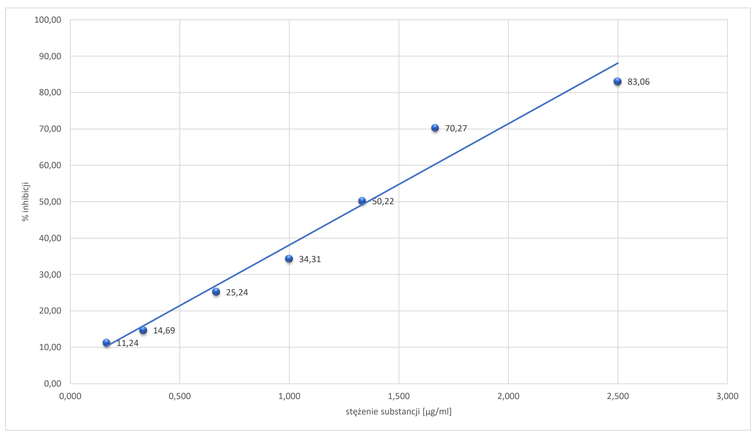

Fig. 2. Plot of % inhibition of DPPH radical as a function of SulFOX content

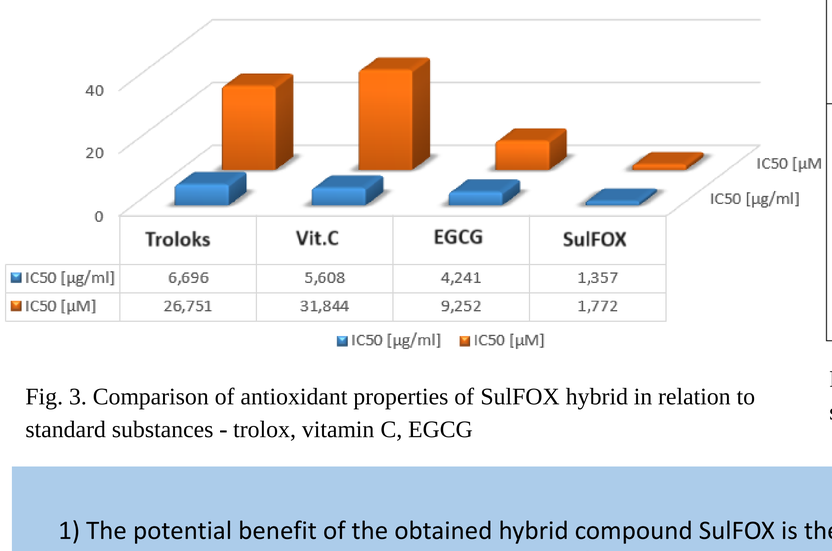

Fig. 3. Comparison of antioxidant properties of SulFOX hybrid in relation to standard substances - trolox, vitamin C, EGCG

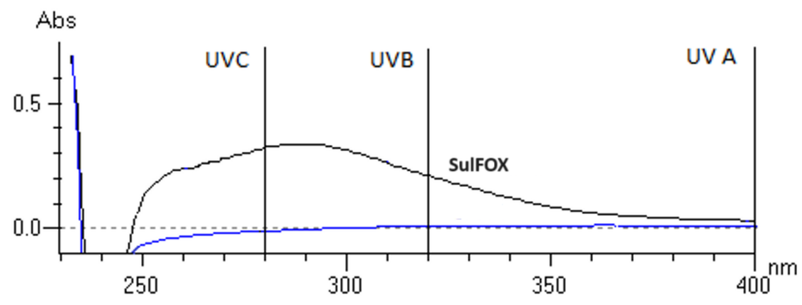

Fig. 4. Spectrophotometric analysis of SulFOX hybrid (black line)and substrate (blue line) in DMSO at a concentration of 0.001% in the wavelength range of 230-400 nm

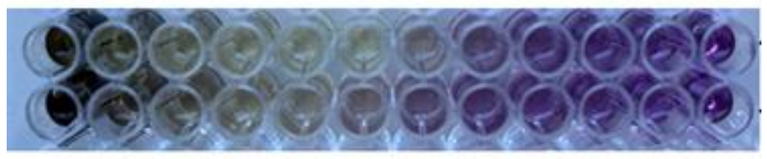

Fig. 5. Determination of IC50 values for SulFOX by DPPH method

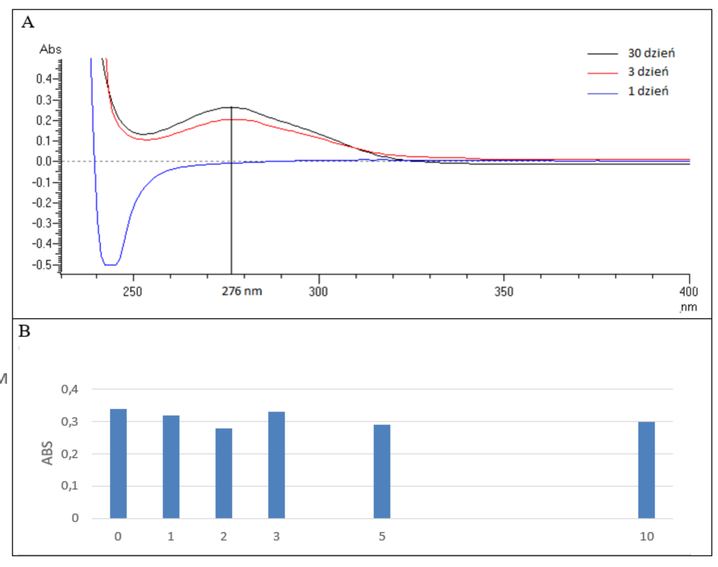

Figure 6: Absorbance spectra of the substrate on days 1, 3 and 30 of the study (A). Absorbance of SulFOX as a function of time (B)

The presence and mode of binding of active compounds in the hybrid structure was confirmed by FT-IR (Fig. 1.).

The antioxidant properties of the SulFOX hybrid with respect to substrates and a standard substance (Vitamin C) were determined by various methods with visual and quantitative evaluation, most favorably using the DPPH method based on the hybrid's ability to inhibit the DPPH- radical (Fig. 2, Fig. 5).

Based on the results obtained, a linear regression equation was determined (Fig. 2.):

I%= 33,335C (±2,69) + 4,779 (±3,58),
correlation coefficient = 0,9683.

Conclusion: the calculated IC50 value for:
SulFOX = 1,36 µg/ml (1,77 µM),

Determined profile of decreasing antioxidant activity: IC50 in µM) (Fig. 3.):
SulFOX ≥ EGCG > Trolox > Vitamin C.

Microbiological tests using the bacterial growth zone inhibition method confirmed the antibacterial activity of SulFOX, including against Cutibacterium acnes.

Test for potential UV sunscreen activity (Figure 4).

SulFOX may exhibit enhanced photoprotective potential with respect to the substrate due to its greater UV absorption capacity.

The stability of the SulFOX hybrid was determined by classical UV spectrophotometry with respect to substrate stability. The SulFOX hybrid had a stability during storage of 30 days in the refrigerator and at room temperature in daylight, significantly higher in relation to the stability of the substrate (observed changes in the UV spectrum of the substrate on day 3 of the test) (Fig. 6.).

Conclusions:

1) The potential benefit of the obtained hybrid compound SulFOX is the combination in one chemical individual of active substances with different courses of action, one with antibacterial properties and the other with antioxidant, immunomodulatory, anti-inflammatory and antimicrobial properties. Due to its potential immunomodulatory and anti-inflammatory activity, there is a possibility that it could be used in promoting wound healing, including acne wounds.

2) SulFOX exhibits multidirectional activities, especially antioxidant activity - elimination of free radicals and thus anti-aging activity.

3) It also absorbs unfavorable ultraviolet radiation from the UVA and UVB range, thus showing potential protection against skin photoaging, against excessive pigmentation.

4) And due to the modification of the antimicrobial component in the hybrid structure, SulFOX can prevent the progression of resistance by showing activity against drug-resistant bacterial strains.

5) SulFOX is practically insoluble in water which makes it possible to maintain a constant concentration of it at the site of application - in the wound, infectious lesion, and thus realize its full therapeutic and nursing potential - increasing efficacy and being able to reduce treatment time. In addition, the potential lack of penetration of the hybrid into the body results in relatively minor adverse effects.

6) The obtained hybrid combination is relatively stable with respect to the substrate, In turn, due to the possibility of hydrolysis of the hybrid combination in contact with the skin, SulFOX can be treated as a carrier for the slow release of "non-hybrid" precursors affecting the prolongation of their biological action.

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In scientific research, efforts were directed towards seeking a novel approach to the treatment and care of cutaneous infections, particularly acne-related ones. Through "ala" biosynthesis, a SulFOX hybrid was obtained, potentially amalgamating antibacterial, antioxidant, immunomodulatory, and anti-inflammatory properties. It may also demonstrate protection against UV radiation and prevent the development of bacterial resistance. Furthermore, it is practically insoluble in water, enabling the maintenance of a constant concentration at the application site - the acne lesion, thereby enhancing effectiveness and reducing treatment duration. The SulFOX hybrid is relatively durable and can act as a slow-release precursor carrier, leading to an extension of their biological activity. The SulFOX hybrid holds promise as a solution in the care and treatment of cutaneous infections.

References:

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