

FUNDING PROGRAMME: UEFISCDI Executive Agency for Higher Education, Research, Development and Innovation Funding SUBPROGRAMME: M-ERA.NET, Call 2023	 EXECUTIVE AGENCY FOR HIGHER EDUCATION, RESEARCH, DEVELOPMENT AND INNOVATION FUNDING
PROJECT TITLE/ACRONYM: Smart rumen composites for metabolic diseases/SMARTCAP	
CONTRACT NO.: 73/2024	
TOTAL PROJECT BUDGET: (including co-financing):1.348.400 EURO INCDTP'S BUDGET: 130.000 EURO	
PROJECT STARTING DATA: 1/04/2024 PROJECT ENDING DATA: 1/04/2027	
WEB PAGE: https://incdtp.ro/icpi/pdf/proiecte/web_M_ERA_NET_RO-AEC.pdf	
PARTNERS: ► CO: National Research and Development Institute for Textile and Leather (RO) - Dr. Chim. Madalina ALBU KAYA   ► P1: National Institute for Research & Development in Chemistry and Petrochemistry (RO) - Dr. Ing. Zina Vuluga  ► Mustafa Kemal University (TR) - Prof. Dr. Durmus Alpaslan KAYA  ► Korea Institute of Ceramic Engineering and Technology (KR) - Dr. Byoung Seung Jeon  ► ULSAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY (KR) - Prof. Dr. Robert Mitchell  ► Yüzüncü Yıl University (TR) - Prof. Dr. Taylan Aksu  ► HANONG Co.,Ltd. (KR) - Mr. Ju Cheol Choi 	
GENERAL OBJECTIVES: The main objective of the project is to develop smart rumen capsules and illite feed additive (IFA), a last generation composites based on natural active ingredients such as natural gelatine, zeolite, illite, violacein and essential oils. These new composite materials are expected to provide long term retention in rumen of animal in order to be used for reducing incidence of nutritional metabolic diseases and greenhouse gas production from ruminal fermentation. SPECIFIC OBJECTIVES/ EXECUTION PHASES: The first objective of this project is identification of requirements and specifications for processing high performance composites as smart rumen capsules and IFA. Second objective is to design and develop smart capsules and IFA by valorization of natural resources. Third objective is to characterize and evaluate the SMARTCAP and IFA. Fourth objective is to demonstrate and validate the green manufacturing processes and prototypes in relevant environment.	

Fifth objective is to facilitate successful exploitation of results.

NOVELTY ELEMENTS/ SCIENTIFIC CONCEPT:

The SMARTCAP approach generates a new concept of development natural performance composite materials with smart properties and controlled release of active ingredients, with applications in veterinary medicine.

EXPECTED EXPLOITABLE RESULTS:

- Experimental models: hard gelatine and soft gelatine; activated / modified zeolite; report about physical-chemical characterization,
- Lab Technologies: technology of obtaining gelatine (hard and soft), activated zeolite, modified zeolite,
- Experimental model for SMARTCAP capsule
- Products: SMARTCAP capsules;
- Lab Technology for obtaining SMARTCAP capsule;
- Report about biodegradation;
- Prototypes – SMARTCAP capsule
- Technical specifications and product safety data sheets,
- Patent applications – 2;
- Published articles – 6 in high ranked journals;
- Participation in conferences – 20;
- Organizing workshops and roundtables – 3;
- Website: 1.

OBTAINED RESULTS:

Results stage I / 2024:

- ✓ Experimental models: hard gelatine and soft gelatine.
- ✓ Reports of physico-chemical and degradation analysis of gelatines.
- ✓ Study on (i) affinity of gases (released in the microbial fermentation process) for a specific zeolite depending on the nature and content of exchange cations in the zeolite, (ii) antimicrobial activity of the zeolite depending on the type of active cation and the content of bioactive agents that can be released in a controlled manner and (iii) method of obtaining and performance of gelatine/zeolite nanocomposites required by the field of use (veterinary medicine).
- ✓ Research report of the development of experimental model for the activation of clinoptilolite.
- ✓ Report on the selection of safe ingredients for the development of SMARTCAP.
- ✓ Web page.
- ✓ Participation on conferences/symposia.
- ✓ SMARTCAP Workshop - International Workshop „From concept to first experiments” attended by all representatives of the consortium partners, both physically and online.

DISSEMINATION, PATENT APPLICATIONS, AWARDS:

- **WoS published papers:** Coman, A.E.; Marin, M.M.; Roşca, A.M.; Albu Kaya, M.G.; Constantinescu, R.R.; Titorencu, I. Marine Resources Gels as Main Ingredient for Wound Healing Biomaterials: Obtaining and Characterization. Gels 2024, 10, 729. <https://doi.org/10.3390/gels10110729>, WOS: 001365043000001
- **Scientific communications:**
 1. George-Mihail TEODORESCU, Zina VULUGA, Madalina Georgiana ALBU KAYA, Cristian Andi NICOLAE, Raluca Augusta GABOR, Marius GHIUREA, Gabriel VASILIEVICI, Valentin RADITOIU, Monica RADULY, Roxana BRAZDIS, Natural Zeolite Clinoptilolite Modified for Metabolic Diseases of Ruminant, poster (awarded by the Scientific Committee of PRIOCHEM 2024), International Symposium "Chemistry Priorities for Sustainable Development"- Book of Abstracts no. 20/2024, Bucharest, October 16-18, 2024).
 2. Alina Elena COMAN, Madalina ALBU KAYA, Elena-Emilia TUDOROIU, Denisa Ioana UDEANU, Mihaela Violeta GHICA, Collagen Extracted from Perch Skin: Rheological Characterization and in vivo Animal Studies, oral presentation, Proceedings of the 10th International Conference on Advanced Materials and Systems, doi 10.2478/9788367405805-009.

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