

Ministry of Education and Science of Ukraine

National University of Food Technologies

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**International scientific conference  
of young scientist and students**

**"Youth scientific achievements  
to the 21st century nutrition  
problem solution"**

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**Part 2**

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Міністерство освіти і науки України

Національний університет харчових технологій

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**89**

**Міжнародна наукова  
конференція молодих учених,  
аспірантів і студентів**

**"Наукові здобутки молоді –  
вирішенню проблем  
харчування людства у ХХІ  
столітті"**

**3-7 квітня 2023 р.**

**Частина 2**

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### **3. Microorganisms cells destruction by mechanical method: justification of research relevance**

Kateryna Hrininh<sup>1</sup>, Kostiantyn Omelianenko<sup>1</sup>,  
Oleksii Gubenia<sup>1</sup>, Ionut Avramia<sup>2</sup>

*1 – National University of Food Technologies, Kyiv, Ukraine*

*2 – Stefan cel Mare University, Suceava, Romania*

**Introduction.** There are assumptions that the topic of destruction of cells and tissues on an industrial scale is relevant. This topic is not sufficiently disclosed in the literature. Before carrying out a scientific project on the cells destruction, this topic relevance should be substantiated.

**Materials and methods.** Analysis of scientific literature, advertising data from the network, survey of experts.

**Results and discussion.** Examples of the use of cell destruction:

- Destruction of yeast to release many substances both from the cell contents (proteins, enzymes, etc.) and walls (extraction of betaglucan)
- Destruction of unicellular algae for the release of target products
- Destruction of genetically engineered strains cells of bacteria that synthesize recombinant proteins (that is, those that are not synthesized naturally) - human insulin, somatrophin, intraferon, etc.). They are located in the cytoplasm in the form of rings of inclusions (granules, droplets or crystals). To extract them, it's needed to destroy the cell. In addition, vitamins, enzymes, medicinal substances - antibiotics, etc. can be synthesized in the cells.

There are known ways of destroying cells. Non-mechanical (delicate) methods - osmotic and other lysis, chemical methods (detergents, etc., but it sometimes destroy the target components), osmotic shock, alkaline treatment.

Harder (mechanical methods):

- Ultrasonic - treatment of a cooled suspension with ultrasonic waves. Disadvantage – rapid wear of working elements, low productivity, heating, only for small volumes.
- By pressure (probably in high-pressure homogenizers, by pushing through a small hole).
- Crushing of a small amount of product (grinding, sometimes in a frozen state) - with a pestle and mortar with fine sand or beads.
- Mechanical homogenization in high-speed paddle-type blenders, etc., is more appropriate for tissue destruction.
- In bead mills, probably by abrasion between the beads.

*Assumption.* In contrast to the crushing of solid bodies, the destruction of cells has a another nature. It is only necessary to damage the wall without grinding it completely. It is not known what properties are inherent in the cell – it is probably elastic, deforms between working elements, slips out, and then restores its shape.

**Conclusion.** The topic microorganisms cells destruction by the industrial methods is relevant. The tasks are to substantiate the advantages and disadvantages of bead mills, to determine the influence of process parameters on productivity and quality, to establish the kinetics of cell destruction.