

POTENTIAL OF MICROENCAPSULATION IN CHEESE PRODUCTION (2019. – 2022.)

KK.01.1.1.04.0058

University of Zagreb, Faculty of Agriculture
Department of Dairy Science
Reference Laboratory for milk and dairy products



Assist.Prof. Nataša Mikulec PhD.
Manager of Reference laboratory
Project Manager



- Contract signed 20.12.2019.
- Total of 24 projects approved as a part of the call: "Investment In Science And Innovations - First Call"
- Total accepted project cost – 7.298.987,13 HRK.
- Total non-refundable funds - 6.077.044,95 HRK
- Maximum support amount among 24 valuable projects
- The aim of this program: To aim the science sector into a cooperation with business sector
- The demand for results of this project was to be proven to get the funding approved.

- Project research team members: total 19 researchers

Faculty of Agriculture

Milk and cheese research group (10 members)

doc.dr.sc. Nataša Mikulec
prof.dr.sc Dubravka Samaržija
prof. dr.sc Neven Antunac
doc.dr.sc. Iva Dolenčić Špehar
dr.sc. Jasminka Špoljarić
dr.sc. Šimun Zamberlin
Fabijan Oštarić, mag.ing.agr.

Iva Horvat Kesić, dipl.ing.

Dijana Plavljanić, dipl. ing.

Biljana Radeljević, dipl. ing.

Genetics research group (3members)

izv.prof.dr.sc. Vlatka Čubrić Čurik

doc.dr.sc. Maja Ferenčaković

dr.sc. Vladimir Brajković

Microencapsulation research group (2 members)

izv.prof.dr.sc. Marko Vinceković

doc.dr.sc. Luna Maslov Bandić

Faculty of veterinary medicine

izv.prof.dr.sc. Vesna Dobranić

Microbiology research group (3 members)

izv.prof.dr.sc. Nevijo Zdolec

Marta Kiš, dr.vet.med.

Ruđer Bošković Institute

Microbiology research group (1 member)

dr.sc. Snježana Kazazić, research
associate

PROJECT PARTICIPANTS

Project coordinator:

University of Zagreb

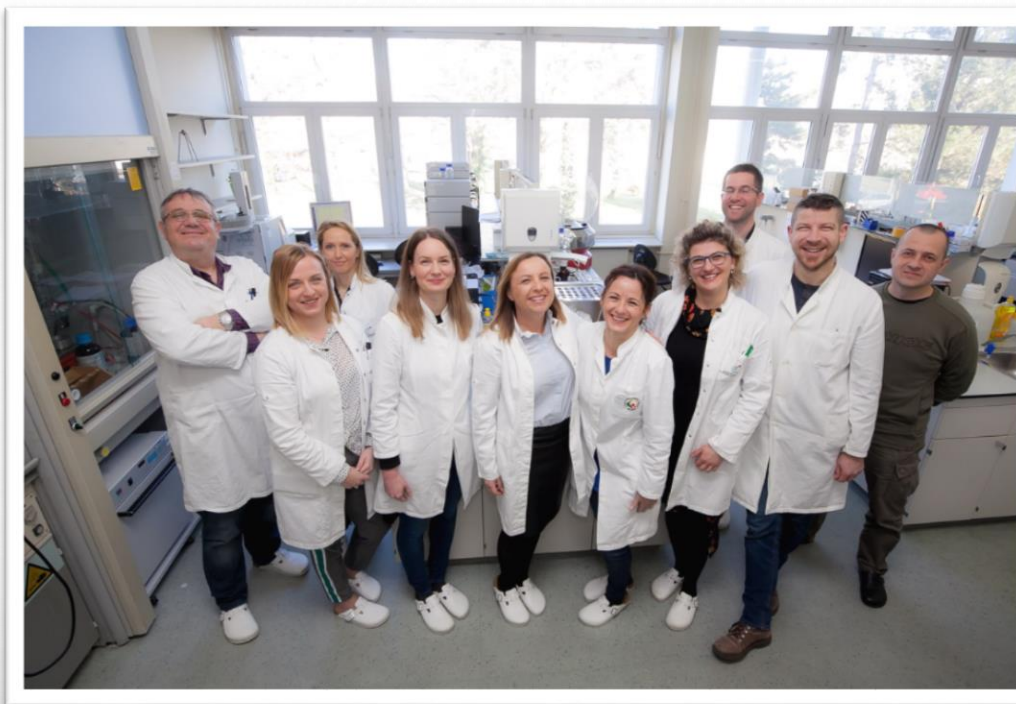
Faculty of Agriculture

Department of Dairy Science

Reference Laboratory for milk and milk products

→ Milk and cheese research group:

1. Doc.dr.sc. Nataša Mikulec
2. Prof.dr.sc. Dubravka Samaržija
3. Prof.dr.sc. Neven Antunac
4. Doc.dr.sc. Iva Dolenčić Špehar
5. Dr. sc. Jasminka Špoljarić
6. Dr. sc. Šimun Zamberlin
7. Fabijan Oštarić, mag.ing.agr.
8. Iva Horvat Kesić, dipl.ing.
9. Dijana Plavljanić, dipl. ing.
10. Biljana Radeljević, dipl. ing.



PROJECT PARTICIPANTS

University of Zagreb
Faculty of Agriculture
Department of Animal Science

→ **Research group for genetics:**

1. Izv.prof.dr.sc. Vlatka Čubrić Čurik
2. Doc.dr.sc. Maja Ferenčaković
3. Dr.sc. Vladimir Brajković



PROJECT PARTICIPANTS

University of Zagreb
Faculty of Agriculture
Department of Chemistry

→ **Microencapsulation research
group:**

1. Izv.prof.dr.sc. Marko Vinceković
2. Doc.dr.sc. Luna Maslov Bandić



PROJECT PARTICIPANTS

Project partner:

University of Zagreb

Faculty of Veterinary Medicine

Department of Hygiene, Technology and
Food Safety

→ Microbiology research group:

- Izv.prof.dr.sc. Vesna Dobranić
- Izv.prof.dr.sc. Nevijo Zdolec
- Marta kiš, dr.vet.med.



PROJECT PARTICIPANTS

Project partner:

Ruđer Bošković Institute

Department of Physical Chemistry

→ **Microbiology research group:**

- Dr.sc. Snježana Kazazić



HYPOTHESIS

- Procedure will protect enzyme activity which will have a significant effect on cheese quality, yield and production process
- Also, a) will be used as a method of conservation of biodiversity
 - b) will be used as a part of production technology for all types of cheeses but mainly „boutique” varieties or traditional cheeses
- This type of product will bring diversity to producers in the same region, save biodiversity, and upgrade dairy production in rural areas

PROJECT GOALS

- To sequence DNA genotype from Pag sheep (Paška ovca)
- To extract coagulation enzymes from suckling lamb's *Abomasum*
- To extract Starter lactic acid bacteria from milk and suckling lamb's *Abomasum*, cheese and milk
- Prepare rennet with starter cultures in microencapsulated form
 - **Innovation in cheese production**
- Confirm new innovative technologies as a new standard for:
 - Rennet and LAB production
 - Cheese production
 - Conservation of biodiversity
 - Protection of traditional cheese production and foundation for „boutique” production varieties

RESEARCH TIMELINE

1. Signing the contract
2. Public procurement activities:
 - I. Working stations and software for genomic data analysis
 - II. Chemicals and expendable materials for research (field work, chemical, microbiological, physical, microencapsulation material)
 - III. Rotational vaporator (for vaporizing solvents from extracts)
 - IV. Research material from animal origin (milk, abomasum, cheese)
 - V. External special services (DNA sequencing, rennet electroforesis, electronic microscopy)
 - VI. MALDI TOF system upgrade

RESEARCH TIMELINE

2. Public procurement activities:

VII. Laboratory instruments purchase:

- ICP – MS → Inductively coupled plasma spectroscopy

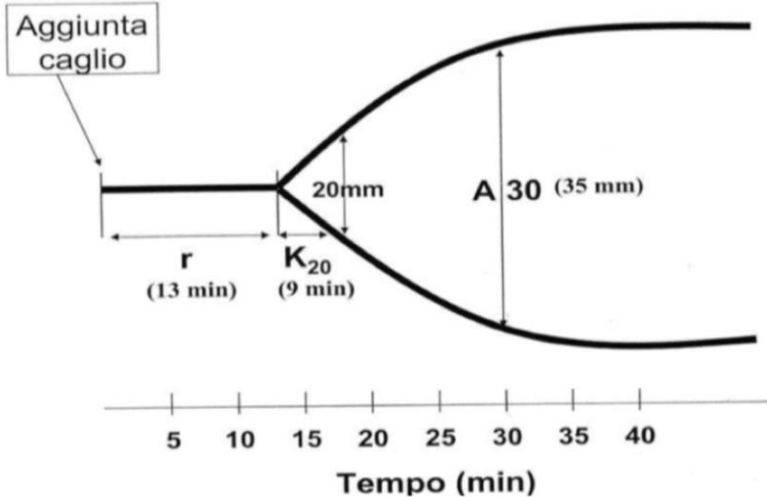


RESEARCH TIMELINE

2. Public procurement activities:

VII. Laboratory instruments purchase:

➤ LAKTODINAMOGRAF



RESEARCH TIMELINE

2. Public procurement activities:

VII. Laboratory instruments purchase:

- GC – MS gas chromatograph



RESEARCH TIMELINE

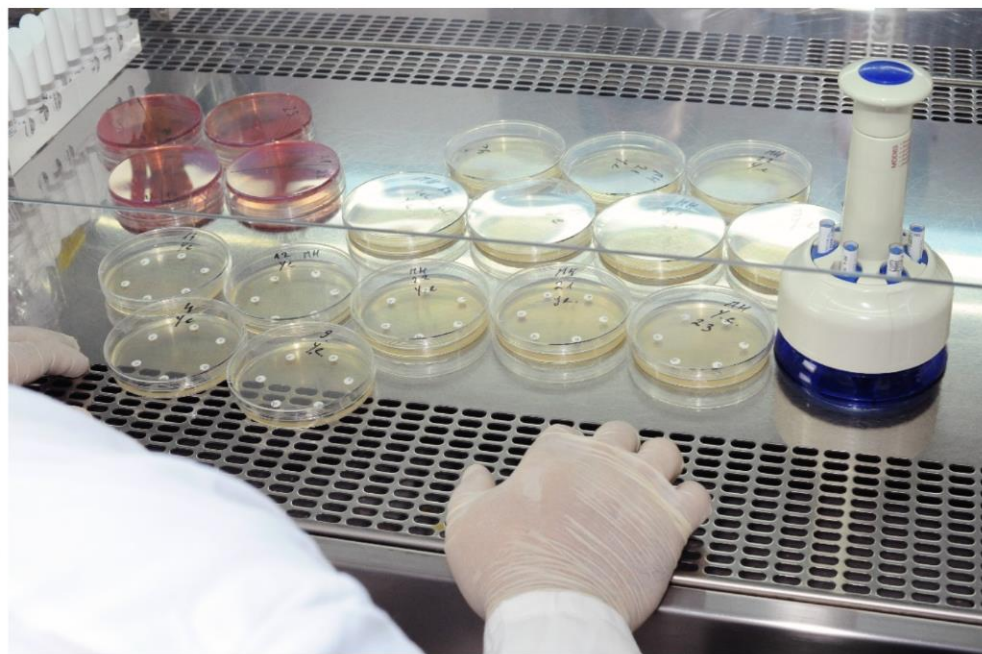
3. Field research, sampling and preliminary research

I. DNA sampling from sheep



RESEARCH TIMELINE

3. Field research, sampling and preliminary research
 - II. Preliminary rennet extraction
 - III. Preliminary indigenous lactic acid bacteria determination

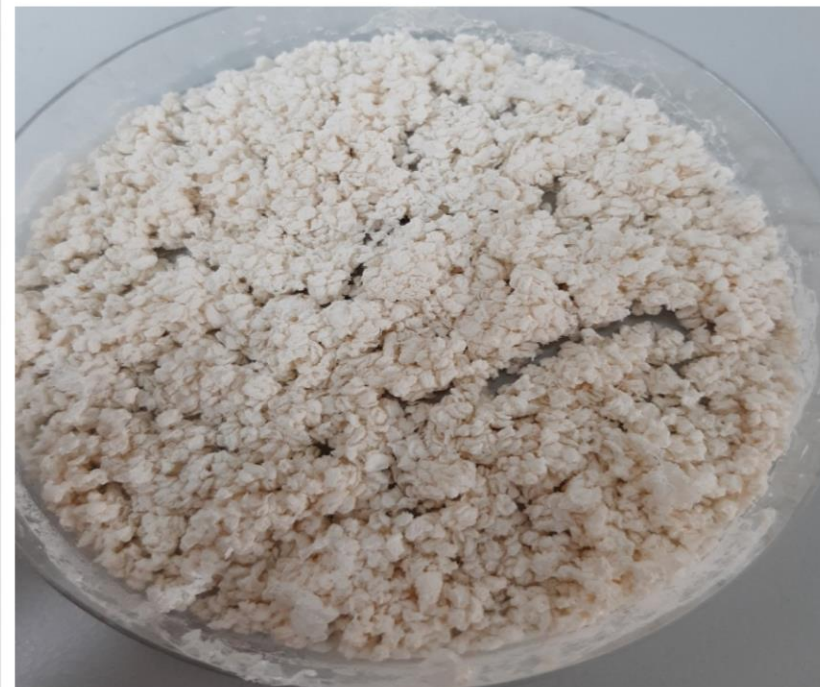


RESEARCH TIMELINE

3. Field research, sampling and preliminary research

IV. Preliminary microencapsulation tests

- Needed to optimize rennet concentration, microcapsules size, efficiency etc.
- Completely new type of capsules containing 2 bioactive components are in development



RESEARCH TIMELINE

3. Field research, sampling and preliminary research

V. Preliminary coagulation properties testing



RESEARCH TIMELINE

4. Future research and project activities

- I. Data analysis of sequenced DNA
- II. Lamb abomasum collection and rennet extraction
- III. Lactic acid bacteria (LAB) determination and multiplication
- IV. Rennet and LAB microencapsulation (capsules optimization)
- V. Laboratory analysis of rennet, LAB cultures, microcapsules
- VI. Small scale field test in Pag cheese production (OPG scale)
 - a) Production with microencapsulated rennet (control and test line)
 - b) Cheese sampling on 0. , 30., 60., 90., 120. day of maturation
 - c) Tracking maturation process and effect of capsulated rennet and SLAB on ripening process
- VII. Laboratory analysis of taken samples

RESEARCH TIMELINE

4. Future research and project activities

VIII. Data processing and statistical analysis

IX. Large scale testing in industry conditions (Dairy on Island Pag)

- a) Production with microencapsulated rennet (control and test line)
- b) Cheese sampling on 0., 30., 60., 90., 120. day of maturation
- c) Tracking maturation process and effect of capsulated rennet and SLAB on ripening process

X. Data processing and statistical analysis

XI. Finalization of research and preparation of product available for marketing

XII. Patenting of technology

XIII. Presenting results and technology to Dairy sector in Croatia

XIV. Writing and publishing scientific papers on this topic

CONTACTS AND PROJECT INFORMATION

1. Assist.prof. Nataša Mikulec PhD, Project Manager

➤ Tel.: +385 1 2393904

fax.: +385 1 2393988

e. nmikulec@agr.hr

2. Fabijan Oštarić, mag.in.agr., Assistant

➤ Tel.: +385 1 2393904

fax.: +385 1 2393988

e. fostaric@agr.hr

Potential of microencapsulation in cheese production (KK.01.1.1.04.0058)

W. <http://sirjein.agr.hr/>

E. sirjein@agr.hr

THANK YOU FOR THE ATTENTION



Sir
je  N

