



ESAC – IPC
College of Agriculture – Polytechnic Institute of Coimbra
Department of Food Science and Technology

LECTURE 2.

WHEY PROTEIN EDIBLE COATINGS WITH ANTIMICROBIAL ACTIVITY IN RIPENED CHEESE



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Erasmus mission

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2017

Part D. nonconventional applications



WPC



films



active coatings



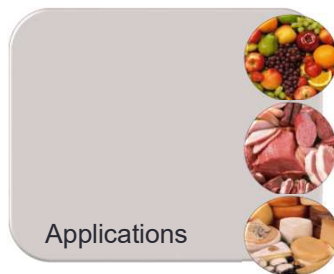
Films & Coatings

- Food Safety
 - Ensure microbiological safety and food protection from the influence of external factors
- Edible coatings
 - Natural
 - Biodegradable
 - May incorporate active ingredients and additives
 - May present similar properties to the synthetic coatings



Whey protein coatings applications

- Proved Characteristics...
 - ↓ Small water retention capacity (hydrophilic)
 - ↑ High oil and oxygen barrier capacity (similar to some synthetic polymers)
- Improve food characteristics with the incorporation of antioxidants and antimicrobials.



Fruits

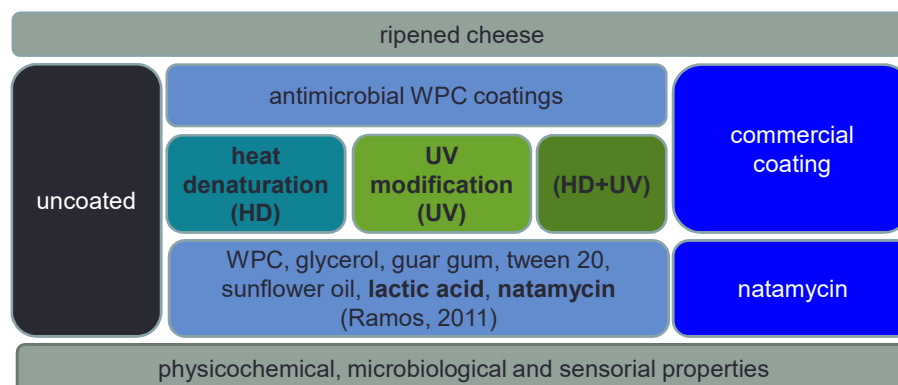
Fresh/processed meat

Cheese

Motivation

- Replacement of **conventional/synthetic** coatings (PVA) by **natural coatings** with antimicrobial activity
- **Whey protein** valorization (WPC) from dairy industry by-products
- Use of **natural** bioactive compounds as **antimicrobials**
- Evaluate how whey protein **polymerization method** influences the performance of cheese coatings
- Assess the effectiveness of **antimicrobial whey protein edible coatings** on cheese







Part D. WPC-based coatings with antimicrobial activity



Coating types

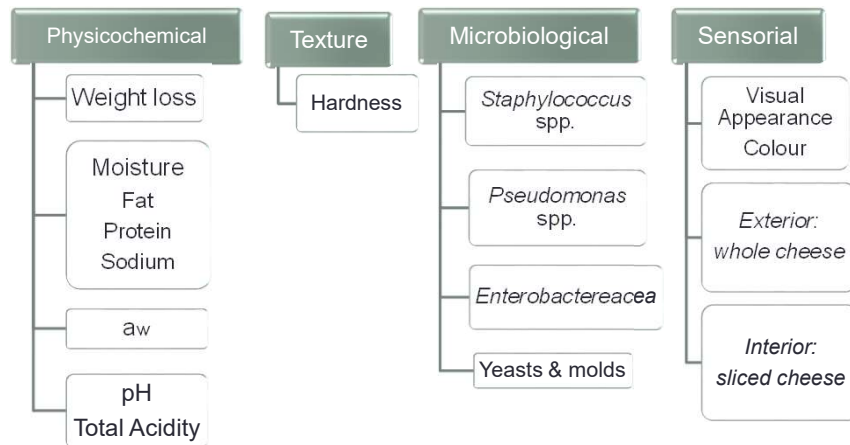
| Commercial | HD Heat denaturation | UV UV polymerization | HD+UV |
|--|--|-------------------------|-------|
| PVA Polyvinyl alcohol | WPC Whey protein concentrate: 10% (w prot/w coat) Glycerol (plasticizer): 50% (w gly/w prot) Guar gum (thickener): 0.7% (w thick/w coat) Sun flower oil (hydrophobic compound): 10% (w oil/w coat) Tween 20 (surfactant): 0.2% (w surf/w coat) | | |
| Antimicrobial Natamycin 2.5 g/L | Antimicrobials Lactic acid: 6 g/L Natamycin: 0.125 g/L | | |
| Positive control | Photoinitiator Irgacure 2969: 3.5% w phot/w prot | | |
| Negative control | Uncoated cheese | | |

Polymerization methods

| Commercial | HD Heat denaturation | UV UV polymerization | HD+UV |
|--|--|---|---|
| Coating application  | Heat treatment Coating application  | Coating application  UV treatment  | Heat treatment Coating application  UV treatment  |
| Dry | Dry | Dry | Dry |

Coating performance on cheese

Cheese properties



Part D. WPC-based coatings with antimicrobial activity

Cheese - physicochemical properties

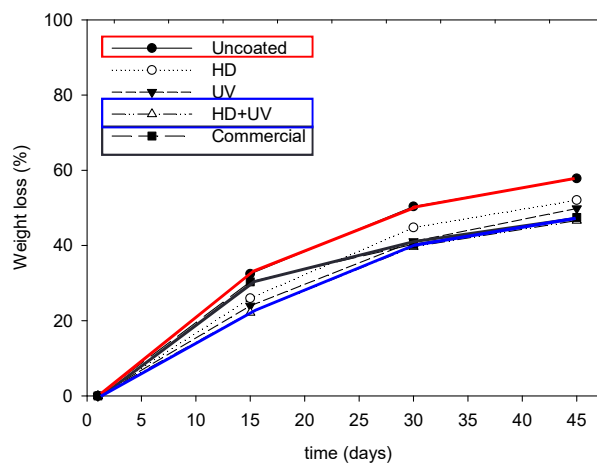
Weight loss

Uncoated
57% weight loss

Coated
46-52% weight loss

- small cheese size
- large ripening period

The coating type and polymerization method influence the weight loss profile



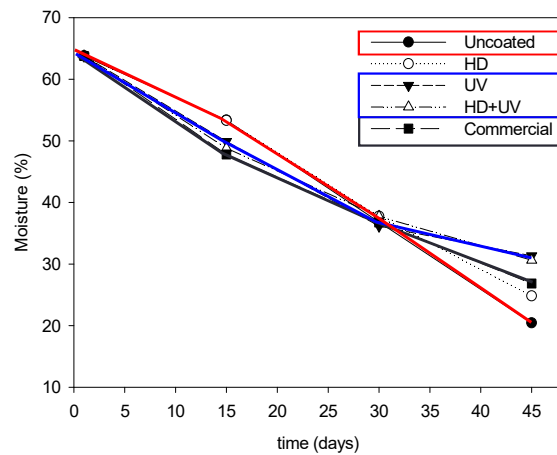
Cheese - physicochemical properties

Moisture content

Uncoated
43% water loss

Coated
33-39% water loss

UV and **HD+UV**
coatings are more
effective than
commercial coating



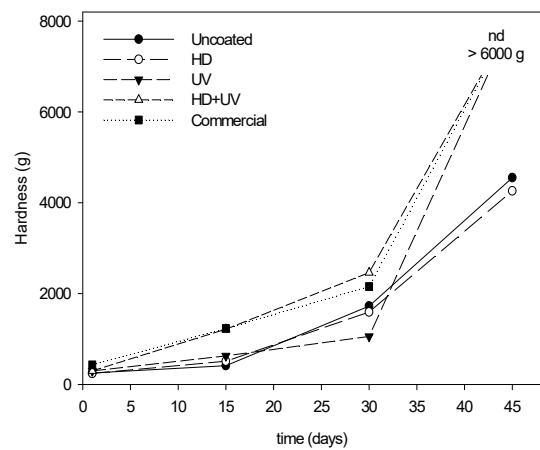
Cheese - texture properties

Hardness

HD and **Uncoated** cheese
have the lower hardness
profiles

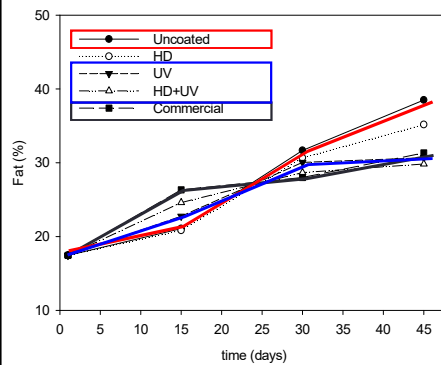
HD+UV and **Commercial**
coatings have the higher
hardness profiles

Higher hardness
Higher effectiveness
preventing water loss

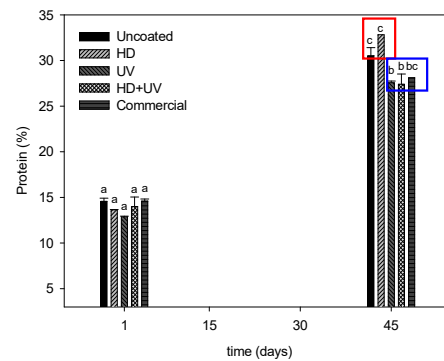


Physicochemical properties

Fat content

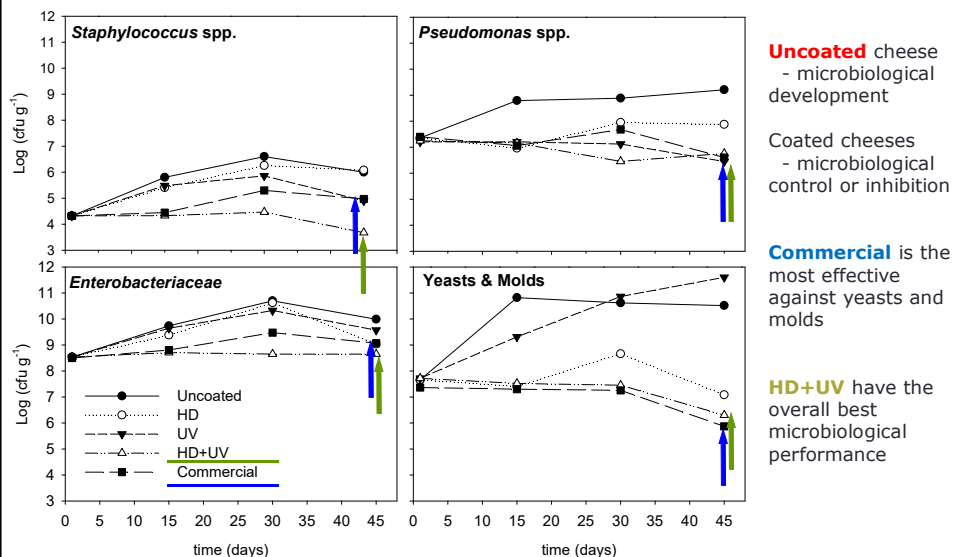


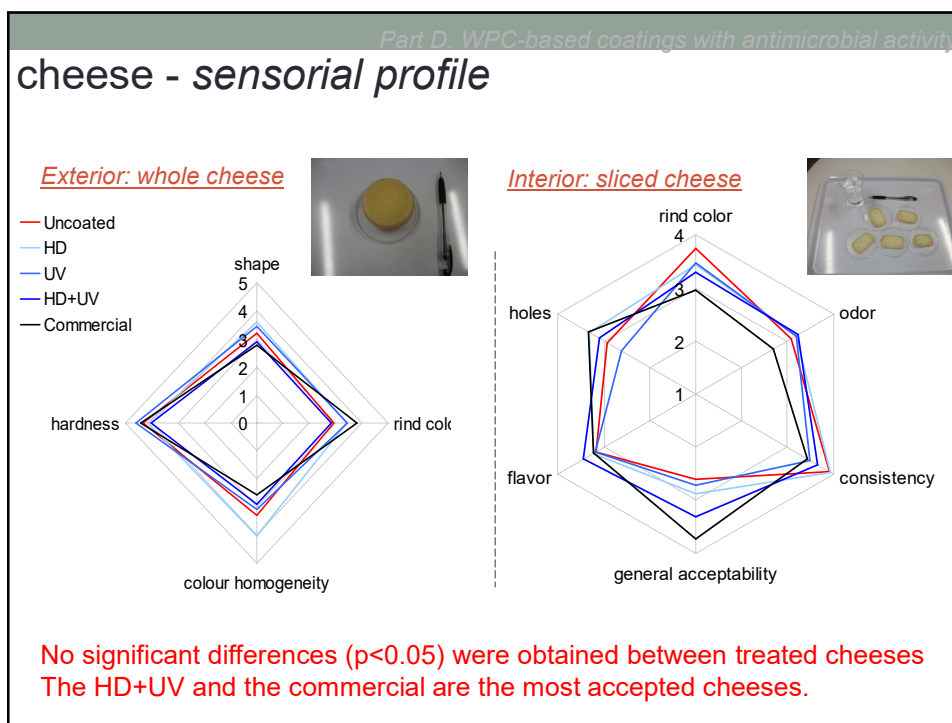
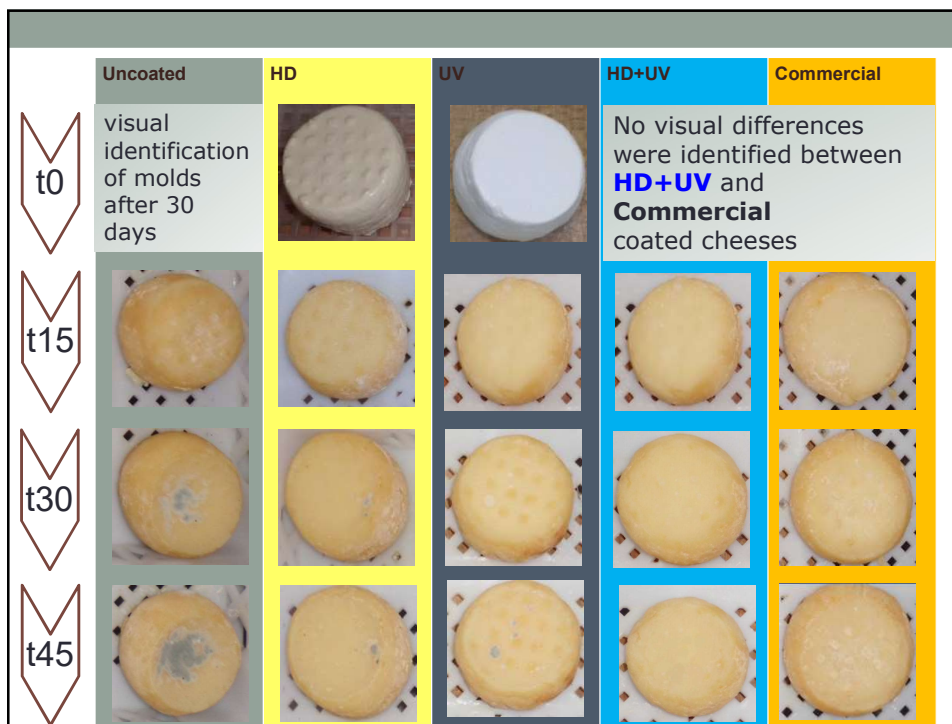
Protein content



Part D. WPC-based coatings with antimicrobial activity

cheese - microbiological profile





Conclusions *in more detail...*

- It was possible to produce natural whey protein edible films with antimicrobial activity
- The protein polymerization method influences the coating performance on cheese
 - Using only heat denaturation did not improve significantly the coating efficiency
 - UV polymerization improved the coating efficiency
- Antimicrobial Whey Protein HD+UV coating
 - prevents more efficiently water loss
 - leads to physicochemical cheese composition similar to the commercial coating
 - prevents and inhibits microbial growth
 - brings a good visual appearance to cheese
- **Antimicrobial whey protein-based edible film produced by HD+UV polymerization is an effective alternative to commercial coatings**

team

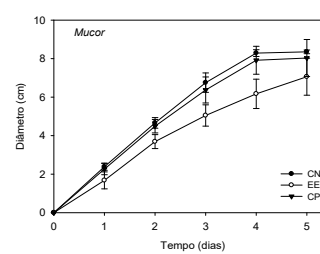
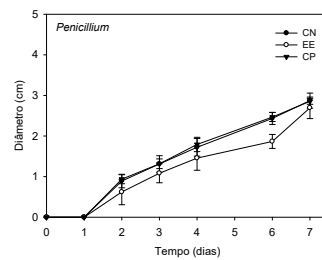
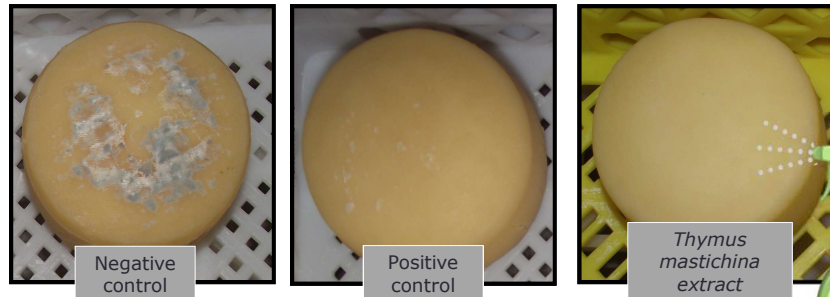


Carlos Pereira



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Currently...



TANKS FOR YOUR
ATTENTION



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