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### FORMATION OF PEPTIDE LAYERS AND ADSORPTION MECHANISMS ON A NEGATIVELY CHARGED CATION-EXCHANGE MEMBRANE

Mathieu Persico, Sergey Mikhaylin, Alain Doyen, Loubna Firdaous, Riadh Hammami, Mickaël Chevalier, Christophe Flahaut, Pascal Dhulster, Laurent Bazinet

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1                   **FORMATION OF PEPTIDE LAYERS AND ADSORPTION MECHANISMS**  
2                   **ON A NEGATIVELY CHARGED CATION-EXCHANGE MEMBRANE**

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4 Mathieu Persico<sup>a,c</sup>, Sergey Mikhaylin<sup>a,c</sup>, Alain Doyen<sup>a</sup>, Loubna Firdaous<sup>b</sup>, Riadh Hammami<sup>a</sup>, Mickaël  
5 Chevalier<sup>b</sup>, Christophe Flahaut<sup>b</sup>, Pascal Dhulster<sup>b</sup>, Laurent Bazinet<sup>a,c\*</sup>

6 <sup>a</sup> *Institute of Nutrition and Functional Foods and Department of Food Sciences, Université Laval,*  
7 *Québec, QC, Canada*

8 <sup>b</sup> *Université de Lille, INRA, Lille, France*

9 <sup>c</sup> *Laboratoire de Transformation Alimentaire et Procédés ElectroMembranaires (LTAPEM,*  
10 *Laboratory of Food Processing and ElectroMembrane Processes), Université Laval, Québec, QC,*  
11 *Canada*

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13  
14 **Abstract**

15 Polypeptide/solid charged surface interactions are omnipresent in the biomedical and biochemical  
16 fields. The present study aimed to understand the adsorption mechanisms of a cation-exchange  
17 membrane (CEM) by a well-characterized peptide mixture at three different pH values. Results  
18 demonstrated that fouling was important at pH 6, twice lower at pH 2 and negligible at pH 10. At pH  
19 6, ALPMHIR and TKIPAVFK sequences firstly established electrostatic interactions with the negative  
20 CEM charges (SO<sub>3</sub><sup>-</sup>) through their positive K and R residues (NH<sub>3</sub><sup>+</sup>) creating a first nanolayer.  
21 Secondly, peptide/peptide interactions occurred through their respective hydrophobic residues creating  
22 a second nanolayer. At pH 2, VLVLDTDYK and IDALNENK sequences interacted only  
23 electrostatically and that in a lower proportion since at low acidic pH values, most of the CEM charges  
24 would be protonated and uncharged (HSO<sub>3</sub>) and then limit the potential electrostatic interactions. In  
25 addition, the sequences of peptides interacting at pH 2 and 6 were different. This was explained by  
26 their structure in terms of residue nature and position in the sequence. At pH 10, no fouling was  
27 observed due to the lack of positive peptide charges. To the best of our knowledge, it is the first in-  
28 depth study concerning the fouling of CEMs by peptides from a complex mixture.

29  
30 **Keywords**

31 Cation-exchange membrane, β-lactoglobulin, Peptide sequence, Electrostatic and hydrophobic  
32 interactions, Peptide/peptide and peptide/membrane interactions

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