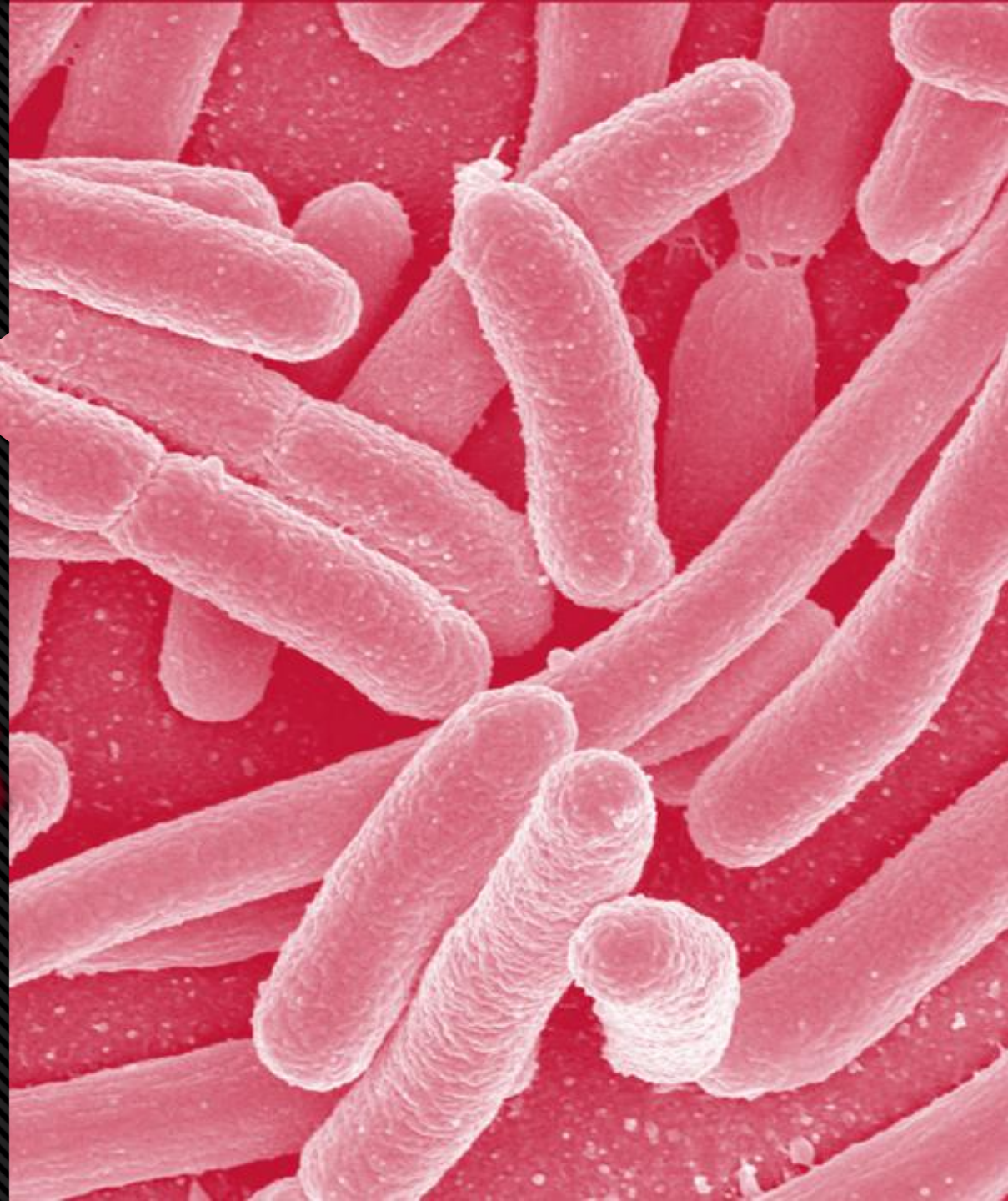
Anti-Listerial Effect Of 4-Hydroxyphenylpropanoic Acid Esters Synthesized By Lipase-Catalyzed Esterification

Bartłomiej Zieniuk

Ewa Białecka-Florjańczyk
Agata Fabiszewska

Department of Chemistry
Institute of Food Sciences
Warsaw University of Life Sciences
159C Nowoursynowska St., 02-776 Warsaw, Poland

bartlomiej_zieniuk@sggw.edu.pl



Introduction

In 2017 thirty European countries reported **2502** cases of listeriosis.

Infection caused **by *Listeria monocytogenes*** with a different clinical presentation.

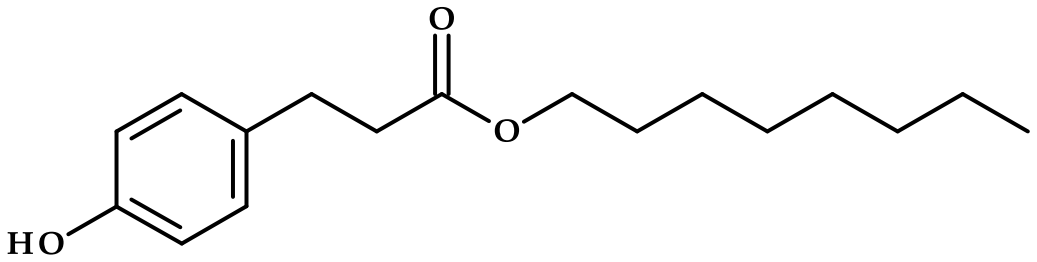
From febrile gastroenteritis to severe invasive infections including sepsis, meningitis, perinatal infections, and abortions.

Especially vulnerable groups of risk of bacterial infections are defined by a common abbreviation YOPI (Young, Old, Pregnant, and Immunosuppressed person).

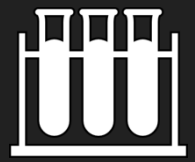
Despite the incidence of listeriosis is low, this disease poses **a serious threat to public health due to very high mortality.**

The aim of the work

- The purpose of the present study was to evaluate the efficiency of five (ethyl, butyl, hexyl, octyl, and decyl) enzymatically obtained esters of 4-hydroxyphenylpropanoic acid against ***L. monocytogenes* PCM 2191**.
- Moreover, the antimicrobial potential of one of them – **octyl 4-hydroxyphenylpropanoate** was also investigated in the time-kill assay.



Methods



- Lipase-Catalyzed Esters Synthesis, Purification, and Identification
- Determination of Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC)
- Time-Kill Assay

Table 1. Antimicrobial activities of 4-hydroxyphenylpropanoates and their precursor expressed as minimal inhibitory concentrations (MIC) and minimal bactericidal concentrations (MBC).

Compound	MIC [mM]	MBC [mM]
4-Hydroxyphenylpropanoic acid	16	32
Ethyl 4-hydroxyphenylpropanoate	8	16
Butyl 4-hydroxyphenylpropanoate	2	4
Hexyl 4-hydroxyphenylpropanoate	0.5	1
Octyl 4-hydroxyphenylpropanoate	0.0625	0.25
Decyl 4-hydroxyphenylpropanoate	0.25	1

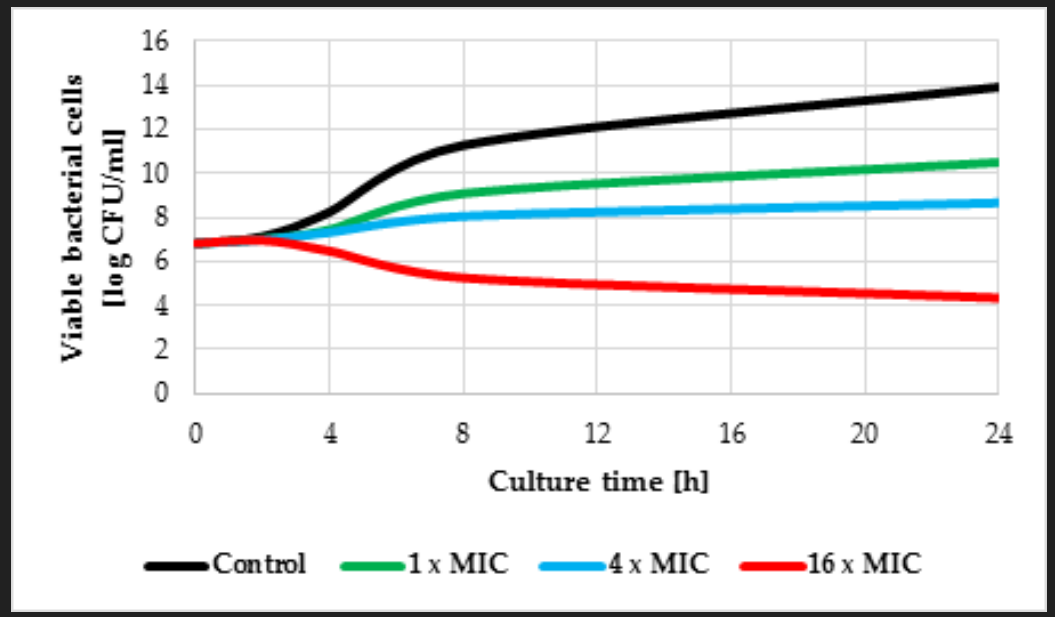


Figure 1. Time-kill curves of *Listeria monocytogenes* PCM 2191 treated with different concentrations of octyl 4-hydroxyphenylpropanoate, i.e. 1 x MIC (0.0625 mM), 4 x MIC (0.25 mM), and 16 x MIC (1 mM).

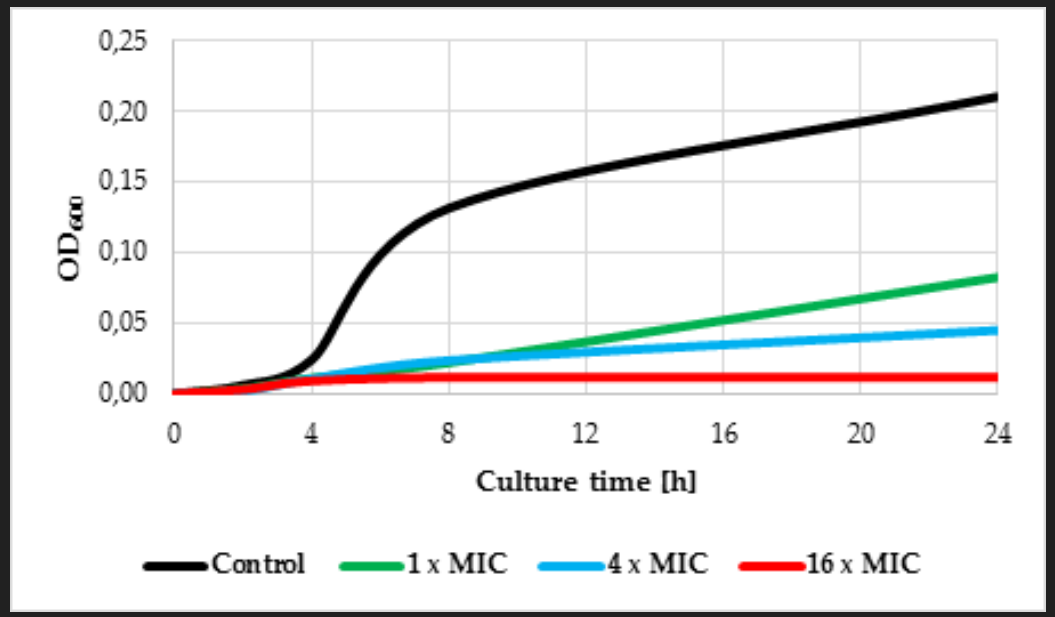


Figure 2. Optical density measurement at 600 nm of *Listeria monocytogenes* PCM 2191 without or with octyl 4-hydroxyphenylpropanoate at 1 x MIC (0.0625 mM), 4 x MIC (0.25 mM), and 16 x MIC (1 mM).

Conclusion

- To summarize, it was proven that 4-hydroxyphenylpropanoic acid esters synthesized by lipase-catalyzed esterification exhibited antibacterial activity towards *L. monocytogenes* PCM 2191.
- Enzymatic reactions allowed obtaining more active compounds compared to their carboxyl precursor, and anti-listerial activity increased with increasing the alkyl chain length.
- Time-kill assay revealed that octyl 4-hydroxyphenylpropanoate was able to limit the number of bacteria cells, and concentration-dependent activity was observed.
- Moreover, the possibility of using octyl 4-hydroxyphenylpropanoate in food applications is worth further investigation.
- Economical and environmentally friendly methods of enzymatic synthesis of new food additives should be also further developed.