

Project Leader (PI): Dr. Chinling Wang

Milestones for FY 2016-17:

1. Project title

Understanding Biofilm Detachment and Reattachment Mechanisms of *Listeria monocytogenes* in Food Processing Environment

2. describe if Milestones met or not

Our 2016 funded project was to investigate the dispersion mechanism of biofilm form of *L. monocytogenes*. This study tested the hypothesis that temperature has an effect on the dispersion and physiological properties of dispersed cells in listerial biofilms. Following the biofilm maturation at 25 or 37 °C for 48 hours, sessile and dispersed cells were collected from the stainless-steel surfaces and the supernatant of biofilm cultures, respectively (Figure 1). The observation of dispersed *L. monocytogenes* in the supernatant of biofilm cultures indicates that the level of dispersion was decreased at 37 °C. Similar growth rates of dispersed cells releasing from biofilms at 25 and 37 °C further suggests that this decrease of dispersion was not affected by bacterial growth rate. Moreover, dispersed cells collected at 37 °C expressed higher resistance to ampicillin when it was compared to cells detaching from biofilms at 25 °C and sessile cells growing at 25 and 37 °C (Table 1). Based on data obtained, the elevation of the environmental temperature, as an important factor for biofilm regulation, inhibits the release of *L. monocytogenes* from biofilms on abiotic surfaces but makes *L. monocytogenes* more likely to tolerate adverse environments once it detaches from the surfaces.

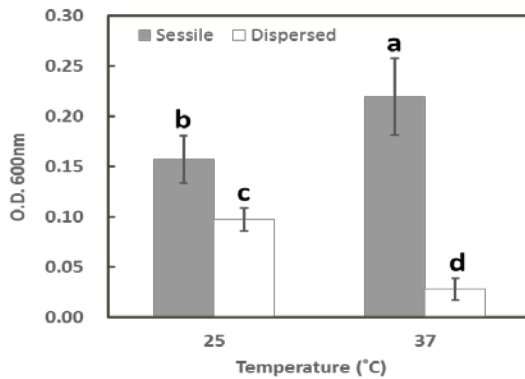


FIGURE 1. The amount of sessile and dispersed *Listeria monocytogenes* at 25 and 37 °C. Sessile and dispersed cells of biofilms formed at 25 and 37 °C for total 3 days were collected. The cell amounts were

Table 1. MICs of ampicillin against different cell types of *Listeria monocytogenes* grown at 25 or 37 °C.

Cell type	MICs of ampicillin (µg/mL)	
	25 °C	37 °C
Planktonic	0.4 ± 0 ^{a, b}	0.4 ± 0 ^b
Dispersed	2.05 ± 0.57 ^a	10.7 ± 1.2 ^a
Sessile	0.36 ± 0.13 ^b	2.9 ± 0.4 ^b

Planktonic cells were collected from a 16-h culture at 30°C. Sessile and dispersed cells of biofilms formed at 25 °C for 1 day and then at 25 or 37 °C for extra 2 days were collected. Planktonic, sessile and dispersed cells were treated with ampicillin with serial-diluted doses for 24 hours. Different letters indicate statistically significant differences ($p < 0.05$).

Significant Activities that Support Special Target Populations: (100 words or less)

Our research have advanced the knowledge of the mechanism of Biofilm dispersion which help us understand how temperature affects the dispersion of *L. monocytogenes* and characteristics of each type of cell populations in biofilms. The data will be presented at the 2017 General Meeting of American Society for Microbiology, June 1-5, 2017, New Orleans, LA.

Technology Transfer: NA

Describe the nature of the transfer

- Number of new CRADAs
- Number of active CRADAs
- Number of new MTAs (providing only)
- Number of invention disclosures submitted

Patent Disclosure. Describe number and title.

US Patent Application, describe the number and title

- 0 Number of new germplasm releases
- 0 Number of new commercial licenses granted
- 0 Number of web sites managed
- 0 Number of non-peer reviewed presentations and proceedings
- 0 Number of newspaper articles and other presentations for non-science audiences
- 0 Number of other technology

International Cooperation / Collaboration

We have collaborated with Dr. Lisa Gorski, Produce Safety and Microbiology Research, USDA, ARS, PWA, WRRRC-PSM and Taiwan University on food safety related projects.

Publications: Please use the following format, examples

Manuscripts:

1. Zhang, T. D. Bae, and C. Wang. LMOh7858_0369, a gene encoding a putative leucine-rich repeat-containing protein, is required for virulence of *Listeria monocytogenes*. (FEMS Microbiol Lett. 2016 May;363(9). pii: fnw060. doi: 10.1093/femsle/fnw060. Epub 2016 Mar 13.
2. Fan, Y.-C., C.-L. Wang, C. Wang, T.-C. Chen, C.-H. Chou, H.-J. Tsai. 2016. Incidence and Antimicrobial Susceptibility of *Clostridium perfringens* in Pre-Market Broilers in Taiwan. Avian Diseases. (doi: 10.1637/11315-110915-Reg.1)
3. Wang, Chia-Lan, Yang-Chi Fan, Chinling Wang, Hsiang-Jung Tsai, and Chung-Hsi Chou. 2016. The impact of *Salmonella Enteritidis* on lipid accumulation in chicken hepatocytes. (Avian Pathol. 9:1-38).
4. Zhang, T. D. Bae, and C. Wang. 2016. *Listeria monocytogenes* DNA Glycosylase AdIP Affects Flagellar Motility, Biofilm Formation, Virulence, and Stress Responses. Appl Environ Microbiol. 2016 Aug 15;82(17):5144-52. doi: 10.1128/AEM.00719-16. Print 2016 Sep 1.
5. Lee, Y. and C. Wang. 2017. Morphological Change and Decreasing Transfer Rate of Biofilm-Featured *Listeria monocytogenes* EGDe. Journal of Food Protection, Vol. 80, No. 3, 368-375. 2017, doi:10.4315/0362-028X.JFP-16-226

Presentation

Lee, Y.J. and C. Wang. (2017, June). Thermo-effect on the biofilm dispersion of *Listeria monocytogenes* EGDe. Poster presented at the General Meeting of American Society for Microbiology, New Orleans, LA.