

TTI smart labels for seafood safety management: Monitoring of *Vibrio* spp. risk in oysters

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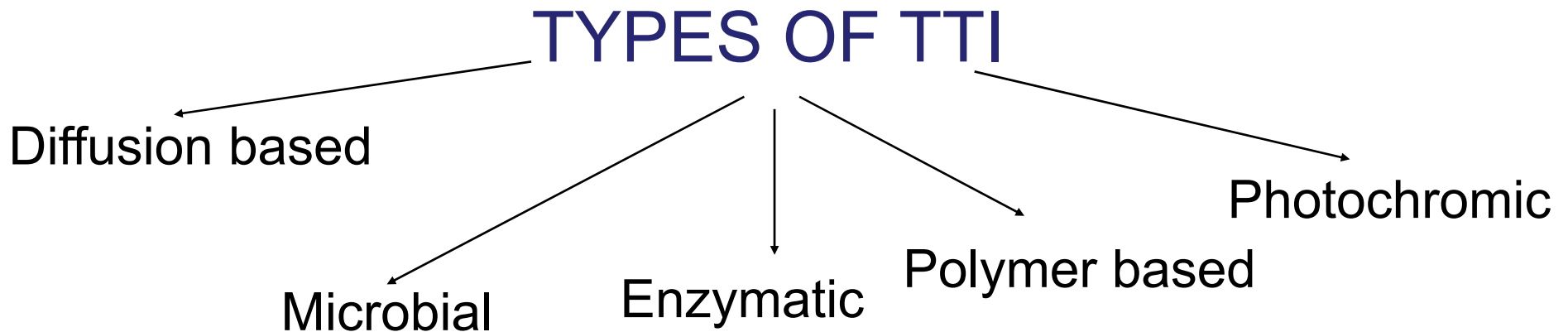
² Vitsab International AB, Sweden (peter.ronnow@vitsab.com)



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Cold Chain Management
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Need for development of practical systems to monitor, record and translate the effect of temperature from production to consumption.

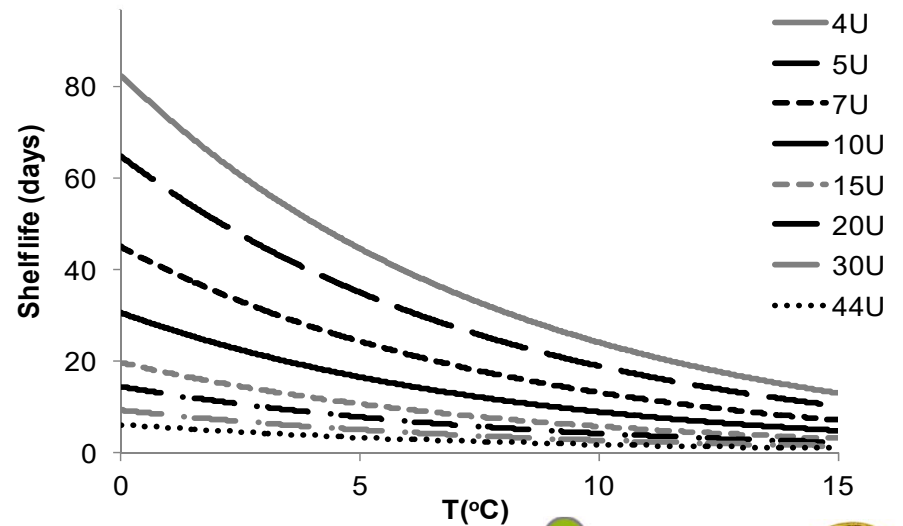
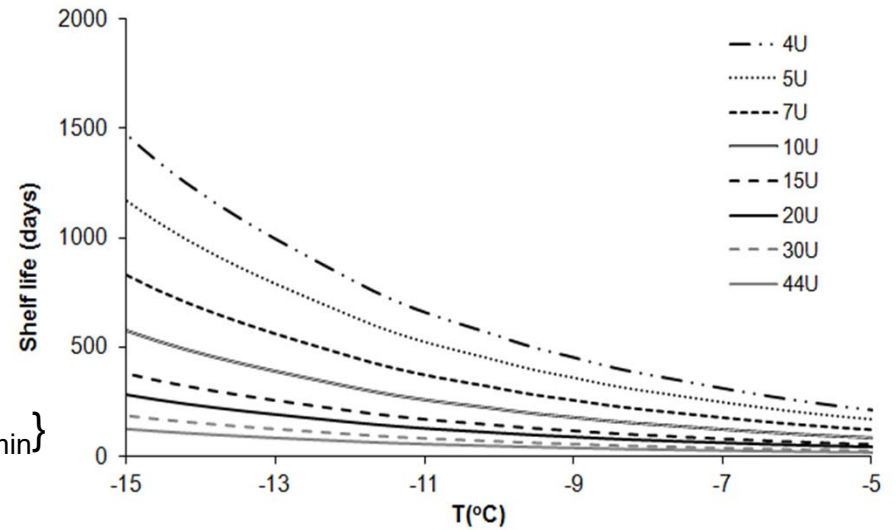
Time Temperature Integrators (TTI) are simple, inexpensive devices that can show an easily measurable, time and temperature dependent change that cumulatively indicates the time-temperature history of the product from the point of manufacture to the consumer, allowing the location and the improvement of the critical points of the chill chain



Total response time of M-type enzymatic TTI as a function of temperature and enzyme concentration

$$\text{norm}(a+b) = \frac{1}{1 + \exp\left(\frac{k_{1,\text{ref}} * C^{-\beta_1} * \exp\left[\frac{-E_a}{R} \left(\frac{1}{T} - \frac{1}{T_{\text{ref}}}\right)\right] - t}{k_{2,\text{ref}} * C^{-\beta_2} * \exp\left[\frac{-E_a}{R} \left(\frac{1}{T} - \frac{1}{T_{\text{ref}}}\right)\right]}\right)}$$

where $\text{norm}(a+b) = \frac{(a+b) - (a+b)_{\min}}{(a+b)_{\max} - (a+b)_{\min}}$



Predictive modeling and selection of TTI smart labels for monitoring the quality and shelf-life of frozen seafood

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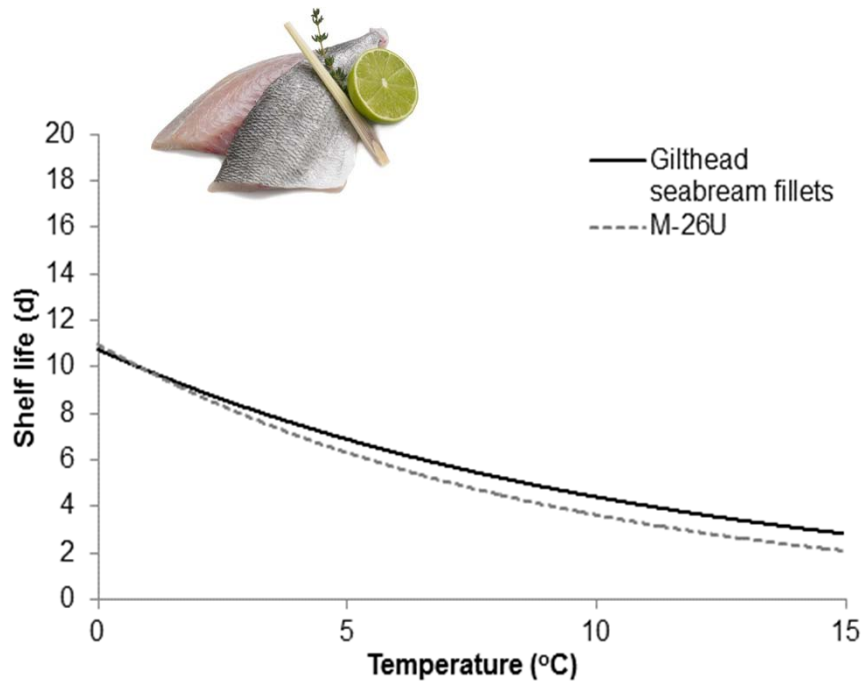


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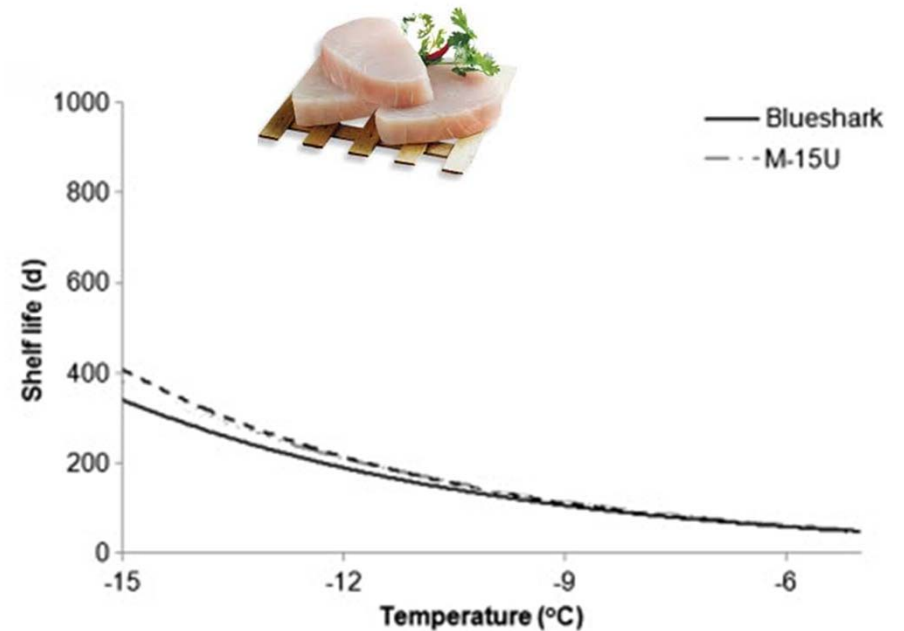
TTI application for monitoring quality of chilled and frozen fish

Selection of appropriate TTI



Limits for SL determination:

Pseudomonas spp. = 6 logCFU/g
TBARs = 0.9 mg MDA/kg
TVBN = 22 mgN/100 g



Limits for SL determination:

Sensory scoring = 5 for overall impression
TBARs = 3.5 mg MDA/kg
TVBN = 12 mgN/100 g



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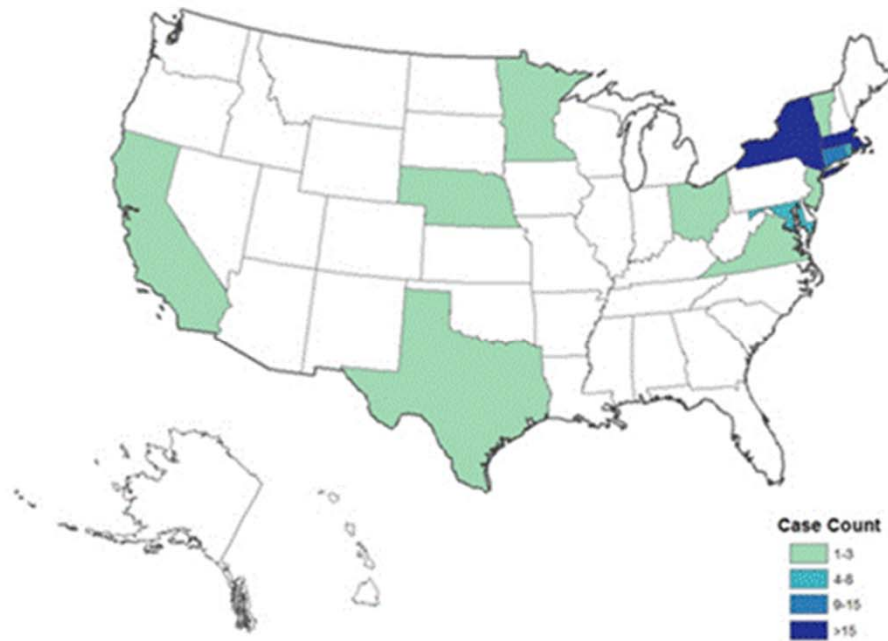
Vibrio spp. infection associated with consumption of shellfish

Increase in *Vibrio parahaemolyticus* illnesses associated with consumption of shellfish from several Atlantic coast harvest areas, United States, 2013

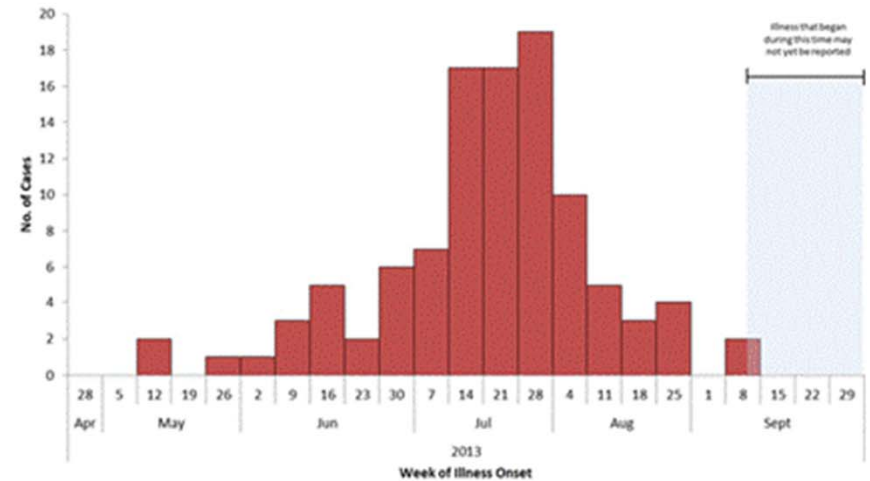
Posted October 21, 2013 11:45 AM ET

Case Count Map

Persons infected with the outbreak strain of *Vibrio parahaemolyticus*, by State*



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™



Ongoing warm weather increases risk of illness associated with raw shellfish consumption

July 31, 2015

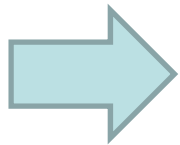
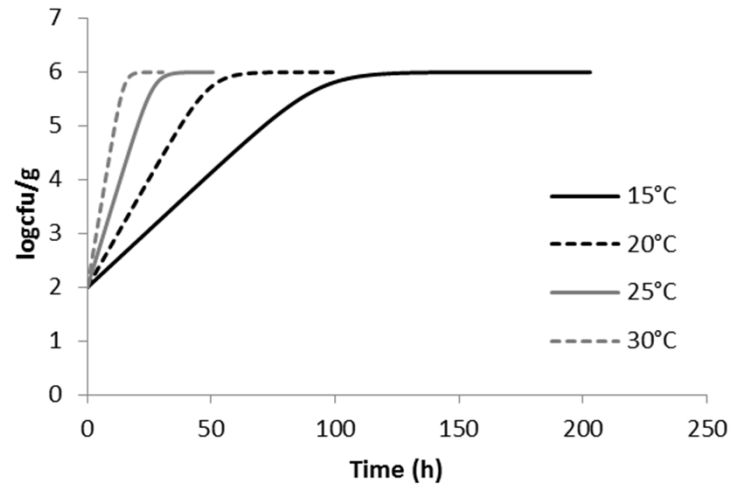
Vancouver – An unprecedented number of shellfish-related illnesses have occurred this summer, with 35 cases of *Vibrio parahaemolyticus* infections reported to the BC Centre for Disease Control (BCCDC) in June and July.



BC Centre for Disease Control
An agency of the Provincial Health Services Authority

TTI application in seafood safety management – *V.parahaemolyticus* TTI

According to FDA (2005)
Miles et al. (1997)
Gooch et al. (2002)



The Vibrio TTI-labels VP-1 and VP-3 are designed to fit to the predicted growth of one doubling and three doublings respectively of *V. parahaemolyticus* in the temperature range 15–30°C.

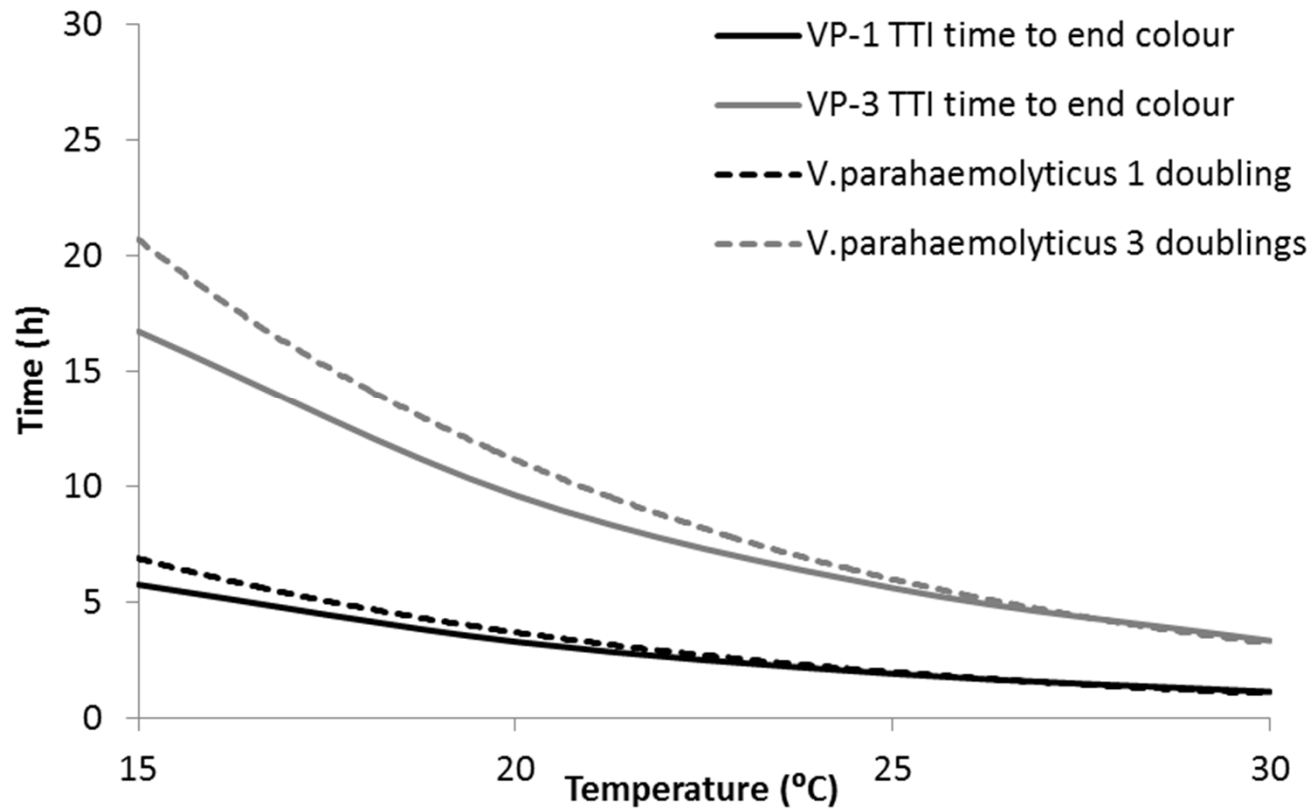
(LP-type enzymatic TTI: VP-1 410U/L, VP-3 140 U/L).



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TTI application in seafood safety management – *V.parahaemolyticus* TTI

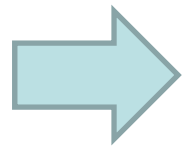
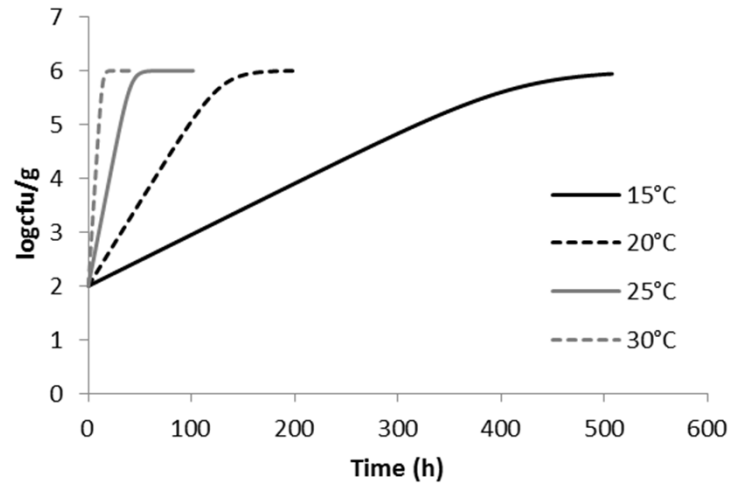


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TTI application in seafood safety management – *V.vulnificus* TTI

According to WHO/FAO (2005)
Cook (1997 and 1994)
Kaspar & Tamplin (1993)



The Vibrio TTI-labels VV-1 and VV-3 are designed to fit to the predicted growth of one doubling and three doublings respectively of *V. vulnificus* in the temperature range 15–30°C.

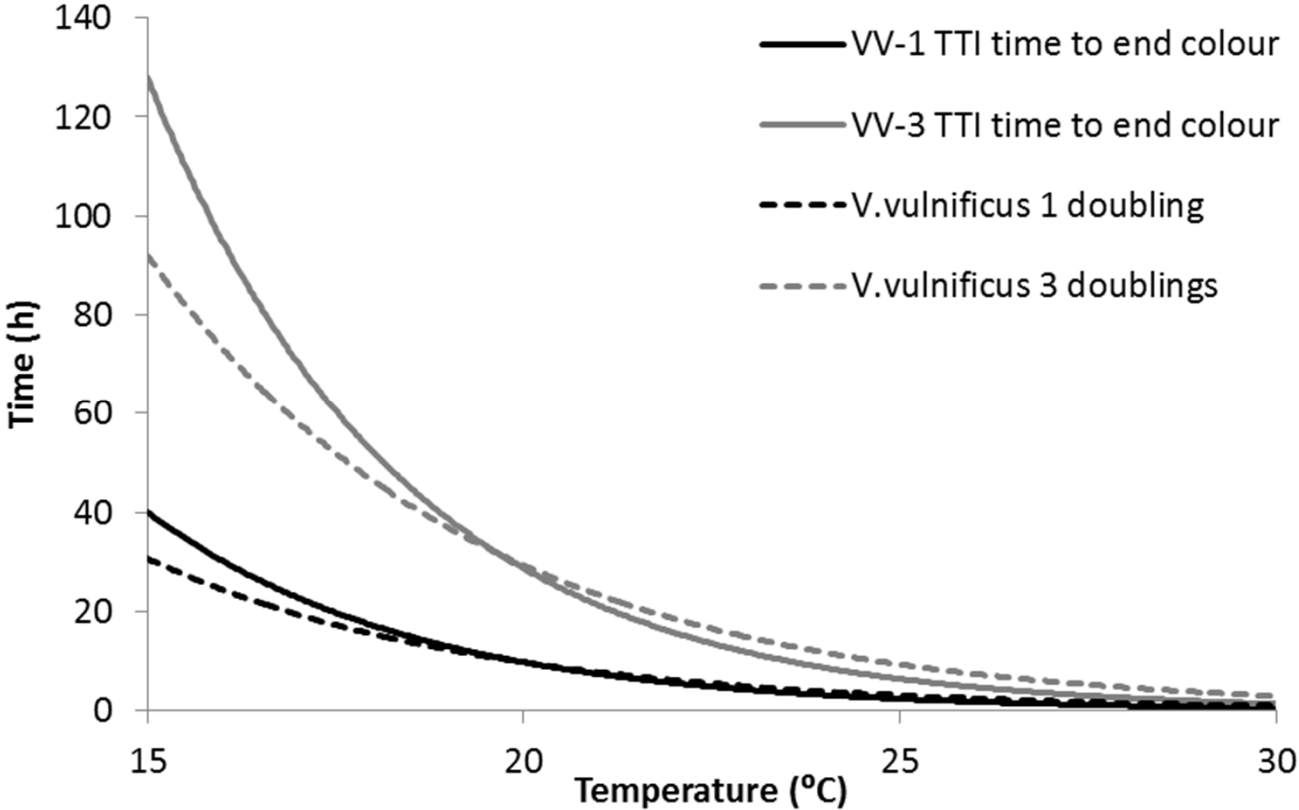
(S-type enzymatic TTI: VV-1 600U/L, VV-3 112 U/L)



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TTI application in seafood safety management – *V.vulnificus* TTI



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TTI application in seafood safety management

For more information:

Food Control xxx (2016) xxx-xxx



Contents lists available at ScienceDirect

Food Control

journal homepage: www.elsevier.com



Developing suitable smart TTI labels to match specific monitoring requirements: The case of *Vibrio* spp. growth during transportation of oysters

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<http://dx.doi.org/10.1016/j.foodcont.2016.06.041>



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Thank you!



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