The calculation of the γ_X value was dependent on the factor included in the equation. To account for the effects of storage temperature, a_w and pH of the product on the pathogen growth rate, the cardinal model [23] was used (Eq 1).

$$\gamma_X(X_i) = \begin{cases} 0 & , if\ X_i \le X_{min} \\ \dfrac{(X_i - X_{max}) \cdot (X_i - X_{min})^n}{(X_{opt} - X_{min})^{n-1} \cdot \left((X_{opt} - X_{min}) \cdot (X_i - X_{opt}) - (X_{opt} - X_{max}) \cdot \left((n-1) \cdot X_{opt} + X_{min} - n \cdot X_i\right)\right)} & , if\ X_{min} < X_i < X_{max} \\ 0 & , if\ X_i \ge X_{max} \end{cases} \quad (1)$$

Where X_i is the value of the environmental factor and X_{min}, X_{opt} and X_{max} are the minimum, optimum and maximum values for the growth of the pathogen, respectively (see Table S1). The *n* value was set up to 1 for pH and a_w and 2 for temperature [28].

To account for the effect of endogenous lactic acid concentration (in water phase) on the pathogen growth, Eq. 2 was used.

$$\gamma_{AH}(AH_i) = \left(1 - \frac{[AH_i]}{MIC}\right)^{\alpha} \quad (2)$$

Where $[AH_i]$ is the undissociated concentration of lactic acid in water phase, α is a shape parameter fixed to 1 for *L. monocytogenes* [29] and to 2 for *Salmonella* [30] and MIC is the minimum inhibitory concentration of the acid (see Table S1).

The term ξ and was defined as Le Marc et al. [15]:

$$\begin{gathered} \text{If } \psi \le 0.5, \quad \xi = 1 \\ \text{If } 0.5 < \psi < 1, \quad \xi = 2(1 - \psi) \\ \text{If } \psi \ge 1, \quad \xi = 0 \end{gathered} \quad (3)$$

Where ψ value was calculated as follows:

$$\psi = \sum_i \frac{\varphi(X_i)}{2 \prod_{j \ne i} \left(1 - \varphi(X_j)\right)} \quad (4)$$

$$\begin{aligned} \varphi(T) &= \left(1 - \sqrt{\gamma_T(T)}\right)^2 \\ \varphi(pH) &= \left(1 - \gamma_{pH}(pH)\right)^2 \\ \varphi(a_w) &= \left(1 - \gamma_{a_w}(a_w)\right)^3 \end{aligned} \quad (5)$$

where φ was defined differently according to the factor [22].

Figure S1. Detailed description of the modelling procedure for calculating the gamma (γ_X) values.