A 3-class mixed plan with both a qualitative and a quantitative limit

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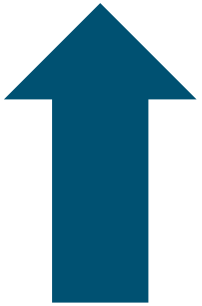
Types of sampling plans

Qualitative
2-class
Food Safety Criterion

Quantitative
3-class
Process Hygiene Criterion

Types of sampling plans

Qual/Quant	Qual	Quant	Quant	Qual/Quant
Class	2	2	3	3
Example	*Salmonella* in PIF	*Listeria* in no growth RTE	Mesophiles in PIF	3-class mixed*



*Alternative approaches to the risk management of *Listeria monocytogenes* in low risk foods. Farber et al. Food Control 2021

Food Safety Criterion
Process Hygiene Criterion

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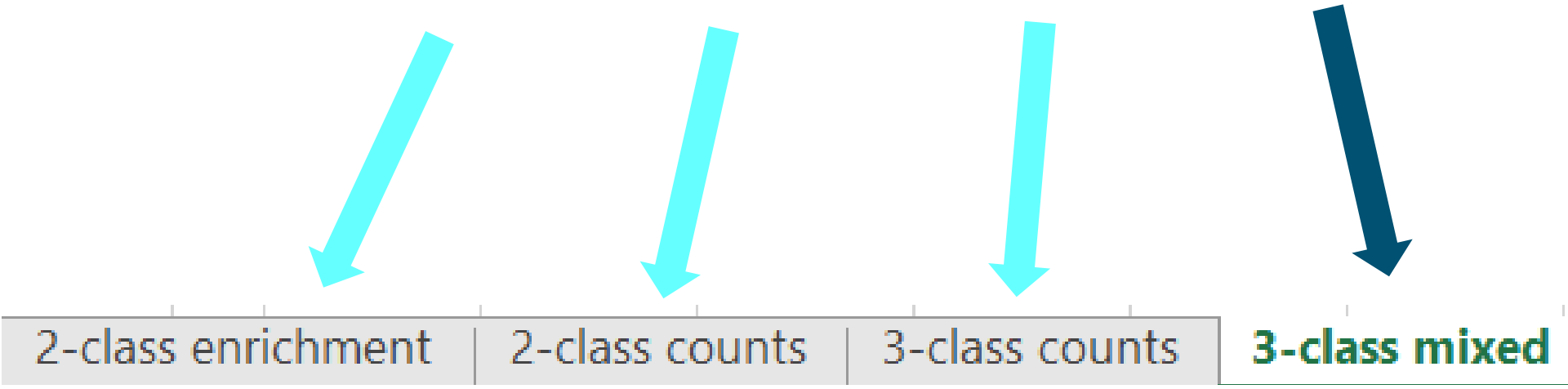

Sampling plan: Food Safety Criterion

Potential criterion for *Listeria monocytogenes* in RTE food

Micro-organism	Sampling plan		*m*	*M*	Analytical method
	n	*c*			
Listeria monocytogenes	5	1	0/25 g	100 cfu/g	ISO 11290-1 ISO 11290-2

2-class enrichment | 2-class counts | 3-class counts | **3-class mixed**

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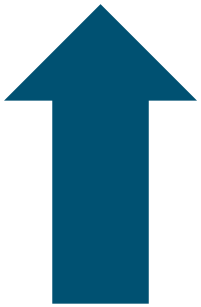

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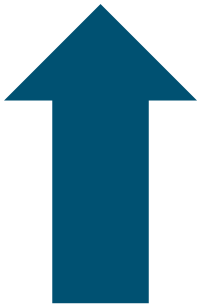

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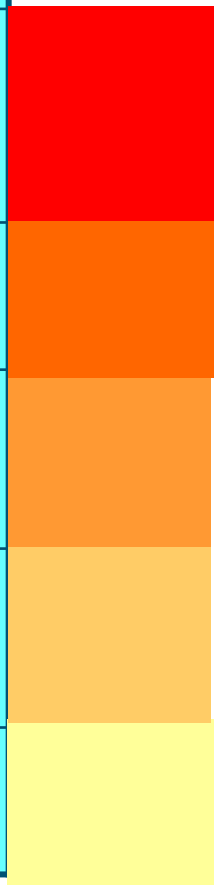
Performance *Listeria* sampling plans

Criterion	*n*	*c*	*m*	*M*	Performance (cfu/g)
EU: food for infants and special medical purpose	10	0	0/25 g		0.031
Codex/EU; supports Lm growth	5	0	0/25 g		0.10
FSIS	2	0	0/25 g		0.68
FDA	1	0	0/25 g		4.3
Codex/EU; does not support Lm growth	5	0	100 cfu/g		434



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Codex/EU supports Lm growth	5	0	0/25 g		0.10
Mixed	**5**	**1**	**0/25 g**	**100 cfu/g**	**0.32**
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Can you reproduce all performances ?

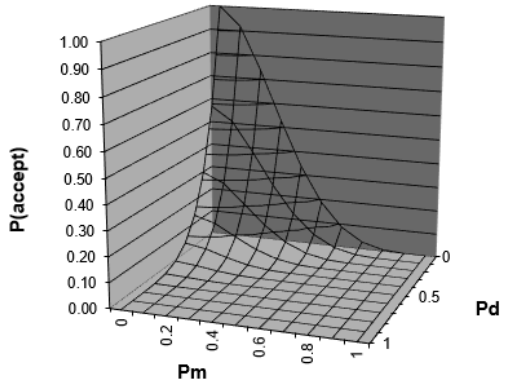
sampleplans2_10 - Excel

File Home Insert Page Layout Formulas Data Review View Developer Add-ins Help Tell me what you want to do

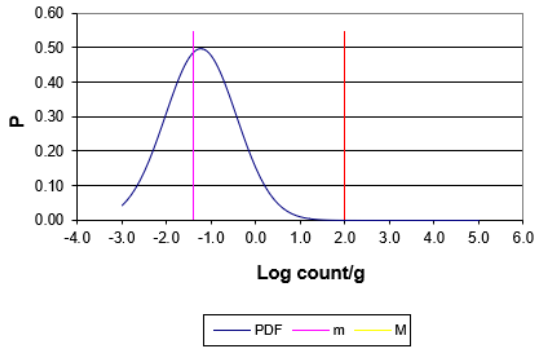
Cut Copy Format Painter Paste Clipboard | Arial 10 Font | Wrap Text Merge & Center Alignment | Number | Conditional Formatting Format as Table Styles | Insert Delete Format Cells | AutoSum Fill Clear Sort & Filter Editing

n 5

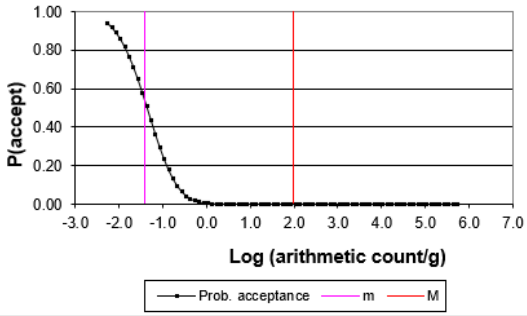
Operating characteristic curve for proportion defective Pd and marginally acceptable Pm with n=5 and c=1



Probability density function (PDF) for log counts. Distribution mean = -1.24 and sigma = 0.80



Operating characteristic curve scaled to relate log arithmetic mean count to m



Lot acceptance for Pd

			P(accept)	
Pd	20	%	16.5	%
Pm	25	%		
actualPd	0.0	%		
actualPm	65.7	%	5.00	%

INPUTS

mean	-1.24	
sigma	0.8	
m	-1.40	
M	2	
n	5	
c	1	
amount	25	g

P(accept)

Computed	5.00	%
Desired	5	%

Find mean that gives desired P(accept)

Find n that gives desired P(accept) or better (less)

P(reject) 95.00 %

ALTERNATIVE n AND c

			P(accept)		
mean	-1.24		Computed	5.00	%
sigma	0.80		Target, left	5.00	%
m	-1.40				
M	2.00		For any value of n and c imputed find the m that gives the same P(accept) as the model on the		
n	5				
c	1				

Sandbox: for your own calculations

FSO	2		
compliment	0.999974	not comply	2.62E-05
%	99.99738	%	0.002618

Means

Arithmetic (=Average)		Geometric (=Median)	
0.32	cfu/g	0.06	cfu/g
-0.50	log cfu/g	-1.24	log cfu/g

Implied Acceptance level

Percentile	z-score	Concentration at this percentile
99.9	3.10	1.24
FSO	P(exceedance)	target level
1.24	0.000973	-1.235876

This sampling plan would provide 95 % confidence that a lot of food containing a geometric mean concentration of 0.06 cfu/g and an arithmetic mean concentration of 0.32 cfu/g (having a standard deviation of 0.80 log cfu/g), would be rejected (i.e. either more than 1 out of 5 samples having levels between [-1.4,2.0] logs cfu/g or 1 or more samples higher than 2.0 log cfu/g)

About | Technical issues | Introduction | 2-class enrichment | 2-class counts | 3-class counts | 3-class mixed | 2-class enrich sensspec | TableSensSpec

Accessibility: Investigate

How to perform the *Listeria* sampling plan ?

Criterion	*n*	*c*	*m*	*M*	Performance (cfu/g)
Mixed	5	1	0/25 g	100 cfu/g	0.32

25.1 g food + 225.9 ml : enrich 250 ml and plate 1 ml
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Conclusions

3 class mixed plans* are targeted on BOTH:

- Frequent low level contaminations (*m*= absence in 25g in 4/5 or 5/5 samples)
- Occasional high level concentration (*M*=100 cfu/g)

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