

SOUS VIDE FOOD SAFETY PRINCIPLES

AKA: Overnight Cook-chill



BAG
COOK -
CHILL

SOUS VIDE FOOD SAFETY PRINCIPLES

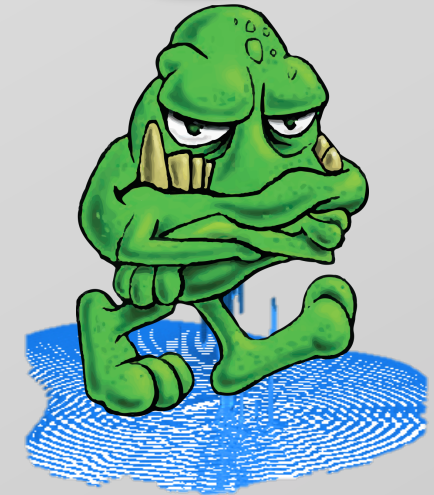
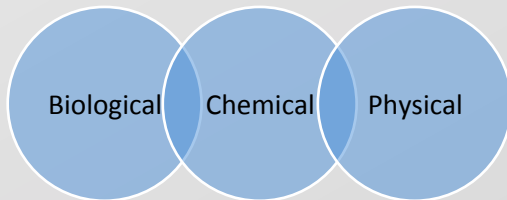


BAG
COOK - CHILL

SOUS VIDE FOOD SAFETY PRINCIPLES

H A

HAZARDS ANALYSIS



SOUS VIDE FOOD SAFETY PRINCIPLES

HAZARDS ANALYSIS



Vegetative

Foodborne illness bacteria

e.g. Salmonella

E. coli O157:H7

Listeria monocytogenes

& others

SOUS VIDE FOOD SAFETY PRINCIPLES

HAZARDS ANALYSIS



Spore-forming Foodborne illness bacteria

Clostridium botulinum
Clostridium perfringens
Bacillus cereus

SOUS VIDE FOOD SAFETY PRINCIPLES

HAZARDS ANALYSIS

Toxin producing Foodborne illness bacteria

Staphylococcus aureus
&

Clostridium perfringens

Clostridium botulinum

Bacillus cereus



SOUS VIDE FOOD SAFETY PRINCIPLES

Salmonella

E. coli STEC

Listeria monocytogenes

INFECTION

C. botulinum (≤ 0.33 log)

INTOXICATION

S. aureus ($\leq 2-3$ log)

B. cereus (emetic)

← ~6 log to symptoms

C. perfringens (≤ 1 log)

B. cereus (diarrheal)

TOXICO-INFECTION



SOUS VIDE FOOD SAFETY PRINCIPLES

HAZARDS ANALYSIS



Psychrotrophic Foodborne illness bacteria

Listeria monocytogenes > 31°F

Clostridium botulinum > 38°F

Hazards

HA

CCP

Controls



SV

 VP

 Cook

 Chill

 Cold Hold

TABLE A	pH		
	< 4.6	4.6-5.6	> 5.6
Aw	≤ 0.92	nonTCS	nonTCS
	0.92- 0.95	nonTCS	
	> 0.95	nonTCS	

Non TCS = no HACCP

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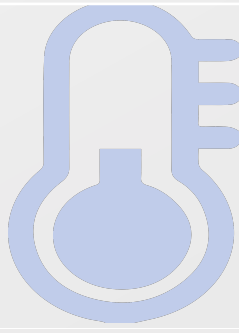
COOK

CCP1



CHILL

CCP2



Cold Hold

CCP3

CCCP
CRITICAL CONTROL POINTS

USDA Appendix A
new update Dec 2021

- Cooking is now **3** criteria
1. Come Up Time (CUT)
 2. Humidity
 3. Cook temp



SOUS VIDE FOOD SAFETY PRINCIPLES



CRITICAL CONTROL POINT CCP1 - COOKING

<u>Parameter</u>	<u>Critical limit</u>	<u>Hazard addressed</u>
Come-up time	40-130°F in ≤ 6 hours	Prevent <i>S. aureus</i> toxin Prevent excessive growth of vegetative pathogens
Humidity	High humidity required – cooking in liquid acceptable	“Wet” cooking is effective thermal lethality
Cook Temperature	Use time-temperature listed in USDA Appendix A for meat & poultry or FDA Seafood HACCP (fish)	All vegetative pathogens eliminated by proper cooking

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Can an operator sous vide fish?

- ▶ Yes
- ▶ 3-502.12 makes no provisions for SV fish
- ▶ Requires variance/waiver of 3-502.11
- ▶ Fully cooked only
- ▶ Follow FDA Seafood Hazards & Controls Guide



SOUS VIDE FOOD SAFETY PRINCIPLES

CRITICAL LIMITS CCP1 - COOKING

FSIS Cooking Guideline for Meat and Poultry Products (Revised Appendix A) December, 2021

Document ID: FSIS-GD-2021-14

This guideline provides information on the Agency regulatory requirements associated with safe production of ready-to-eat (RTE) products with respect to the destruction of *Salmonella* and other pathogens. It applies to small and very small meat and poultry official establishments although all meat and poultry establishments may apply the recommendations in this guideline. It relates to 9 CFR 318.17(a)(1), 9 CFR 318.23, 381.150(a)(1), and 9 CFR 417.

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**TABLE A-3
INACTIVATION OF LISTERIA MONOCYTOGENES**

INTERNAL PRODUCT TEMPERATURE (°F)	INTERNAL PRODUCT TEMPERATURE (°C)	LETHAL RATE	TIME FOR 4D PROCESS (MINUTES)
145	63	0.117	17.0
147	64	0.158	12.7
149	65	0.215	9.3
151	66	0.293	6.8
153	67	0.398	5.0
154	68	0.541	3.7
156	69	0.736	2.7
158	70	1.000	2.0
160	71	1.359	1.5
162	72	1.848	1.0
163	73	2.512	0.8
165	74	3.415	0.6
167	75	4.642	0.4
169	76	6.310	0.3
171	77	8.577	0.2
172	78	11.659	0.2
174	79	15.849	0.1
176	80	21.544	0.09
178	81	29.286	0.07
180	82	39.810	0.05
182	83	54.116	0.03
183	84	73.564	0.03
185	85	100.000	0.02

Note: z = 13.5°F (7.5°C).

APPENDIX 4: Bacterial Pathogen Growth and Inactivation

Minimum time (min) at temperature

Water must be 0.5°F above desired cooking temperature.

Come up time must be accounted for and time should not start until protein reaches desired cook temperature.

°F	P	M	°F	P	M	F*
130		121	141	29	10	
131		97	142	24	8	
132		77	143	20	6	
133		62	144	17	5	
134		47	145	14	4	17
135		37	146	12	3	
136	82 ^a	32	147	10	4	13
137	66 ^a	24	148	8	2	
138	53 ^a	19	149	7	2	10
139	43 ^a	15	150	5	2	
140	35 ^a	12	> 150	5	2	7

^a Cooking poultry ≤ 140°F leaves a rubbery texture and is not recommended.

Meat = M and Poultry = P 2021. USDA FSIS Cooking Guideline for Meat and Poultry Products (Revised Appendix A). December.

F = Fish/Seafood: Generally, *L. monocytogenes* is selected as the target pathogen because it is regarded as the most heat-tolerant, foodborne bacterial pathogen that does not form spores. Cooking processes are not usually designed to eliminate spores of bacterial pathogens. Determining the degree of destruction of the target pathogen is also critical. Generally, a reduction of six orders of magnitude (six logs) or a 6D process. Appendix 4. Page 422. Seafood HACCP hazards and Controls Guide. 2021. 4th edition.

SOUS VIDE FOOD SAFETY PRINCIPLES

CRITICAL LIMIT monitoring CCP1 – COOKING Process Approach vs Temperature Approach

- **Est. process in tested equipment**
 - Set standard process for food (a) thickness and (b) starting food temp (cold or frozen)
 - Monitor water bath temperature until water is at cook temp.
 - Establish time from when water is at cook temp until interior of food is at cook temp (for thickest portions)
 - Critical limit is established as water temp for time indicated.
- **Temperature approach**
 - Insert a temperature probe in one sample of food to geometric center
 - Monitor food interior temp.
 - After cooking and chilling, remove probe and overbag and vacuum package

USDA Appendix B
new update Dec 2021

Cooling still **2** criteria
1. Fast growth zone
2. Slow growth zone



SOUS VIDE FOOD SAFETY PRINCIPLES



CRITICAL CONTROL POINT CCP2 - CHILLING

<u>Parameter</u>	<u>USDA Appendix B</u>	<u>FDA Food Code</u>	<u>Hazard addressed</u>
Chill level 1	130°F - 80°F ≤ 1.5 hours	135-70°F in ≤ 2 hours	Prevents growth of <i>C. perfringens</i> during most rapid growth phase
Chill level 2	80°F - 40°F ≤ 5 hours	135-41°F in ≤ 6 hours	Prevents growth of <i>C. perfringens</i> during entire cooling process

*Note that controlling possible growth of *C. perfringens* will control the growth of *Clostridium botulinum*. An excessive deviation from the cooling critical limit may permit botulism toxin to form.*

SOUS VIDE FOOD SAFETY PRINCIPLES



CORRECTIVE ACTIONS CCP2 - CHILLING

<u>Parameter</u>	<u>FDA Food Code</u>	<u>Hazard addressed</u>	<u>Possible Corrective Action</u>
Chill level 1	135-70°F in ≤ 2 hours	Prevents growth of <i>C. perfringens</i> during most rapid growth phase	Immediately, reheat to 165F Start Cooling over
Chill level 2	135-41°F in ≤ 6 hours	Prevents growth of <i>C. perfringens</i> during entire cooling process	Immediately, reheat to 165F Start Cooling over

***What happens to the *C. perfringens* hazard upon reheating to 165F?
Is *C. perfringens* illness an infection, intoxication, or toxico-infection?***

SOUS VIDE FOOD SAFETY PRINCIPLES

CRITICAL CONTROL POINT CCP3 - REFRIGERATION



<u>Parameter</u>	<u>Critical limit</u>	<u>Hazard addressed</u>
Refrigerate	$\leq 41^{\circ}\text{F}$	Prevents growth of <i>all pathogens except psychrotrophs</i>
Refrigerate	$\leq 41^{\circ}\text{F} \leq 7 \text{ days}$	Prevents growth of <i>all pathogens including psychrotrophs</i>
Refrigerate	$\leq 38^{\circ}\text{F}$	Prevents growth of psychrotrophic <i>C. botulinum</i>
Refrigerate	$\leq 34^{\circ}\text{F} \leq 30 \text{ days}$	Prevents growth of psychrotrophic <i>L. monocytogenes</i>
Refrigerate	$\leq 31^{\circ}\text{F}$	Prevents growth of psychrotrophic <i>L. monocytogenes</i>

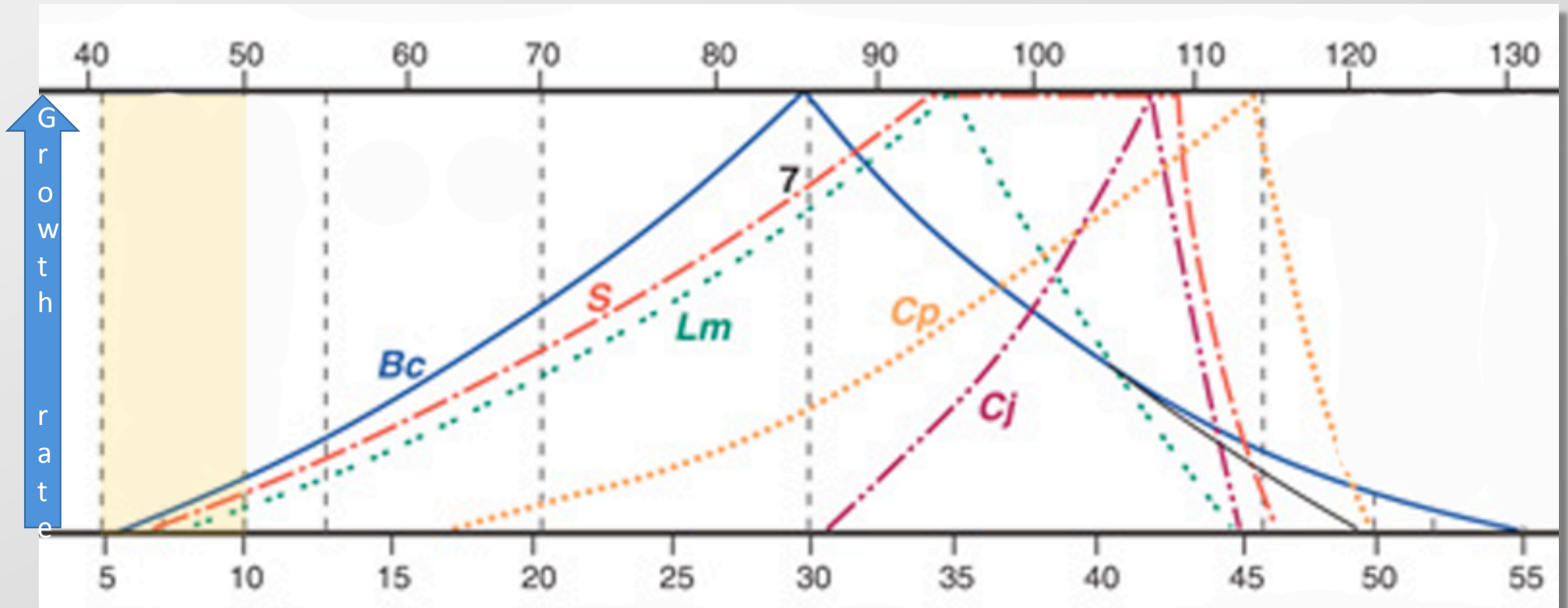
When there is a shelf life critical limit (e.g. 7 days), it must be on the products label with instructions to discard after expiration.

2017 Food Code Supplement

(iii) Cooled to 1°C (34°F) within 48 hours of reaching 5°C (41°F), removed from refrigeration equipment that maintains a 1°C (34°F) FOOD temperature and then held at 5°C (41°F) or less for no more than 7 days, not to exceed 30 days from its date of PACKAGING, at which time the FOOD must be consumed or discarded;

SOUS VIDE FOOD SAFETY PRINCIPLES

**THE FOOD CODE SAYS FOOD > 41.1°F IS NON-COMPLIANT?
Just how unsafe is food at 41.1°F or even 50°F?**



SOUS VIDE FOOD SAFETY PRINCIPLES

CORRECTIVE ACTIONS CCP3 – COLD HOLDING

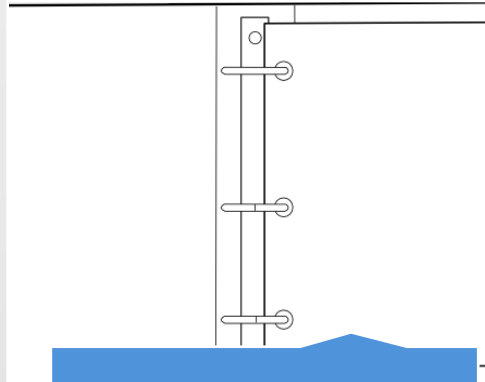
If the food is...	And the food is held at an internal temp...	Then limit exposure time to ...
RAW	> 70	2
RAW OR COOKED RTE	> 41 ≤ 50	24*
	> 50 ≤ 70	5
	< 50	No limit
COOKED RTE	> 80	1
	> 70 ≤ 80	2

Table 3-C Quick Reference Guide for Time and Temperature Guidance for Controlling Pathogen Growth and Toxin Formation in Food Products (for Internal Temperatures above 50°F (10°C) but below 135°F (57.2°C))

If the food is a ...	And the food is held at an internal temperature ...	Then you should limit the exposure time to ...	Or, if <i>Staphylococcus aureus</i> (S. aureus) is the only pathogen of concern, then you should limit the exposure time to ...	As long as ...
Raw, RTE ingredient or food product	Above 70°F (21.1°C)	2 hours	3 hours	N/A
Raw, RTE ingredient or food product	Above 70°F (21.1°C)	4 hours	N/A	No more than 2 of those hours are between 70°F (21.1°C) and 135°F (57.2°C)
Raw, RTE ingredient or food product	At any time above 50°F (10°C) but never above 70°F (21.1°C)	5 hours	12 hours	N/A
Raw, RTE ingredient or food product	At internal temperatures (or at ambient air temperatures) below 50°F (10°C) throughout processing	N/A	N/A	N/A
Cooked, RTE ingredient or food product	At any time above 80°F (26.7°C)	1 hour	3 hours	N/A
Cooked, RTE ingredient or food product	At any time above 80°F (26.7°C)	4 hours	N/A	No more than 1 of those hours is above 70°F (21.1°C)
Cooked, RTE ingredient or food product	At any time above 70°F (21.1°C) but never above 80°F (26.7°C)	2 hours	3 hours	N/A
Cooked, RTE ingredient or food product	Never held above 80°F (26.7°C)	4 hours	N/A	No more than 2 of those hours are above 70°F (21.1°C)
Cooked, RTE ingredient or food product	At any time above 50°F (10°C) but never above 70°F (21.1°C)	5 hours	12 hours	N/A
Cooked, RTE ingredient or food product	At internal temperatures (or ambient air temperatures) below 50°F (10°C) throughout processing	N/A	N/A	N/A

*BC 24H
 CB 48H
 EC 48H
 LM 24H
 SAL 48H
 VIB 21 DAYS

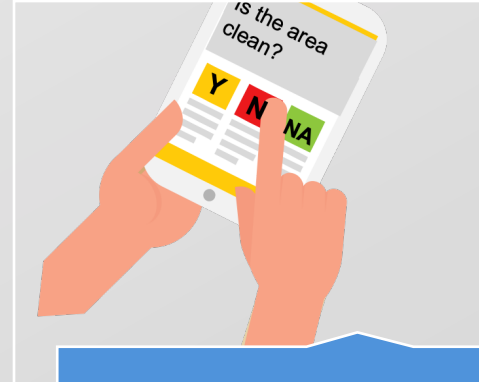
SOUS VIDE FOOD SAFETY SUMMARY



Documented



Implemented



Recorded



Verified

A Dr. B Production

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