

Minimizing the Risk of *Campylobacter* and *Salmonella* Illnesses Associated with Chicken Liver

What is the purpose of this guideline?

FSIS is issuing this guideline to help FSIS-regulated establishments, retail food outlets, and foodservice entities mitigate the public health risks from chicken liver.

Who is this guideline designed for?

This document is designed for FSIS-regulated establishments, and retail food outlets, and foodservice entities, including hotels, restaurants, and institutions, that produce raw (not-ready-to-eat) chicken liver, or products made from chicken liver, for human consumption. It provides **guidance** to assist establishments in reducing the public health risk associated with chicken liver. Additionally, retail food outlets and foodservice entities may find this guidance useful when considering suppliers for chicken liver for use in pâté or similar dishes. These entities may also find it useful when considering preparation practices, as this guidance explains the need to fully cook chicken liver due to the potential for the external and internal presence of pathogens. The document discusses recommendations by FSIS, based on currently available scientific evidence and practical considerations. The recommendations are **not requirements** that must be met. Establishments may choose to adopt different procedures than those outlined in the guideline, but they would need to support why those procedures are effective. This guideline represents FSIS's current thinking on this topic, and FSIS encourages official establishments and others to use it.

Why was this guidance developed?

Several reports of outbreaks of *Campylobacter* and *Salmonella* illnesses associated with chicken liver consumption have been published ([USDA-FSIS, 2011](#); [CDC, 2013](#); [CDC, 2015](#); [CDC, 2017](#)). According to a recent presentation summarizing a review of these outbreaks, 22 chicken liver–associated campylobacteriosis and salmonellosis outbreaks were reported to public health authorities in the United States during 2000–2015, comprising 331 total reported illnesses (Lanier et al., 2017). Over half of these outbreaks occurred during 2014–2015 and represented 21–34% of chicken-related outbreaks ([CDC, 2016](#); [CDC, 2017](#)). Commonly reported outbreak features included:

- 1) Consumption of a blended chicken liver dish (e.g., pâté);
- 2) Inadequate cooking of the chicken liver dish; and/or
- 3) Consumption of the chicken liver dish outside the home (e.g., in a restaurant).

Another factor that likely contributed to these outbreaks is the potential for pathogens to

be present both on the surface and internally. These findings led to the recommendations in this guideline to promote a reduction in pathogens in raw chicken liver products and to promote thorough cooking of these products.

Can chicken liver be contaminated with pathogens?

Yes, similar to other raw poultry products, chicken liver can be contaminated with pathogens such as *Campylobacter* and *Salmonella*. Surface contamination can result from insanitary dressing procedures, as well as from the processing environment.

In addition to surface contamination, chicken liver can contain pathogens internally, even when chickens are dressed in a sanitary manner. Studies have demonstrated the presence of *Campylobacter* in the internal tissue of between 10% and 90% of tested chicken livers after the external surface was sanitized (Boukraa et al., 1991; Barot et al., 1983; Baumgartner et al., 1995; Firlieyanti et al., 2016; Whyte et al., 2006). Additionally, researchers have detected *Campylobacter* and *Salmonella* in the liver of chickens previously free of these pathogens after experimental oral inoculation (Chaloner et al., 2014; Knudsen et al., 2006; Sanyal et al., 1984; Borsoi et al., 2009; Gast et al., 2013; He et al., 2010). Pathogens are thought to spread from the intestine to the internal liver tissue via the biliary, lymphatic, or vascular systems, although the exact route is unclear.

Why is the presence of pathogens in the internal tissue of chicken liver a problem?

Some recipes for chicken liver dishes, such as pâté, instruct the preparer to only partially cook the liver (e.g., by searing). Partial cooking may kill pathogens on the external surface, but will likely not kill all pathogens in the internal tissue. Any internal pathogens that survive in products made from inadequately cooked chicken liver could make consumers sick. Inadequate cooking was a contributing factor in many of the reported illness outbreaks associated with chicken liver.

How should retail food outlets, foodservice entities, and consumers prepare chicken liver?

The main message for food preparers at retail food outlets and foodservice entities and at home is that chicken liver dishes, like all poultry products, should be consumed only after being cooked throughout to a [safe minimum internal temperature of 165 °F \(73.9 °C\)](#) as measured with a food thermometer ([Food Code](#), 3-401.11). For food safety reasons, this should be done regardless of preferences. In addition, with respect to storage, FSIS recommends using chicken liver within one to two days if stored in a refrigerator set at 40 °F or below, or within three to four months if frozen at 0 °F or below. Further information on the safe handling of chicken liver and

other giblets is available on [Foodsafety.gov](https://www.foodsafety.gov).

What can establishments do to lower the risks to consumers associated with chicken liver?

The Hazard Analysis and Critical Control Points (HACCP) system of each establishment that produces chicken liver for human consumption is required to adequately address food safety hazards reasonably likely to occur, including external and internal pathogens. As part of the HACCP requirements, establishments must identify the intended use for consumers of the finished product ([9 CFR 417.2\(a\)\(2\)](#)). When identifying the intended use, establishments should consider whether chicken liver will be sold to foodservice entities that prepare pâté or similar dishes and consider the potential hazards that could result from inadequate cooking at foodservice entities. Official establishments that sell chicken liver to foodservice entities should consider any contractual controls that can be put in place to ensure customers will prepare the liver in a manner whereby pathogens would not be a significant health risk. Establishments that do not know the intended use of the chicken liver should consider the possibility that the liver will be used to prepare pâté or similar dishes and the hazards that could result from inadequate cooking. As described below, freezing, washing with organic acids, proper labeling, and other interventions may help establishments address these hazards.

Freezing

Studies have demonstrated that freezing can reduce, but not eliminate, *Campylobacter* contamination of chicken liver.

In a study involving homogenized chicken liver, Harrison et al. (2013) found that freezing caused significant reductions in *Campylobacter* counts. In liver placed in a freezer set at 5 °F (-15 °C), *Campylobacter* counts were reduced by approximately 0.8 log after 24 hours or by approximately 1.5 log after 7 days. *Campylobacter* counts more rapidly decreased in liver placed in a freezer set at -13 °F (-25 °C). An approximately 1.5-log reduction in *Campylobacter* counts was achieved after 24 hours; there was no significant difference between this reduction and the 7-day reduction at the same temperature. Additionally, these researchers observed an overall approximately 3-log reduction in *Campylobacter* counts after two periods of freezing at -13 °F (-25 °C) for 24 hours separated by a 24-hour thaw at 39.2 °F (4 °C).

Baumgartner et al. (1995) found *Campylobacter* less often in chicken liver that had been frozen, then thawed, than in liver that had not been frozen (16% vs. 31%). These researchers also found that *Campylobacter*, when present, was generally present in lower numbers in previously frozen chicken liver than in fresh.

Freezing the entire liver is likely to affect *Campylobacter* organisms existing on both the external liver surface and in the internal tissue.

Foodservice preparers and consumers may be concerned that freezing chicken liver negatively affects palatability. However, in a study of cooking practices and consumer preferences in the United Kingdom, Hutchinson et al. (2015) observed among consumers an overall sensory preference for chicken liver pâté made from liver that had been frozen.

Organic Acid Washes

Some antimicrobials have been validated to reduce *Campylobacter* on the surface of chicken liver. For example, Hutchinson et al. (2015) found that 2-minute washes at 69.8 °F (21 °C) with either 5% lactic or 5% ethanoic (acetic) acid reduced *Campylobacter* counts on the surface of naturally contaminated chicken liver by ~1.5 log. Any antimicrobial interventions applied by official establishments to chicken liver need to be considered safe and suitable by FSIS. A list of approved antimicrobials can be found in [9 CFR 424.21\(c\)](#) and in [FSIS Directive 7120.1](#), *Safe and Suitable Ingredients Used in the Production of Meat, Poultry, and Egg Products*.

Although acid washes will likely not be effective in reducing internal pathogen contamination, they may reduce pathogens on the external surface of chicken liver.

Labeling/Cooking Instructions

FSIS recommends that chicken liver be fully cooked because freezing and organic acid washes can reduce, but not eliminate, pathogens. For this reason, FSIS recommends that labels of all chicken liver include validated cooking instructions that are sufficient to destroy pathogens. FSIS recommends that cooking instructions indicate that the product should be cooked to a safe minimum internal temperature of 165 °F (73.9 °C), or other validated time/temperature combination, as measured with a food thermometer. This recommendation is consistent with the cooking recommendations in the ([Food Code](#), 3-401.11).

In addition, if the product appears ready-to-eat (RTE), but is not (e.g., because chicken liver is broiled, but not fully cooked to lethality, it appears RTE), the label needs to have features that are conspicuous so that the intended user is fully aware that product must be cooked for safety. This is best conveyed through language on the principal display panel of the label (e.g., “cook and serve,” “needs to be fully cooked,” “see cooking instructions,” or “cook before eating”). In a 2011 outbreak of salmonellosis involving 190 reported illnesses associated with chicken liver products (Hanson et al., 2014), potentially misleading labeling (i.e., “broiled”) and product appearance may have given the impression that the product was fully cooked when, in fact, it was not.

FSIS requires raw meat and poultry products (including those that are partially cooked) to be labeled with safe handling instructions ([9 CFR 317.2\(k\)](#) and [9 CFR 381.125\(b\)](#)). In addition, if it is not obvious the product is raw, based on appearance, FSIS recommends establishments include other cues on the label, such as those mentioned in the paragraph above, to increase consumer awareness that the product needs to be

cooked.

Other Interventions

Additional interventions listed in the [Draft FSIS Compliance Guide for Controlling *Salmonella* and *Campylobacter* in Raw Poultry](#), such as high-pressure processing (HPP), may also be effective in controlling pathogens in chicken liver. Generally, HPP has been found effective in reducing pathogen contamination in other chicken parts; however, FSIS is not aware of any published reports of its effectiveness specifically in chicken liver. Therefore, if an establishment uses HPP to support decisions in its hazard analysis related to pathogen reduction in chicken liver, it would need to gather its own scientific support to meet the validation requirements in [9 CFR 417.4\(a\)\(1\)](#).

Does this guideline apply to liver from other species?

This document is specific to chicken liver. However, illness outbreaks associated with the liver of other poultry species, including goose and duck, have been reported; the recommendations contained in this document may also be effective for other species.

Helpful Webpages

- AskKaren Webpages
 - o [How do you cook giblets?](#)
 - o [How are giblets inspected?](#)
- [Giblets and Food Safety](#)
- [Safe Minimum Internal Temperature Chart](#)
- [FoodSafety.gov blog about cooking chicken liver dishes](#)
- [Draft FSIS Compliance Guideline for Controlling *Salmonella* and *Campylobacter* in Raw Poultry](#)

What if I still have questions after I read this guideline?

If the desired information cannot be found within the guideline, FSIS recommends that users search the publicly posted Questions & Answers (Q&As) in the [AskFSIS](#) database or submit questions through [AskFSIS](#). Documenting these questions will help FSIS improve and refine present and future versions of this guideline and associated issuances.

When submitting a question, use the Submit a Question tab, and enter the following information in the fields provided:

Subject Field: Chicken Liver–Associated Outbreaks: Food Safety Guideline for Official Establishments, Retailers, and Foodservice Entities
 Question Field: Enter question with as much detail as possible.
 Product Field: Select **General Inspection Policy** from the drop-down menu.
 Category Field: Select **Sampling** from the drop-down menu.
 Policy Arena: Select **Domestic (U.S.) Only** from the drop-down menu.

When all fields are complete, press **Continue**.

How can I comment on this guideline?

FSIS is seeking comments on this guideline as part of its efforts to continuously assess and improve the effectiveness of policy documents. All interested persons may submit comments regarding any aspect of this document, including but not limited to: content, readability, applicability, and accessibility. The comment period will be 60 days and the document will be updated in response to the comments submitted.

Comments may be submitted by any of the following methods:

Federal eRulemaking Portal Online submission at [regulations.gov](http://www.regulations.gov): This web site provides the ability to type short comments directly into the comment field on this Web page or attach a file for lengthier comments. Go to <http://www.regulations.gov> and follow the online instructions at that site for submitting comments.

Mail, including CD-ROMs, etc.: Send to Docket Clerk, U.S. Department of Agriculture, Food Safety and Inspection Service, 1400 Independence Avenue SW, Mailstop 3758, Room 6065, Washington, DC 20250-3700.

Hand or courier-delivered submittals: Deliver to 1400 Independence Avenue SW, Room 6065, Washington, DC 20250-3700.

All items submitted by mail or electronic mail must include the Agency name (FSIS) and document title: Chicken Liver–Associated Outbreaks: Food Safety Guideline for Official Establishments, Retailers, and Foodservice Entities. Comments received will be made available for public inspection and posted without change, including any personal information, to <http://www.regulations.gov>.

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