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

Environmental Health Services

Food Issue

Notes from the Field

Sous vide style cooking of duck breast

Request received from:	Regional Health Authority
Date of request:	Date: January 19, 2015
Issue *(brief description)*:	Sous vide duck breast, and grilled duck breast processes are being questioned by inspectors as the meat in centre of breast is pink at service. One *Salmonella* illness implicated with sous vide duck breast cooking. At another premise where grilled duck breast was served pink, the Chef asserted it was acceptable to cook duck breast to an internal temperature of 57°C as duck meat does not carry *Salmonella.* Assess health risk of duck in general and sous vide recipe.

Summary of search information

1. Internet sources: PubMed search: "duck" AND "foodborne" AND "illness" resulted in 82 hits, 12 of interest.
2. Ovid (define your search terms): not done.
3. Other: google scholar search of key article [Adzitey 2012] and general internet based search for government literature / Chef literature.

Background information

One recent case of *Salmonella* infection was potentially tied to consumption of a sous vide prepared duck breast. A few weeks later, an inspector observed preparation and service of grilled duck breast that was served rare (pink inside). At this premise the Chef asserted that it was acceptable to cook duck breast to an internal temperature of 57°C as duck meat does not carry *Salmonella.*

Blogs sites on duck breast explain that because ducks are often de-feathered using a bath of hot paraffin, this process will kill off surface *Salmonella*, which then doesn't migrate into the interior of the carcass. They also state that because ducks aren't regularly injected to make them moist, the *Salmonella* bacteria would have less of a chance to be pushed into the meat. [1]

These are myths, and have no scientific basis. According to a meat safety specialist, while the purpose of the wax is to defeather the birds, the temperature of the paraffin wax is not hot enough to kill bacteria, it is at the same temperature used to get a leg wax (personal communication, M.P., Jan 29, 2015).

What are the risks associated with duck?

There are significant biological hazards associated with domestically raised duck and with wild duck. These include *Salmonella, Campylobacter, Listeria, Yersinia* and Avian Influenza.[2-5] The mean prevalence of *Campylobacter* in duck rearing and processing environments is extremely high (94%), with prevalence in the animals at 53%, and in duck meat and parts at 32%.[2] Overall, the mean prevalence of *Salmonella* is lower in environments (33%), ducks (19%), duck meat and parts (28%) and eggs (18%).[2]

Salmonella infections from contact with chicks and ducklings from hatcheries have been reported, [6] and several foodborne outbreaks have been associated with the use of duck eggs.[7-9] Foodborne illnesses have also been linked to consumption of duck meats, although no specific cases of illness with consumption of duck breast could be found in the literature.[10,11]

Previous guidance on cooking duck breasts from British Columbia

This question has come up before (in 2007). At that time, Health Canada confirmed that duck should be treated the same as other poultry (chicken, turkey) and whole duck should be cooked to an internal temperature of 85°C (185°F) for 15 sec (personal communication, Helene Couture April 30, 2007). The CFIA site stated to cook poultry pieces to an internal temperature of 74°C (165°F). These temperatures are still valid and quoted by the current CFIA site http://healthycanadians.gc.ca/eating-nutrition/safety-salubrite/cook-temperatures-cuisson-eng.php

BCCDC recommendations for whole poultry and pieces of poultry are to cook until an internal temperature of 74°C (165°F).[12]

Guidance on duck breast cooking from government agencies

US and Canadian government agencies are all consistent with consumer messaging for preparation of poultry pieces, including duck breasts, informing consumers to prepare these meats by cooking to an internal temperature of 74°C (165°F).[13-15] The US FDA food code further specifies to cook to poultry an internal temperature of 165°F (74°C) for 15 seconds (section 3-401.11 A(3)).[16]

These temperature/time requirements for cooking (74°C for 15 sec) will satisfactorily address the hazards of *Salmonella* in poultry (duck, chicken, turkey) and other hazards such as *Campylobacter* and Avian Influenza.[5,17]

Guidance on duck breast cooking from Chef recipes found on-line

Five recipes were reviewed on-line (see Table 1). No recipes advised to cook duck breast to the required internal temperature of 74°C. One recipe provided a reasonable recommendation that would achieve a final temperature of 71°C, with the worst recipes providing cooking information to “rest for 7 to 10 minutes so it won’t bleed like crazy” and “serve pink at an internal temperature of 52°C”, although the latter advice was to check the temperature with a meat thermometer.

Table 1. Review of food safety information during dust breast cooking

Internet recipes for duck breast cooking	Final internal temp
http://www.saveurduck.com/cooking_duck_breast.php Score fat and cook skin side down in fry pan 10 to 15 min, then flip and cook the other side. The breast is done "when the breast is cooked the juices will run clear"	when juices run clear
http://www.greatbritishchefs.com/how-to-cook/how-to-pan-fry-duck-breast Ideally duck breast should be served pink with an internal temperature of 52°C - check using a meat thermometer.	52°C
https://www.youtube.com/watch?v=9ow7Bh82czA Cook scored skin side down 5 min for 6oz breast, then 2-3 min other side. Rest 7 to 10 min so it won't bleed like crazy. Served very rare/pink, and still with some blood.	Serve very rare/pink
https://www.youtube.com/watch?v=YIMKAwe8KSU Maple leaf Chef. Score fat, fry med high heat 10 min. pour off fat, flip and put into 400F oven (205C) for 4 to 6 min. Aim for an internal temp of 155F when out of oven, rest to final temp of 160F (71C).	71°C
http://www.foodnetwork.com/recipes/pan-roasted-duck-breast-recipe0.html# Score fat, fry medium high 6 min, flip over & sear 1 min, put into 400F oven for 7 to 9 min until medium-rare.	Medium rare
http://www.chefsteps.com/activities/duck-breast use chilled or frozen duck breast. Render over med heat. Put on chilled plate and leave out at room temp up to one hour or put into refrigerator. Cook skin-side up at 175 °F / 79 °C to preference: (1) Rare: 129 °F / 54 °C; (2) Medium-Rare: 136 °F / 58 °C; (3) Medium: 144 °F / 62 °C; (4) Medium-Well: 149 °F / 65 °C; (5) Well: 158 °F / 70 °C	To preference: Rare: 54°C Well: 70°C

Evaluation of sous vide duck breast recipe in use at implicated premise

The time and temperature of the searing step is unknown, and the effect on internal temperature of the duck breast, if any, prior to sous vide style cooking is also unknown. In this recipe, 40 duck breasts are placed in a 62.5°C immersion circulator for 23 minutes. This would not be long enough to achieve pasteurization of the duck breasts. In a similar experiment with chicken breast, with similar conditions, when only 1 or 2 duck breasts were placed in an immersion circulator, the student found that after 23 minutes at 66°C, the average peak temperature reached was 60°C.[18] At this temperature, a hold time at 60°C for 17 minutes minimum is recommended to achieve pasteurization. In the recipe reported, after 23 minutes at 62.5°C, one would expect the duck breasts would only be nearing the 60°C temperature mark, and were not held at this temperature for a long enough period of time to achieve a 7 log *Salmonella* reduction and pasteurization.

Recommendations from BCCDC

Surveys of live ducks and duck meat for the presence of *Salmonella* clearly indicate this is a hazard of concern. *Campylobacter,* with higher prevalence than even *Salmonella,* is also a concern. While colour is not a reliable indicator of doneness, it can be assumed that the current preparation practices of most grilled duck breast that is served rare or medium-rare will not provide for a 7-log reduction of *Salmonella.*

1. All poultry, including duck breast, should be prepared to allow for a 7-log reduction of *Salmonella*
2. We support current consumer messaging to cook all poultry, including duck breasts, to an internal temperature of 74°C (165°C).
3. Sous vide preparation of duck breast should adhere to the time and temperature guidance for poultry in Table 3 found in the *Guidelines for restaurant sous vide cooking safety in British Columbia* [19]. Chefs need to find a cooking method that will provide the proper thermal reduction, while maintaining optimal food quality. Sous vide preparation of duck breast, if properly done, should allow the meat to remain tender and pink inside. The fat rendering step could be done either before or following the sous vide style cooking process. It is unknown how much log reduction fat rendering imparts to sous vide style cooking of duck breast. We recommend that duck breast be held in the immersion circulator at a time and temperature long enough to allow for 7 log reduction of *Salmonella.*
4. Chefs should be using probe-tip thermometers and cell foam tape to verify sous vide recipes. Thermometers should also be used to monitor the temperatures of immersion circulators. Immersion circulators must not be overloaded, and must be able to perform to the capacity required.
5. Chefs are also responsible to ensure that staff are trained to properly operate temperature monitoring devices and how to calibrate the immersion circulators.
6. Food safety plans and recipe verification must be documented for every sous vide recipe performed at a restaurant.

Additional recommendations for BCCDC

1. BCCDC's Talking Turkey food safety note does not specifically address cooking recommendations for other types of poultry, such as duck. We (BCCDC) should add a short paragraph to our web page on meat issues http://www.bccdc.ca/foodhealth/meat/default.htm describing these recommendations, and providing links to other Canadian sites that provide this consumer advice.
2. BCCDC should recommend an investigation of duck breast cooking for a BCIT EHO student project. Areas of focus to include the affects of searing/finishing on duck breast cooking.
3. BCCDC should write up this illness in collaboration with VCH and inform the community of this sous vide issue.

Appendix 1 – Sous vide duck breast recipe

The Chef was using a sous vide food safety plan for venison. The venison plan was approved, but no plan was submitted to the Health Authority or approved for sous vide duck breast.

- duck breasts are received, seared on the outside, cooled, vacuum-packed and refrigerated
- 40 breasts are placed into the immersion circulator at 62.5°C for 25 minutes
- After 25 minutes breasts taken out and refrigerated
- Rewarmed for service

According to the inspection report, the operators had a probe-tip thermometer (thermocouple and data-logger), alarm and cell foam tape, but was not using. Further staff not aware how to operate temperature monitoring equipment. The operator, upon follow-up inspection, reported it took 40 min for the internal temperature of the duck breast to reach 62°C.

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