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Background

What is Steak Tartare?

- Steak tartare is a raw beef dish made of various different cuts such as lean cuts of sirloin, filet, strip loin, tenderloin, round beef and others. The meat is either ground with a meat grinder or finely chopped by hand.
- The raw meat is mixed with various ingredients such as onions, capers, ground pickles, shallots, chives, parsley, salt, pepper, Dijon sauce, Worcestershire sauce, Tabasco sauce, ketchup, mayonnaise, mustard, chili spices, olive oil, raw egg yolk and/or other ingredients. Each dish is made in a unique manner. After the ingredients are mixed together, the steak tartare is served with sliced toasted bread, salad and/or fries.

What are the Public Health Implications?

- Steak tartare is highly prone to bacterial spoilage due to its raw nature and can cause foodborne illnesses.
- Possible contaminations by different types of bacteria include: *E. coli* O157:H7, *Enterobacteriaceae*, *Salmonella*, *Listeria monocytogenes* and others. Contamination by these types of bacteria can cause foodborne illness such as diarrhea, abdominal pain, vomiting, fever, and chills.
- In very rare cases, bacterial contamination can lead to severe foodborne illness such as severe pain in the abdomen and rectum, severe dehydration, septicemia, kidney failure, anemia and Hemolytic Uremic Syndrome.

What is the Objective of This Study?

- The objective of this study is to determine the microbiological counts of *Escherichia coli* and *Enterobacteriaceae* in steak tartare based on samples collected from 13 restaurants in downtown Toronto, and to compare the counts to the acceptable limit according to the Microbiological Guidelines of Ontario and Alberta respectively.
- Determination of whether or not steak tartare is safe to consume was based on the microbiological counts of *E.coli* and *Enterobacteriaceae*.
- A series of questions were asked to the chef responsible for making the dish to see if there's a relation between the preparation process and microbiological count.

Methods and Materials

- A local Public Health Inspector from Toronto Public Health identified 13 restaurants in downtown Toronto that serve the dish prior to collecting samples.
- Upon entering the food premise, the chef responsible for making the steak tartare was interviewed in regards to the preparation process of steak tartare. Table 2 outlines the results of the interview for each restaurant.
- Samples were collected in accordance with the Public Health Inspector's Guide for Food Sample Analysis. Between 150g-200g of steak tartare was collected using aseptic techniques and placed inside a sterile sample bag. Sample bags were labelled before samples were placed inside.
- As soon as samples were collected, they were placed in a cooler containing 3 ice packs and the temperature was between 0-4°C. A maximum of 4 samples from 4 different restaurants were collected on each sampling day and taken to the University of Guelph Laboratory the same day. The Laboratory procedure was according to the Government of Canada, Health Products and Food Branch.

The materials used for the experiment were:

- 1 cooler
- 3 ice packs
- 1 permanent marker
- 1 pen
- 1 notebook
- 13 questionnaires
- 13 sterile sample bags
- 1 sanitary spoon
- 13 disinfectant wipes
- 10.4 sample submission forms



Results

Table 1: Microbiological Count for Steak Tartare

Microbiological Count for Steak Tartare		
Sample Number	E.coli petrifilm CFU/g	Enterobacteriaceae count CFU/g
1	0	1.5 x 10 ³
2	0	1.6 x 10 ³
3	0	2.9 x 10 ³
4	0	1.8 x 10 ³
5	0	5.9 x 10 ³
6	0	9.4 x 10 ²
7	0	0
8	0	5.4 x 10 ²
9	0	3.5 x 10 ²
10	3.0 x 10 ¹	2.0 x 10 ²
11	0	2.5 x 10 ³
12	4.0 x 10 ¹	2.2 x 10 ³
13	0	5.2 x 10 ²

Table 2: Preparation Process of Steak Tartare

Sample Number	Beef Cut	Hand/ Machine	Prepared Immediately or in Advance	How Often is it Served	HACCP Plan/Another Plan	Certified Food Handlers Each Shift
1	Flank AAA	Machine	Immediately	Daily	No	3
2	Culotte	Hand	In Advance	Daily	No	1
3	Filet	Hand	In Advance	Daily	Yes	4+
4	Strip loin	Hand	In Advance	Daily	No	4+
5	Tenderloin	Hand	Immediately	Rarely	No	4+
6	AAA Tenderloin	Hand	In Advance	Daily	No	4+
7	Sirloin	Hand	In Advance	Daily	Yes	2
8	Eye of Round	Hand	In Advance	Daily	Yes	4+
9	Eye of Round	Hand	In Advance	Daily	Yes	3
10	Sirloin	Hand	In Advance	Daily	No	3
11	Tenderloin	Hand	Immediately	Daily	Yes	4+
12	Hanger	Hand	In Advance	Daily	No	4+
13	Top Sirloin	Hand	In Advance	Daily	Yes	4+

1. Microbiological Guideline for *E.coli* in Ontario is < 3 CFU/g2. Microbiological Guideline for *Enterobacteriaceae* in Alberta is < 100 CFU/g

3. For Sample 1, the machine is cleaned after each use. This doesn't apply to the others.

Results - Continued

- 2 of the 13 samples (15.4%) were positive for both *E.coli* and *Enterobacteriaceae*, both of which exceeded the acceptable limit in Ontario and Alberta (Table 1). Sample number 10 was 3.0 x 10¹ CFU/g for *E.coli* and 2.0 x 10² CFU/g for *Enterobacteriaceae*, and sample number 12 was 4.0 x 10¹ CFU/g for *E.coli* and 2.2 x 10³ CFU/g for *Enterobacteriaceae* thus making it unsatisfactory in regards to the Microbiological Guideline for Ontario and Alberta (Table 1).
- 12 of the 13 samples (92.3%) were positive for *Enterobacteriaceae*, which exceeded the acceptable limit in Alberta thus making it unsatisfactory in regards to the Microbiological Guideline for Alberta (Table 1).
- 7 of the 13 restaurants (53.8%) do not follow HACCP (Table 2). There was also one restaurant (sample 1) that grinds the raw meat with a machine instead of chopping it by hand. Although this sample was below the Microbiological Guideline for the *E.coli* count, the *Enterobacteriaceae* count was 1.5 x 10³ CFU/g, which is higher than the Microbiological limit for Alberta.
- Sample 5 has the highest *Enterobacteriaceae* count of 5.9 x 10³ CFU/g (Table 1) and is the only restaurant that rarely serves steak tartare (Table 2).

Conclusion

There are always food safety risks involved with eating raw meat especially for the vulnerable population such as young children, the elderly, pregnant women and anyone who is immunocompromised. To reduce the risk of foodborne illness, proper hand hygiene, effective food preparation and handling, and thorough cooking of raw beef to an internal temperature of 71° C is strongly recommended. HACCP is a highly recommended system that all food establishments should follow because it reduces, eliminates, and prevents the risks of food hazards by controlling Critical Control Points.

Future Directions

While this study looked at indicators of bacterial contamination, future studies should evaluate the possible presence of specific foodborne pathogens in steak tartare (e.g. *E.coli* O157:H7, *Salmonella*, and *Listeria*). Meat samples taken directly from suppliers should be tested to ensure they're not contaminated. There should also be more samples collected from a variety of different restaurants to provide more accurate results. Proper risk communication is needed for consumers in restaurants that serve the dish.

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