

Food Safety Deficiencies in Ready-to-Eat Meat Processing Plants in Ontario, Canada

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INTRODUCTION

Food safety inspections of meat processing plants and abattoirs that process ready-to-eat (RTE) meats have identified a lack of compliance with a good manufacturing practices. These food safety deficiencies in RTE meat processing plants can increase foodborne disease risks. This study was undertaken to identify common deficiencies and factors related to improved food safety performance in RTE meat plants in Ontario through an analysis of historical audit records.

MATERIALS & METHODS

Annual food safety compliance verification audit records from 2015 to 2019 for free-standing meat processing plants (FSMP) and abattoirs that process RTE meats in Ontario were analyzed. The audits assessed up to 426 items across the following evaluation categories: facilities and surface, equipment, water, operation, personnel, meat product handling and processing, labeling, packaging, transportation, and records.

RESULTS & DISCUSSION

A total of 376,457 audit item results were evaluated across 912 unique audits of 204 different RTE meat plants, with FSMP (81.9%; $n = 167$) being the major establishment type. A nearly two-thirds overall item pass rate (64.4%; $n = 242,478$) was identified.

Table 1. Number of audit item passes and fails by category

Category	No. of Pass (%)	No. of Fail (%)	Total (%)
Premises and equipment	572 (43.3)	750 (56.7)	1322 (100.0)
Sanitation program	6742 (90.3)	728 (9.7)	7470 (100.0)
Equipment	9511 (93.6)	645 (6.4)	10156 (100.0)
Temperature and humidity of rooms	5774 (91.5)	539 (8.5)	6313 (100.0)
Process controls	13113 (96.1)	529 (3.9)	13642 (100.0)
Construction materials	1527 (74.6)	521 (25.4)	2048 (100.0)
Processing standards	19082 (97.7)	442 (2.3)	19524 (100.0)
Lighting	4284 (91.4)	405 (8.6)	4692 (100.0)
Handling and storing of food items	11227 (96.7)	388 (3.3)	11615 (100.0)
Maintenance program	3314 (91.0)	329 (9.0)	3643 (100.0)
Pest control	4183 (92.8)	325 (7.2)	4508 (100.0)
Handling and storing of chemicals	2293 (88.8)	289 (11.2)	2582 (100.0)
Location	3356 (92.5)	274 (7.5)	3630 (100.0)
Recalls	1572 (82.2)	251 (13.8)	1823 (100.0)
Personal hygiene and clothing	14598 (98.4)	243 (1.6)	14841 (100.0)
Cleaning and sanitizing facilities	5053 (96.3)	194 (3.7)	5247 (100.0)
Washroom and other facilities	18984 (99.2)	152 (0.8)	19136 (100.0)
Condition of plant	2537 (94.4)	151 (5.6)	2688 (100.0)
Records	2276 (94.5)	133 (5.5)	2409 (100.0)

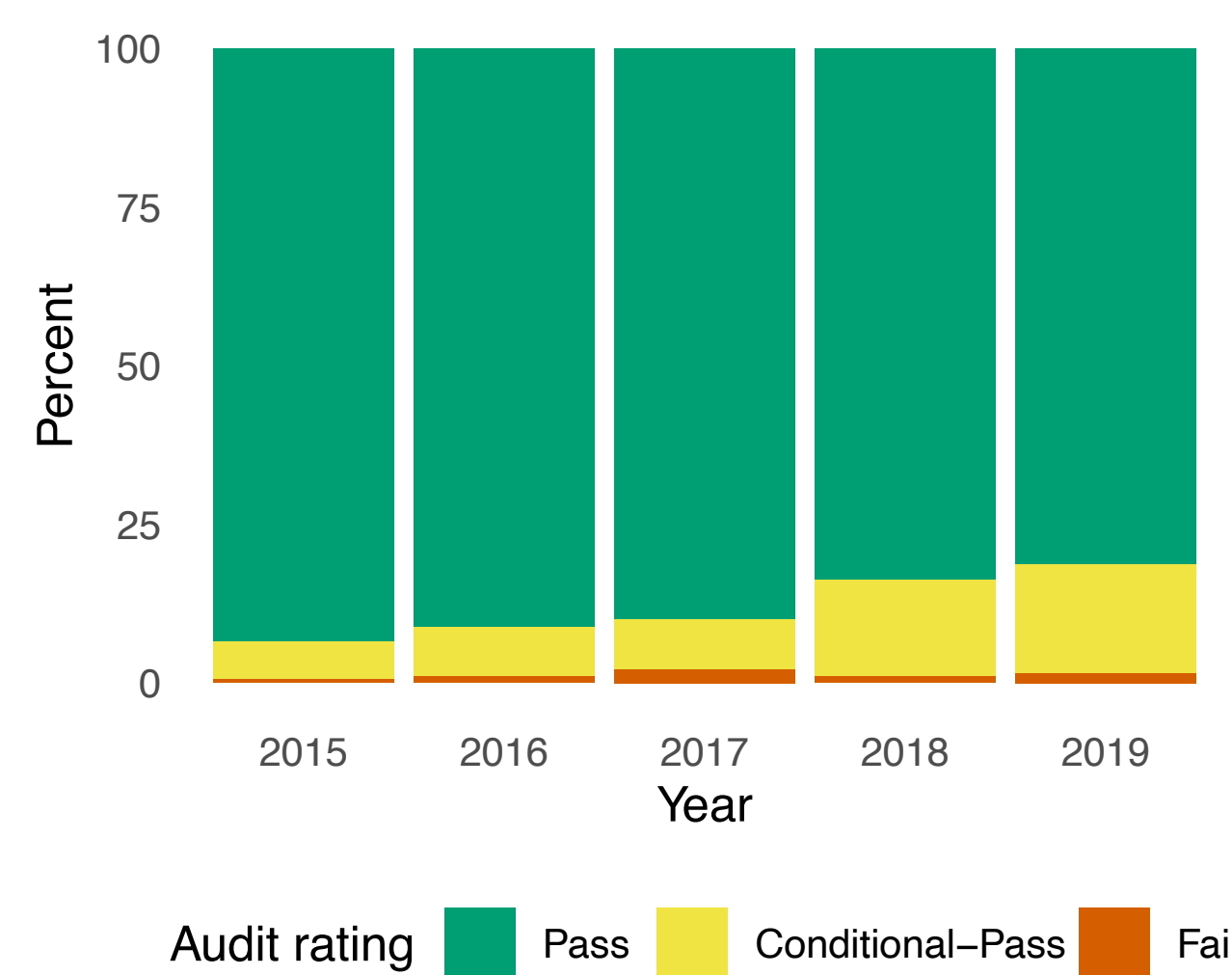


Figure 1. Percentage of audit rating (pass, conditional-pass or fail) by year.

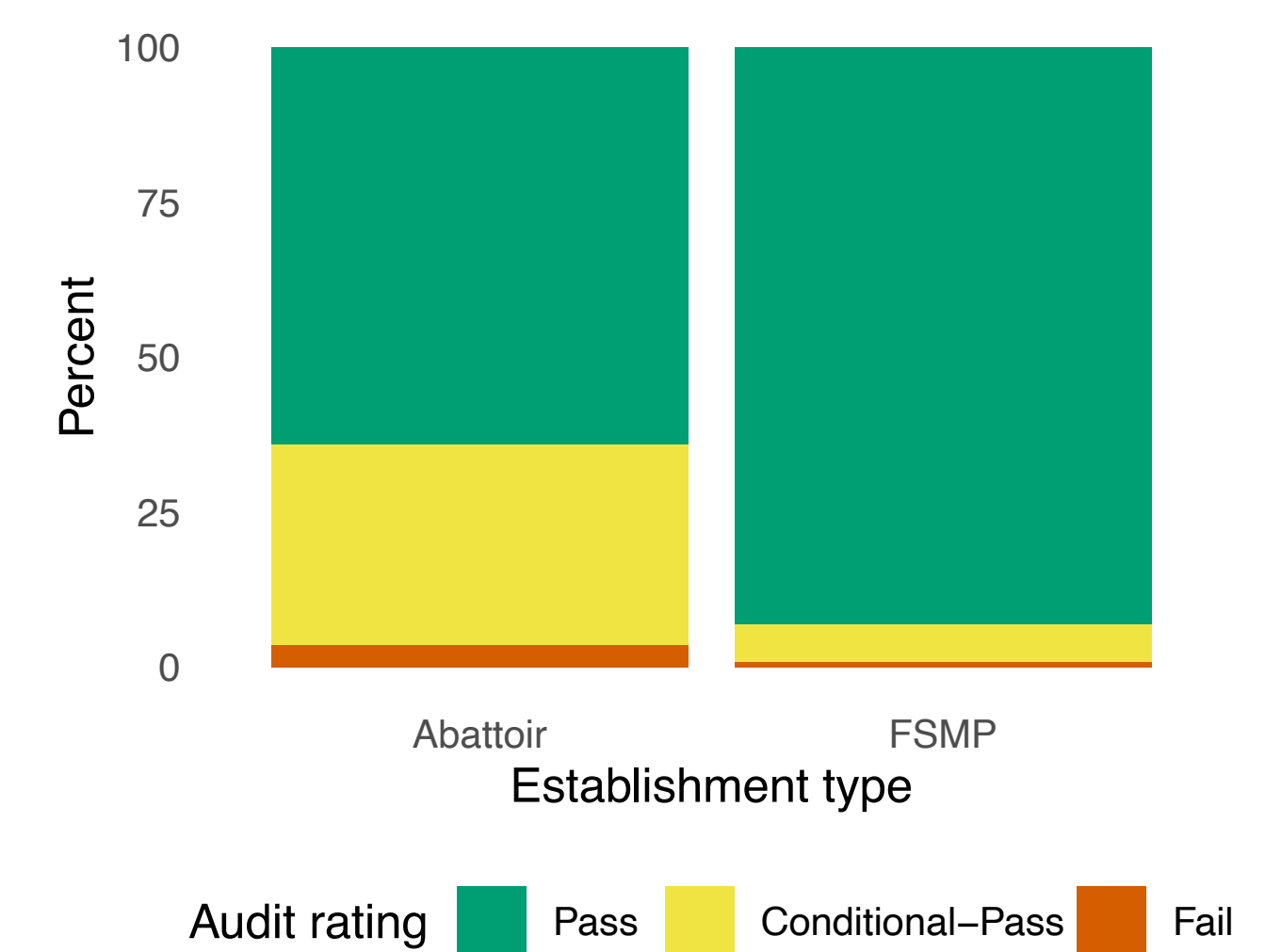


Figure 2. Percentage of audit rating (pass, conditional-pass or fail) by establishment type.

Table 2. Multivariable log-linear model of rate of passing audit items per audit^{a-b}

Predictor	IRR	SE	95% CI	P-value
Carcass_aging_breaking				
Yes	0.993	0.002	0.988, 0.977	0.002
Tenderizing				
Yes	0.995	0.002	0.991, 1.000	0.041
Blood products				
Yes	1.012	0.004	1.005, 1.019	<0.001

^a The model includes account for audit year and day of the week of the audit as confounding factors.

^b IRR, incidence rate ratios; SE, standard error; CI, confidence interval.

Table 3. Multivariable logistic model of overall audit rating (pass vs. conditional pass or fail)^{a-b}

Predictor	OR	SE	95% CI	P-value
Operation type				
FSMP	4.207	0.327	2.216, 7.989	<0.001
Carcass_aging_breaking				
Yes	0.347	0.350	0.175, 0.689	0.002
Jerky				
Yes	0.471	0.295	0.264, 0.840	0.011
No. of employees	0.992	0.003	0.986, 0.998	0.014

^a The model includes account for audit year and day of the week of the audit as confounding factors.

^b OR, odds ratios; SE, standard error; CI, confidence interval.

CONCLUSION

- Excellent compliance was found across audit items in the two highest risk categories (critical-high and significant-high).
- The overall item pass rate of was higher in FSMPs than abattoirs, while pass rates gradually decreased cross the study period.
- Processing activities have significant impact on audit item pass rate and overall pass rating.
- The results found in this study can support and guide future inspection, audit, and outreach efforts to reduce foodborne illness risks associated with RTE meats.