

Effect of nudges in reducing microbial contamination in pork joints in Kampala, Uganda

Denis Mugizi¹, Steven Kakooza², Velma Kivali¹, Kristina Roesel¹, Joshua Waiswa², Dorothée Etienne³, Memory Chirwa³, Imara Roychodhury³, Jolly Hoona⁴, Elizabeth Cook¹

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¹International Livestock Research Institute, Uganda/Kenya; ²Vétérinaires Sans Frontières Germany, Uganda; ³17 Triggers; ⁴Ministry of Agriculture, Animal Industry and Fisheries, Uganda

Introduction

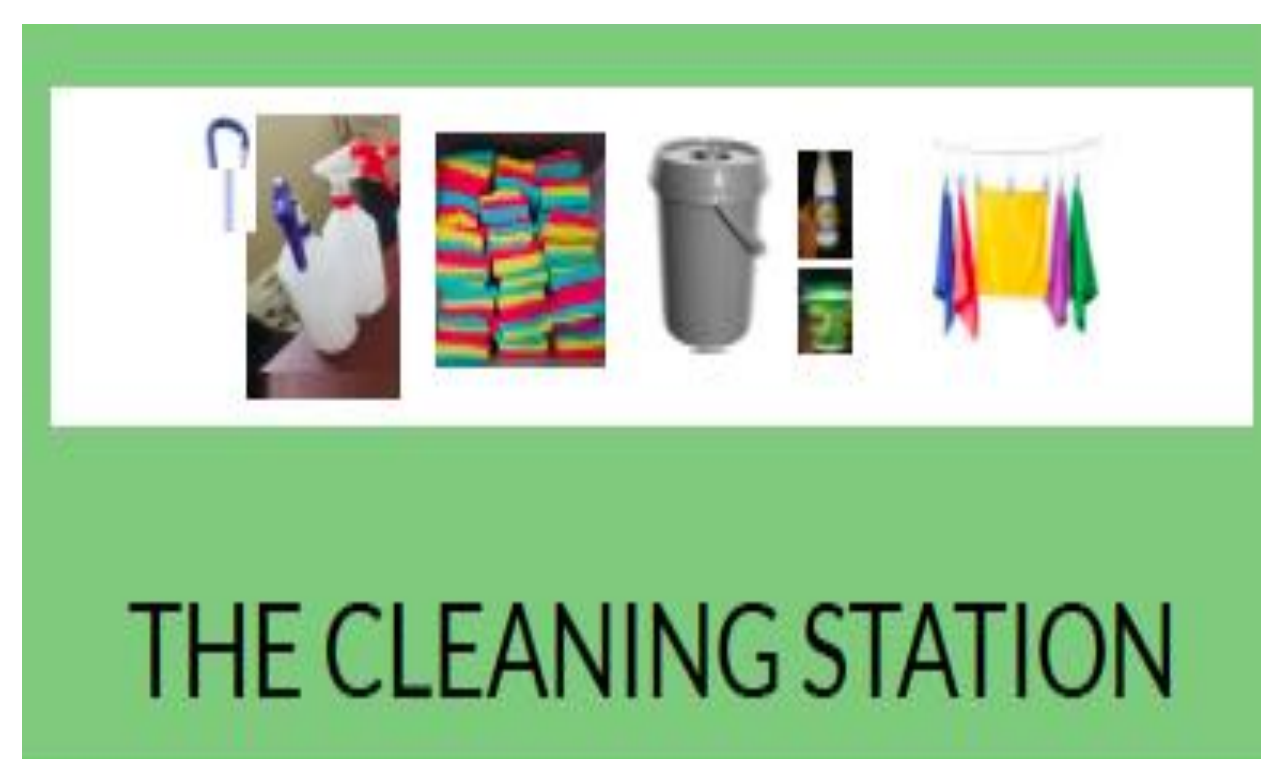
- Bacterial contamination of food is one of the major causes of foodborne illnesses globally.
- Most uncooked food are contaminated with bacteria during production or processing
- Proper cooking is known to kill most of the bacteria making food safe.
- Cross contamination of cooked and uncooked food is one of the major risk for food born illness.
- Most pork joints in Uganda have poor hygiene practices that lead to cross contamination of raw and cooked pork.
- Studies have shown that nudging food handlers with appropriate tools reinforces the adoption of knowledge and improves food hygiene.



Objective and methodology

- To establish if the use of nudge kits (Shown below) reduces bacterial contamination in pork joints
- Compare the impact of using a minimal nudge kit and a full kit on bacteria in pork joints
- Establish the effect of training on food safety on bacterial contamination in Pork joints

| | GROUP | No. of Pork Joints | SAMPLES (Oct. 2020 to Dec. 2021) |
|----------------------|--|-----------------------------|---|
| A | Comprehensive Nudge set & not trained in food safety | 8 | Raw pork; Cooked pork; Roasted pork; Vegetables; Equipment used on raw pork; Equipment used on cooked pork; Equipment used on vegetables; Swabs from kitchen towel; Swabs from hands of pork handlers |
| B | Comprehensive Nudge set & trained in food safety | 8 | |
| B | Minimum Nudge set & not trained in food safety | 8 | |
| D | Minimum Nudge set & trained in food safety | 8 | |
| E | No Nudge set & not trained in food safety | 7 (one dropped out mid-way) | |
| F | No Nudge set, but trained in food safety | 8 | |
| TOTAL | | 47 Pork joints | 431 samples |
| Analyses done | | | Cultured for coliforms and Salmonella |



Key Results

- A total of 431 samples were collected in the entire period, and all cultured for coliforms; and 265 cultured for salmonella.
- The prevalence of Salmonella in samples was 1.9% (5/256) and 3.4% (9/256) pre and post-intervention respectively.
- Salmonella was only prevalent in raw pork pre-intervention (10.9%) and in post-intervention was prevalent in raw pork (8.5%); human hands (2.4%) and Vegetables (6.7%)

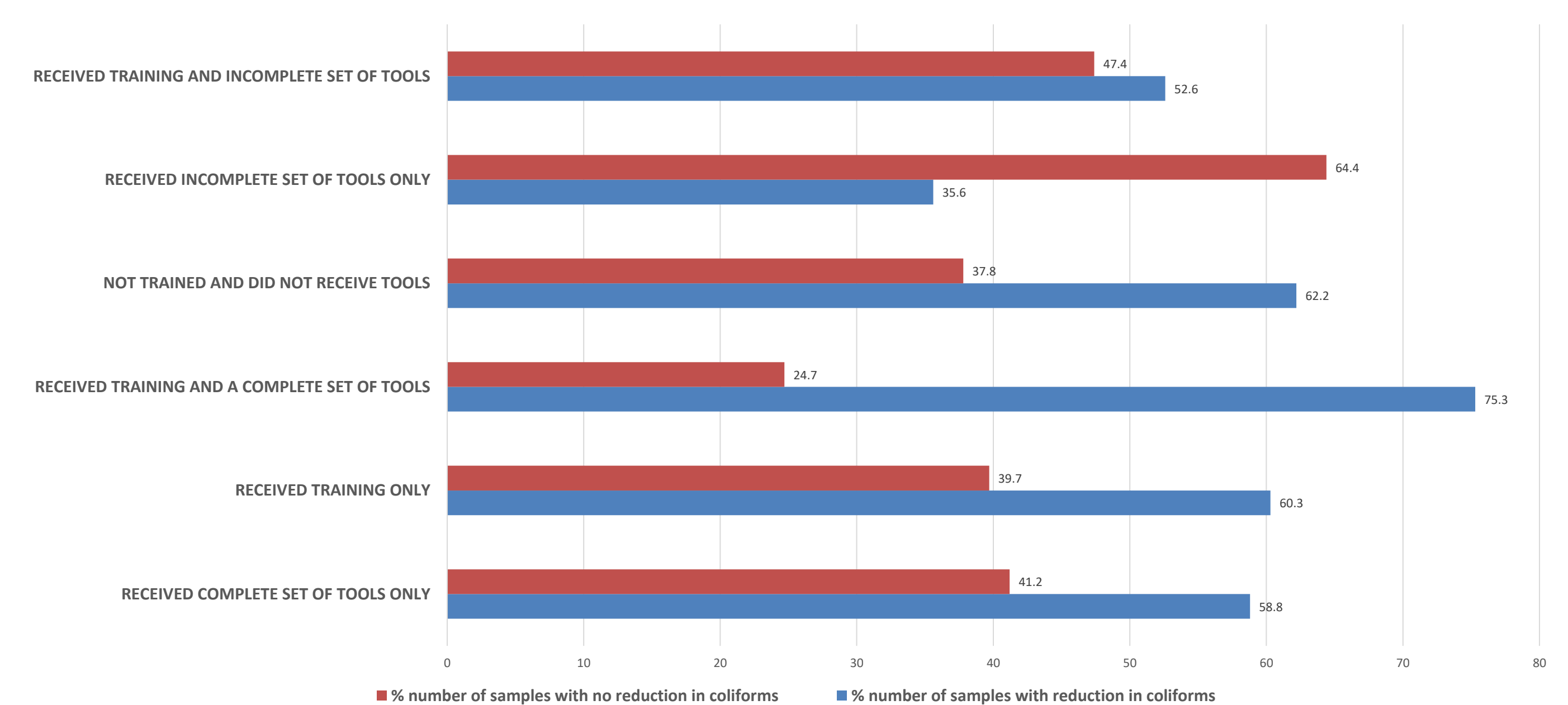
Percentage reduction in coliform counts in different samples in Pork joints that received complete set of Nudges

| Sample type | N | Mean coliforms at baseline (cfu x 10 ³) | Mean coliforms at end-line (cfu x 10 ³) | % Reduction in CfU | t | p-value |
|---------------------------------|----|---|---|--------------------|-------|---------|
| Raw pork | 16 | 617.2 | 141.6 | 77 | 2.834 | 0.013 |
| Equipment for Raw Pork (ERP) | 16 | 820.4 | 1037.3 | -26.4 | -475 | .842 |
| Equipment for Cooked Pork (ECP) | 16 | 233.3 | 106.1 | 55 | .849 | .409 |
| Equipment for Vegetables (EV) | 15 | 268.7 | 140.8 | 45.6 | .604 | .558 |
| Hand Swab (HS) | 25 | 280.0 | 45.4 | 83.8 | 2.034 | .053 |
| Kitchen Towel (KT) | 12 | 318.1 | 131.8 | 58.3 | 1.124 | .285 |
| Vegetables (VEG) | 15 | 17.7 | 3.2 | 82.2 | 1.710 | .109 |
| Roasted Pork (RTP) | 14 | .00 | .00 | - | - | - |
| Cooked Pork (CP) | 16 | .00 | .00 | - | - | - |

Percentage reduction in coliform counts in different samples in Pork joints that received incomplete set of Nudges

| Sample type | N | Mean coliforms at baseline (cfu x 10 ³) | Mean coliforms at end-line (cfu x 10 ³) | % Reduction in CfU | t | p-value |
|---------------------------------|----|---|---|--------------------|--------|---------|
| Raw pork | 16 | 264.7 | 315.7 | -10.9 | -301 | .768 |
| Equipment for Raw Pork (ERP) | 16 | 873.7 | 2038.1 | -133.3 | -1.719 | .106 |
| Equipment for Cooked Pork (ECP) | 16 | 76.3 | 498.9 | -562.4 | -2.052 | .058 |
| Equipment for Vegetables (EV) | 16 | 93.8 | 224.2 | -139.2 | -7.799 | .436 |
| Hand Swab (HS) | 26 | 102.99 | 90.4 | 12.2 | .208 | .837 |
| Kitchen Towel (KT) | 13 | 182.6 | 846.1 | -363.7 | -1.515 | .156 |
| Vegetables (VEG) | 16 | 4.5 | 29.6 | -562.7 | -1.311 | .209 |
| Roasted Pork (RTP) | 15 | 1.2 | .00 | 100 | 1.000 | .334 |
| Cooked Pork (CP) | 16 | .00 | .00 | - | - | - |

EFFECT OF TREATMENT TYPE ON COLIFORMS SAMPLES FROM PORK JOINTS



Effect of training in food safety on Reduction in Bacteria in pork joints

- Pork joints that received training in food safety
- Pork joints that did not receive training in food safety

| Sample type | N | Mean baseline coliforms (cfu x 10 ³) | Mean end-line coliforms (cfu x 10 ³) | % Reduction in CfU | t | p-value |
|---------------------------------|----|--|--|--------------------|-------|---------|
| Raw pork | 23 | 686.5 | 193.0 | 61.3 | 2.319 | .030 |
| Equipment for Raw Pork (ERP) | 23 | 859.9 | 964.0 | -12.1 | -249 | .806 |
| Equipment for Cooked Pork (ECP) | 23 | 144.2 | 153.6 | -6.5 | -0.77 | .940 |
| Equipment for Vegetables (EV) | 22 | 133.1 | 90.6 | 32 | .399 | .694 |
| Hand Swab (HS) | 41 | 192.1 | 66.3 | 65.5 | 1.652 | .106 |
| Kitchen Towel (KT) | 18 | 364.5 | 411.7 | -4.3 | -0.80 | .953 |
| Vegetables (VEG) | 22 | 12.7 | 6.98 | 45 | 1.005 | .326 |
| Roasted Pork (RTP) | 21 | 0.8 | .00 | 100 | 1.000 | .329 |
| Cooked Pork (CP) | 22 | .00 | .00 | - | - | - |

| Sample type | N | Mean baseline coliforms (cfu x 10 ³) | Mean end-line coliforms (cfu x 10 ³) | % Reduction in CfU | t | p-value |
|---------------------------------|----|--|--|--------------------|--------|---------|
| Raw pork | 24 | 279.95 | 272.8 | 2.6 | .089 | .937 |
| Equipment for Raw Pork (ERP) | 21 | 732.6 | 1426.8 | -94.8 | -1.482 | .152 |
| Equipment for Cooked Pork (ECP) | 24 | 215.6 | 415.3 | -92.6 | -1.131 | .270 |
| Equipment for Vegetables (EV) | 23 | 114.9 | 175.4 | -52.8 | -.862 | .860 |
| Hand Swab (HS) | 37 | 97.3 | 41.1 | 57.7 | 1.485 | .157 |
| Kitchen Towel (KT) | 18 | 8.9 | 295.3 | -3213.9 | -1.318 | .205 |
| Vegetables (VEG) | 23 | 12.2 | 16.1 | -33.6 | -.278 | .787 |
| Roasted Pork (RTP) | 20 | .00 | .00 | - | - | - |
| Cooked Pork (CP) | 23 | .00 | .00 | - | - | - |

Conclusions

- Pork in Uganda is safe for human consumption IF well cooked
- Training in good hygienic practices reduces the risk of cross-contamination
- Fully equipping pork joints with appropriate tools facilitates the uptake of training
- Only partial equipment of pork joints increases cross contamination

Limitations

COVID 19 control measures that were being implemented at the time could compromise the findings of this study.

Contribution to Uganda's livestock development agenda

Appropriate foodborne illness risk reduction measures in pork joints have been identified, successfully and could increase consumers interest in pork. With the support of the private sector, this could have a trickle-down effect on increased uptake of pig farming and pork processing in Uganda.

Denis Rwabiita Mugizi
d.mugizi@cgiar.org
ILRI c/o Bioversity International
P.O. Box 24384, Kampala Uganda
+256 392 081 154/155



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