




 The U.S. Government's Global Hunger & Food Security Initiative

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សៀវភៅណែនាំ
 គន្លឹះទាំង៥សម្រាប់អាជីវករ
 ដើម្បីសុវត្ថិភាពសាច់ជ្រូកនៅតាមទីផ្សារក្នុងប្រទេសកម្ពុជា








Safe Food, Fair Food for Cambodia

July 2017 – March 2021

Principal Investigator

- Dr. Delia Randolph, International Livestock Research Institute (ILRI)
- Dr. Nguyen Hung, ILRI

Co-PI and Collaborators

- Dr. Sothyra Tum, National Animal Health and Production Research Institute
- Dr. Chhay Ty, Centre for Livestock and Agriculture Development (CelAgrid)
- Emory University
- Cambodia CDC, National Institute of Nutrition

Objectives

- 1) Assess the multiple burdens of foodborne diseases associated with key animal-source food value chains.
- 2) Adapt and evaluate a market-based approach to improving food safety.
- 3) Reduce the burden of foodborne disease in informal, emerging formal, and niche markets.

Prevalence of Salmonella and Staphylococcus aureus in meat in Cambodian markets

Chea Rortana, Delia Grace, Hung Nguyen, Sothya Tum, Sinh Dang-Xuan, Sok Koam, Theng Heng, Seng Sarim and Johanna Lindahl

Introduction

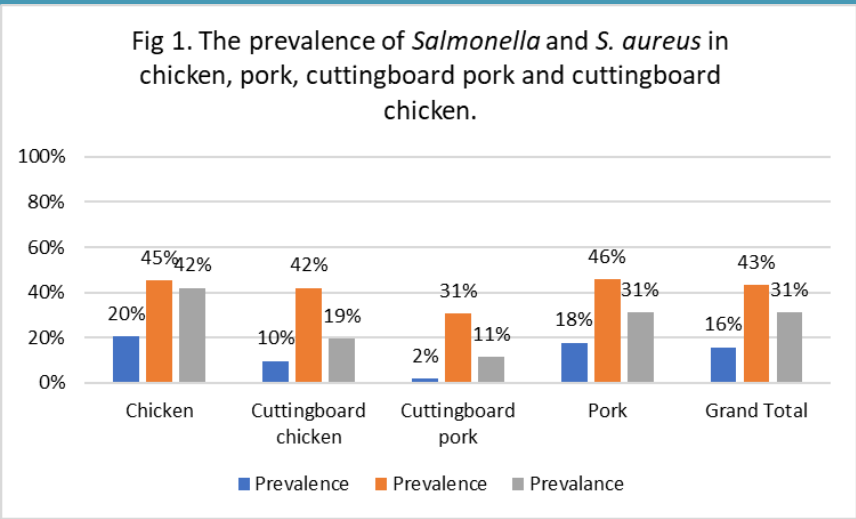
- Foodborne diseases are important in low and middle-income countries, because of their high health burden and huge economic cost.
- Fresh meat is often contaminated with microorganisms.
- Here we assess the prevalence of *Salmonella* and *Staphylococcus aureus* in animal-source foods (chicken and pork) sold at Cambodian traditional markets.

Methods

- Sampling was collected from retail wet markets for pork and chicken meat in 25 provinces of Cambodia between October 2018 and August 2019, including repeat sampling in wet season in 4 provinces (Phnom Penh, Sihanoukville, Battambang and Siem Reap) after approximately 5 months.
- The 496 specimens were collected aseptically at about 9-11 am: chicken meat (n=186), chicken cutting board (n=62), pork (n=186) and pork cutting board (n=62).
- All specimens were tested for presence of *Salmonella* and *S. aureus*

A nationwide multi-hazard survey in markets in Cambodia found the prevalence in meat (pork and chicken) of *Salmonella* was 43% and of *Staphylococcus* was 31%.

The prevalence of *Salmonella* found in chicken 45.2%, cutting board of chicken 41.9%, pork 45.7% and cutting board of pork 11.3%. The prevalence of *S. aureus* found in chicken 41.9%, cutting board of chicken 19.4%, pork 45.7% and cutting board of pork 30.6%.



Results

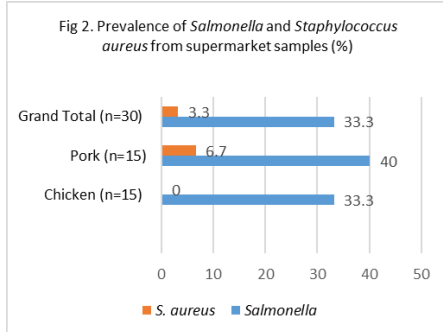


Table I. Colony forming unit of coagulase-positive *Staphylococci*

Specimen	Number tested sample	Number and %		
		500-5000 CFU/g	10-200 CFU/g	<10 CFU/g
Chicken	186	44(23.7)	39(21.0)	103 (55.4)
Cutting board chicken	62	6 (9.7)	5 (8.1)	51 (82.3)
Cutting board pork	62	4 (6.5)	3 (4.8)	55 (88.7)
Pork	186	31 (16.7)	34 (18.3)	123 (66.1)
Total	496	83 (16.7)	81 (16.3)	332 (66.9)

Recommendations

- The study found that half of the samples collected were positive for these zoonotic pathogens that can cause serious foodborne diseases in humans.

Research gaps or future opportunities

- The results indicate that these pathogens may contribute to common foodborne illness in Cambodia, and interventions to improve hygienic standards in markets are strongly recommended.

Food environment, food safety & nutrition

Minh-Cam Duong, Morgan Brown, Chhay Ty, Chhea Chhorvann, Hung Nguyen, Delia Grace and Melissa Young

Introduction

Food environment is driving the food choice in low-and-middle-income countries, but there is a lack of evidence on food environment and inadequate meat consumption.

Food safety perception can potentially affect food purchase & consumption, but there is a lack of food environment studies that incorporate food safety perception.

Objective

Examine whether mothers' perception of access to affordable, good-quality and safe-to-consume food are associated with their and their children's food consumption.

Methods

Mixed methods: in-depth interviews and cross-sectional survey with mothers of young children in cities of Phnom Penh & Siem Riep, Cambodia

Although less common than bacterial contamination, mothers expressed a high level of concern about chemical contamination in fresh produce.

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Mothers' perception of *poor access to good-quality and safe-to-consume food* was associated with low consumption of animal-sourced food, and fruits and vegetables in mothers and their children.



Other results

1. Urban food acquisitions

14% of women reported acquiring fruits and vegetables, and 26% acquiring animal meat, fish and seafood from their own gardens, relatives, friends or the natural environment.

2. Household wealth and child's food consumption

Child age and not household wealth was associated with their meat consumption, suggesting that beliefs and norms might play important roles in determining the timing of the introduction of meat, fruits and vegetables

Recommendations

Future studies should:

1. Examine how food safety perception influences food acquisition and consumption
2. Examine household norms and beliefs surrounding the introduction of meat, fruits and vegetables to infants.
3. Develop innovative measures of food environment to capture the informal natures of food acquisitions.

Experiment of *Salmonella* cross-contamination during handling and preparation of chicken salad in Cambodia

Rortana Chea, Sinh Dang, Sothya Tum, Johanna Lindahl, Delia Grace, Sok Koam, Tet Khuoch, Rourn Sophia, Hung Nguyen-Viet

Introduction

- In Cambodia, chicken salad is a popular meal prepared by mixing sliced chicken with raw vegetable.
- To assess the risk of chicken salad, a quantitative microbial risk assessment (QMRA) required quantitative information on microbial load and cross-contamination in consumed food.

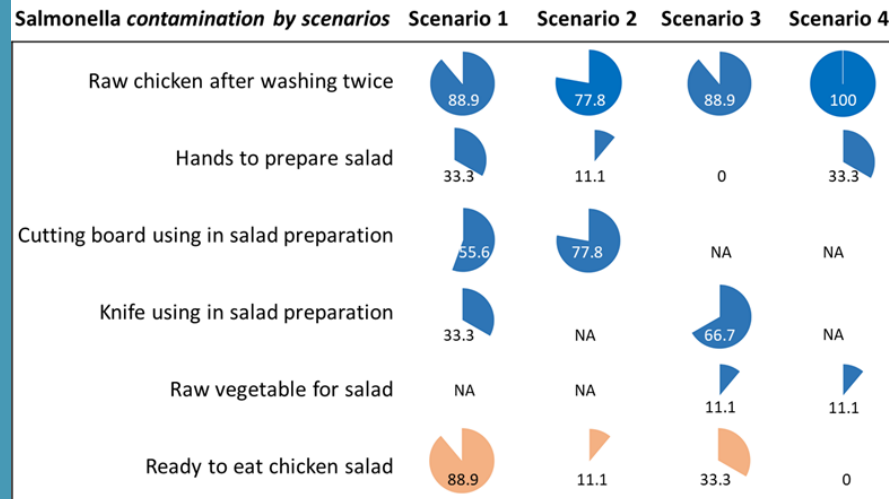
Methods

- Four cross-contamination scenarios were examined according to common practices and consumption regarding chicken salad.
- A whole chicken carcass (approx. 1 kg) was inoculated with 10 colony-forming unit (CFU) per gram *Salmonella* prior preparing the chicken salad. Each scenario was performed 9 times.
- We assessed various specimens in each scenario (Table 1) to quantify *Salmonella* presence and most probable number (MPN).

- Scenario 1:** Washing and preparing the vegetable first, then washing and cutting raw chicken, and when prepare boiled chicken using the same hands, cutting board and knife to make salad.
- Scenario 2:** Washing and preparing the vegetable first, then washing and cutting raw chicken, and when prepare boiled chicken using the same hands, but separate cutting board and knife to make salad
- Scenario 3:** Washing and cutting raw chicken first, put carcass on pot for boiling, then washing and preparing the vegetable. When prepare boiled chicken, using the same hands, cutting board and knife to make salad.
- Scenario 4:** Washing and cutting raw chicken first, put carcass on pot for boiling, then washing and preparing the vegetable. When prepare boiled chicken using the same hands, but separate cutting board and knife to make salad.

Salmonella cross-contamination occurred when preparing chicken salad using the same bare hands, knife and cutting board.

The highest and lowest *Salmonella* cross-contamination from raw chicken to salad were the use of the same hands, cutting board and knife (scenario 1) and the use of the same hands, but separate cutting board and knife (scenario 4)



Results



Ready to eat Cambodian chicken salad

Recommendations

- Create awareness about best home cooking practices ensuring clean hands and utensils.
- Avoiding the source of microbial contamination is also needed, by improving practices at slaughterhouses and markets.

Research gaps or future opportunities

- This result will be used in the quantitative microbial risk assessment model to estimate the incidence of salmonellosis in Cambodian people through consumption of chicken salad.

Good Hygiene Practices Intervention for Safer Pork in Traditional Markets in Cambodia: a preliminary result

Chea Rortana, Delia Grace, Hung Nguyen, Sothyra Tum, Sinh Dang-Xuan, Sok Koam, Theng Heng, Seng Sarim and Johanna Lindahl

Introduction

- In low-and-middle-income countries, animal sourced food sold in traditional markets play an important role because of the livelihood importance but also because of food safety concerns.
- Light-touch interventions can change practice (*by nudging*) and are especially suited to contexts where demand for food safety is high.
- **Objective:** To improve hygiene practices and knowledge of pork vendors contributing towards safer pork sold in traditional markets in Cambodia.

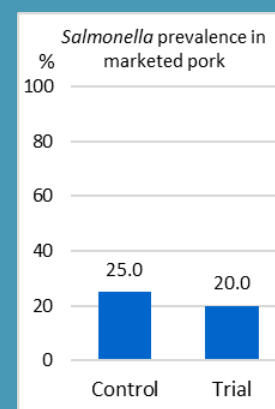
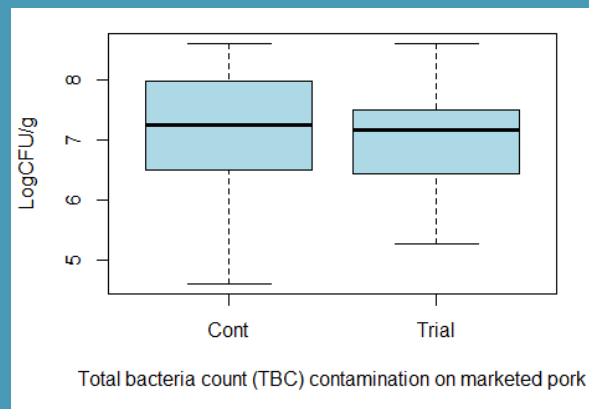
Methods

1. A randomized controlled trial was designed in 12 trial and 12 control markets in 6 provinces in Cambodia.
2. The intervention package included the provision of shop equipment and training on good hygiene practices.
3. Pork sampling (for total bacteria count, TBC and *Salmonella* contamination, $n_{\text{control}} = n_{\text{trial}} = 180$), and Knowledge, Attitude and Practice (KAP) evaluation were conducted and analyzed.

A low to moderate compliance of pork vendors in applying cleaning and disinfection spray for shop equipment and hands was observed from trial group.

While there was a slight reduction of total bacteria count load and *Salmonella* prevalence in pork, there was no significant difference between trial and control groups.

A major issue was that the whole intervention period took place during COVID-19 disrupting follow-up and monitoring.



Results

We present a preliminary result from four out of six provinces on microbial analysis. The KAP data are not presented here.



Recommendations

- Vendor's behavior regarding cleaning and disinfection practices at the shop need to be followed up during the intervention period.
- Stronger policy engagement and consumer recognition to the vendor's food safety practices in order to strengthen vendors' compliance with the intervention packages.

Research gaps or future opportunities

- To evaluate how incentives, and provision of an enabling policy environment influence the improvement of both food hygiene practices and indicators.

Prevalence of the zoonotic diseases cysticercosis and trichinellosis among pigs in rural Cambodia

R. Söderberg, F. Unger, J. Lindahl

Introduction

Cysticercosis and trichinellosis are important parasitic zoonoses that are expected to be endemic among pigs in Southeast Asia. Both can lead to serious illnesses in humans. In Cambodia, the majority of pigs are raised extensively, a potential risk factor for both diseases. Pork is the most importance source of meat and risky consumption habits may exist.. While sporadic outbreaks in humans have been reported, data in pigs are scarce.

Objective

Assess the seroprevalence of porcine cysticercosis and trichinellosis in rural Cambodia and identify possible risk factors for both diseases.

Methods

This study was conducted in 4 provinces in north-eastern Cambodia (Kampong Thom, Preah Vihear, Ratanakiri and Stung Treng)

242 blood samples were collected from 139 households (less than 10 pigs) and one household member interviewed (pig raising, food safety and consumption habit).

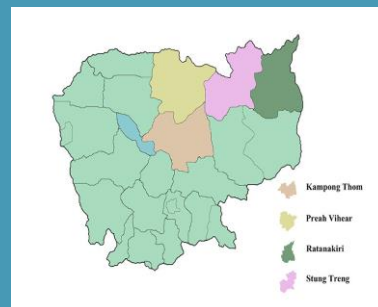
Serum samples were analysed with ELISA for presence of antigens for cysticercosis or antibodies towards trichinellosis.

Positivity for porcine cysticercosis was 11.2% and varied by province. It was highest in Preah Vihear with about 1 in 3 pigs positive.

At 2.5%, positivity for trichinellosis was lower.

Knowledge on cysticercosis was moderate but poor for trichinellosis.

Men were more aware of cysticercosis, and were consuming undercooked pork to a greater extent.



Credit: R. Söderberg

Results

Both parasitic zoonoses are endemic in the surveyed areas with higher prevalence's for cysticercosis. Poor pig management and access to human feces increased the risk for porcine cysticercosis while feeding food waste those for trichinellosis.



Credit: R. Chea

Recommendations

The occurrence of both zoonoses, observed risk factors aligned with limited knowledge of interviewed household members indicates the need for targeted intervention in particular in the high-risk areas. This may include promoting deworming of pigs, capacity building in meat inspection and awareness campaigns in consumers.

Further studies in the rest of Cambodia would be of interest to get a better understanding of the distribution of both diseases.

Research gaps

As the specificity of commercially available cysticercosis ELISA tests is limited (cross-reactivity with other *taenia* spp.) future research for more specific test is suggested.