

RESEARCH ARTICLE

# Prevalence of *Salmonella* spp. Isolated from Pigs at Nongdouang Slaughterhouse in Vientiane Capital, LAO PDR

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## Abstract

**Objective**—To determine the prevalence of *Salmonella* isolated from pigs at Nongdouang slaughterhouse in Vientiane Capital, Lao PDR.

**Materials and Methods**—Eleven samplings were conducted during March to July 2011. A total of 176 samples consisted of 88 swine carcass swabs and 88 swine cecal swabs were collected. The culture method was followed that of ISO 6579:2002/AMD 1:2007 for *Salmonella* identification.

**Results**—The prevalence of *Salmonella* spp. isolated from all samples was 39.77% (70/176). Prevalence in swine carcass and swine cecum was 25.00% (22/88) and 54.55% (48/88), respectively. Twelve serotypes was identified and the most isolated serotype from pigs was *S. Rissen* (48.05%), followed by *S. Typhimurium* (11.69%), *S. Worthington* (7.79%), *S. Derby* (6.49%), *S. Anatum* (5.19%), *S. Stanley* (5.19%), *S. Farmsen* (3.90%) and *S. Panama* (3.90%), *S. Panama* (3.90%), *S. Give* (2.60%), *S. Kedougou* (2.60%), *S. Bovismorbificans* (1.30%) and *S. London* (1.30%), respectively.

**Conclusion**—This suggested that pork is an important source of salmonellosis for consumers in Vientiane capital, Lao PDR. A hygienic improvement in slaughtering process should be considered. Bacterial transmission must be prevented for the safer pork consumption.

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**Keywords:** Lao PDR, Pork, Prevalence, *Salmonella*, Slaughterhouse

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# ความชุกของเชื้อซัลโมเนลลาที่แยกได้จากสุกร ในโรงฆ่าสัตว์หนองบัว นครหลวงเวียงจันทน์ ประเทศสาธารณรัฐประชาธิปไตยประชาชนลาว

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## บทคัดย่อ

วัตถุประสงค์ เพื่อหาความชุกของเชื้อ และการดื้อยาของเชื้อซัลโมเนลลาที่แยกได้จากสุกร ในโรงฆ่าสัตว์หนองบัว นครหลวงเวียงจันทน์ ประเทศสาธารณรัฐประชาธิปไตยประชาชนลาว

วัสดุ อุปกรณ์ และวิธีการ โดยเก็บตัวอย่าง 11 ครั้ง ระหว่างเดือนมีนาคม – กรกฎาคม 2554 รวม 176 ตัวอย่าง จากสุกร 88 ตัว ประกอบด้วย ตัวอย่างปัสสาวชากสุกร 88 ตัวอย่าง และ ตัวอย่างปัสสาวไส้ใหญ่สุกร 88 ใช้การตรวจแยกเชื้อด้วยวิธีมาตรฐาน 6579:2002 AMD1:2007

ผลการศึกษา พบเชื้อซัลโมเนลลาทั้งหมด 39.77% (70/176) แบ่งเป็นจากตัวอย่างปัสสาวชากสุกร และ ตัวอย่างปัสสาวไส้ใหญ่สุกร จำนวน 25.00% และ 54.55% ตามลำดับ พบ 12 ซีโรไทป์ โดยซีโรไทป์ที่พบมากที่สุดในสุกร คือ *S. Rissen* (48.05%), รองลงมาคือ *S. Typhimurium* (11.69%), *S. Worthington* (7.79%), *S. Derby* (6.49%), *S. Anatum* (5.19%), *S. Stanley* (5.19%), *S. Farmsen* (3.90%) และ *S. Panama* (3.90%), *S. Give* (2.60%), *S. Kedougou* (2.60%), *S. Bovismorbificans* (1.30%) และ *S. London* (1.30%) ตามลำดับ

ข้อสรุป เนื้อสุกรจากแหล่งศึกษาอาจก่อให้เกิดโรคซัลโมเนลโลซิสในผู้บริโภคในนครหลวงเวียงจันทน์ ประเทศสาธารณรัฐประชาธิปไตยประชาชนลาวได้ สุขอนามัยในกระบวนการฆ่าควรรได้รับการปรับปรุง การแพร่เชื้อของแบคทีเรียต้องได้รับการป้องกัน เพื่อทำให้การบริโภคเนื้อหมู่นั้นปลอดภัยมากยิ่งขึ้น

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## Introduction

Salmonellosis is an important public health problem in many countries. It has a high and inevitable impact on human and animal health and economy of the society. The disease caused by *Salmonella* spp. other than *S. Typhi* and *S. Paratyphi*. It can be found in many species of animals such as pig, cattle, sheep, goat, dog, poultry, and shellfish as well as in human [1-3]. The disease can be transmitted via consumption of *Salmonella*-contaminated foods such as meat, which is mainly contaminated during the slaughtering, evisceration, and transporting process. In addition, the bacteria can be found in faeces, muscle, blood, lymph node, tonsils, the digestive tract and visceral organs of animals and humans [4-8]. The present study aimed at examining the prevalence of *Salmonella* in pigs at Nongdouang slaughterhouse in Vientiane capital, Lao PDR.

Limited studies were conducted in LAO PDR concerning prevalence of *Salmonella*. One study by Inthavong et al. [11] in 2006 showed that the prevalence for specific serotype i.e. *S. Rissen* was 29.00%, while Boonmar et al. in 2008 [10] indicated the prevalence of *S. Derby* at 51.00%. The present study in 2011 was the third study conducted in LAO PDR.

## Materials and Methods

### *Sample collection*

Eighty-eight pigs slaughtered at Nongdouang slaughterhouse in Vientiane capital, Lao PDR were sampled during March to July, 2011. Each carcass-half of around 8 pigs at 100 kg, regardless of breed and age submitted to the slaughterhouse, were sampled at each visit, 1 to 2 weeks apart. A swab of the whole carcass-half surface and a cecal content swab were collected from each pig. Samples were then submitted to the Department of Veterinary Public Health, Faculty of Veterinary Medicine, Khon Kaen University, Thailand for isolation and identification.

### *Bacteriological culture*

Isolation procedure was performed according to ISO 6579: 2002/AMD 1:2007 [9]. The single swab in the Cary-Blair Broth (BD BBL, Becton Dickinson, Franklin Lakes, NJ) were put into 9 ml of Buffer Peptone Water (BPW, Criterion, Hardy Diagnostis, Santa Maria, CA) and incubated at 37°C for 18-24 h. The suspension was placed onto Modified Semisolid Rappaport Vassiliadis medium (MSRV, Difco, Franklin Lakes, NJ) at 3 peripheral spots, 3 loops each, and then incubated at 42°C for 18-24 h. Positive colonies were streaked onto Xylose Lysine Deoxycholate Agar (XLD, Difco) and Hektoen Enteric Agar (HE, Difco) and incubated at 37°C for 18-24 h. Three *Salmonella* positive colonies were streaked and stabbed into Triple Sugar Iron Agar (TSI, Difco) and the same needle were stabbed into a tube containing the Motility Indole Lysine medium (MIL, Difco), and incubated at 37°C for 18-24 h. The slide agglutination test with O-antigen (Biotechnical, Bangkok, Thailand) was used to group the *Salmonella* isolates. All isolates were also submitted to the National Laboratory at the Department of Medical Sciences, Ministry of Public Health in Bangkok, Thailand for serotyping.

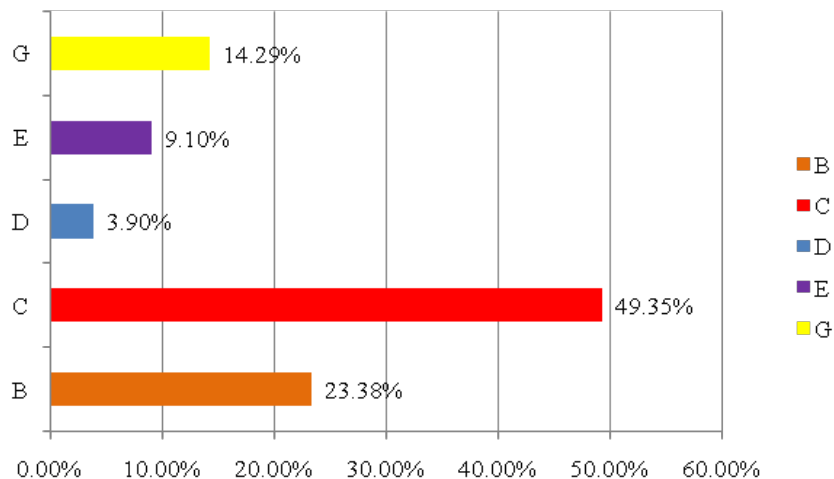
## Results

The prevalence of *Salmonella* spp. isolated from all samples was 39.77% (70/176). The prevalence in swine carcass and cecal swab samples was 25.00% (22/88) and 54.55% (48/88), respectively (**Table 1**). After grouping, the total of 70 positive samples comprised of 77 *Salmonella* isolates. They were classified into 5 different groups, ranked in order of the prevalence, which were C (38 isolates), B (18 isolates), G (11 isolates), E (7 isolates), and D group (3 isolates) as shown in **Figure 1**. There were 5 groups of *Salmonella* isolates, which were C (38), B (18), G (11), E (7) and D (3). Twelve serotypes were identified i.e. *S. Rissen* (37), *S. Typhimurium* (9), *S. Worthington* (6), *S. Derby* (5), *S. Stanley* (4), *S. Anatum* (3), *S. Farmsen* (3), *S. Give* (3), *S. Panama* (3), *S. Kedougou* (2), *S. Bovismorbificans* (1) and *S. London* (1) as shown in **Table 2**.

**Table 1.** *Salmonella* Isolates in Swine Samples in Nongdouang Slaughterhouse

Type of sample	No. of total sample	No. of <i>Salmonella</i> positive sample (%)
Swine carcass swab	88	22 (25.00)
Swine cecal swab	88	48 (54.55)
<b>Total</b>	<b>176</b>	<b>70 (39.77)</b>

**Figure 1.** Proportion of Samples Classified by Groups of *Salmonella*



**Table 2.** *Salmonella* Serotypes in Swine Samples

Type of sample	No. of sample	No of <i>Salmonella</i> positive sample (%)	Group	Serotype (no. of isolates)
Swine cecal swab	88	54 (61.36)	B	Derby (4)
				Typhimurium (4)
				Stanley (3)
			C	Rissen (26)
			D	Panama (2)
			E	Give (2)
				Anatum (1)
				London (1)
				G
Kedougou (2)				
Swine carcass swab	88	23 (26.14)	B	Typhimurium (5)
				Derby (1)
				Stanley (1)
			C	Rissen (11)
				Bovismorbificans (1)
			D	Panama (1)
			E	Anatum (3)
<b>Total</b>	<b>176</b>	<b>77(43.75)</b>		

## Discussion

The present study noted that *Salmonella* contamination in pigs and pig carcasses was high (39.77%, 70/176) in Vientiane Capital, Lao PDR. This indicated poor hygienic practice during the slaughtering process. Prevalence of *Salmonella* in swine cecum was higher than in swine carcasses (54.00 and 25.00%, respectively). Twelve serotypes were identified, and the most frequently isolated serotype from pigs was *S. Rissen* (48.05%), followed by *S. Typhimurium* (11.69%). Previous study in Vientiane capital in 2007 reported that the prevalence of *Salmonella* infection in slaughtered pigs was 76.00% [10], which was higher than what found in this study. In Surin province, northeastern Thailand, the prevalence of *Salmonella* in bunker swine farm was 4.58% (11/240) and 7.50% (18/240) at small conventional swine farm, which was much lower than reported in the present study. *S. Sandiego* and *S. Bovismorbificans* were reported in bunker swine farm while *S. Stanley* was identified in small conventional swine farm [12]. Moreover, study in 2010 in Khon Kaen province of Thailand noted that prevalence of *Salmonella* isolated from pig carcasses was higher than from live pigs (36.67 and 27.14 %, respectively) [13]. This indicated a mal- hygienic practice at the slaughtering process. The present study in 2011 showed a controversial rate

of *Salmonella* contamination in Lao PDR slaughtered pigs in that pig carcasses were less contaminated compared with the *Salmonella* prevalence reported by Inthavong et al. in 2006 [9].

In conclusion, the overall prevalence of *Salmonella* in both swine carcass and swine cecum was high in the slaughtered pigs in Vientiane Capital, Lao PDR. This may also be an important source for human infection. Hygienic practices should be implemented for a better control of quality pork.

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