THE 4TH FOOD SAFETY AND ZOONOSES SYMPOSIUM FOR ASIA PACIFIC

Antibiotic residues and heavy metal in pork at wet markets in Vietnam

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Outline

1. Chemical hazards in pork and concerns
2. Objectives
3. Sampling and sample analyses
4. Results and discussion
5. Conclusions

1. Chemical hazards in pork and concerns

News

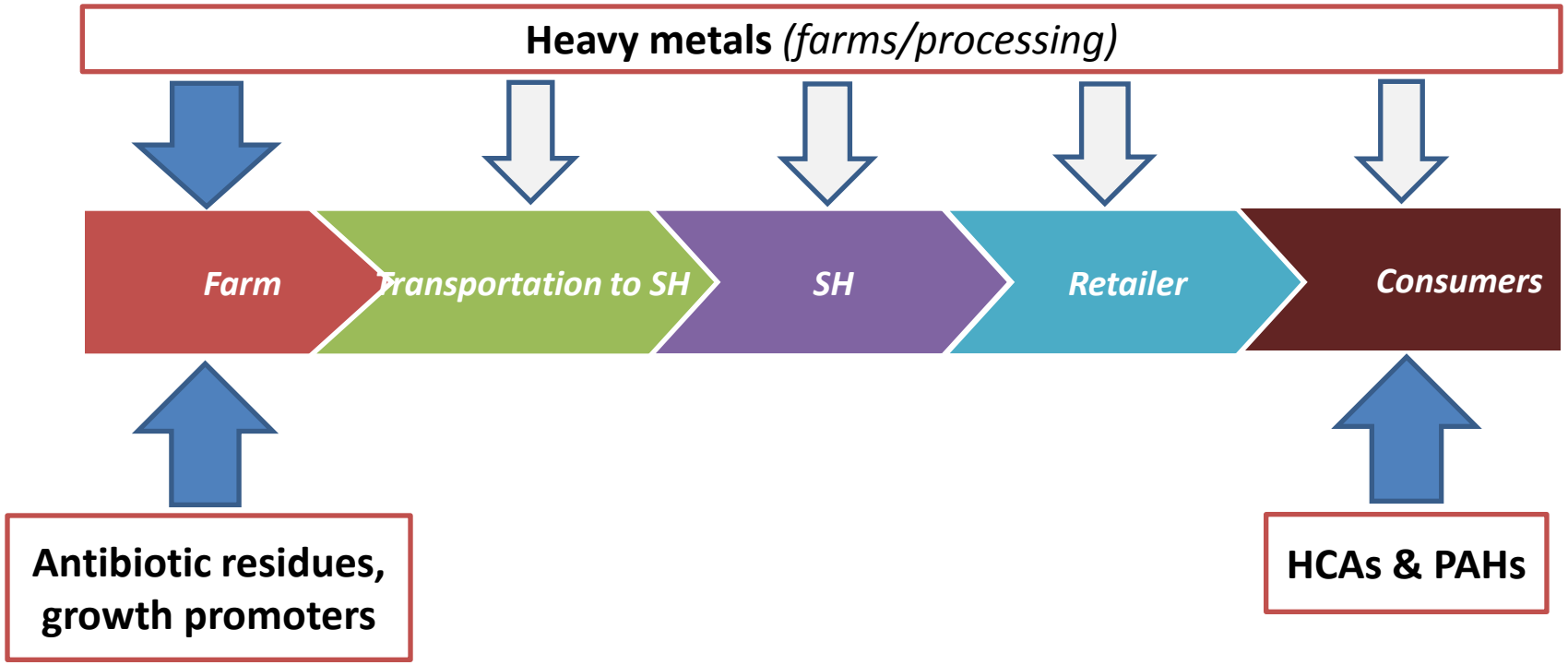
Found some pig farms using banned substance- *Beta agonist* (in Dong Nai province)

Sub-DAH Dong Nai proposed to treat this as an criminal affaires rather than civilian issues that claim a low fine

Chemical hazards in pork

- Vietnam, pork makes up ~75% of meat consumed daily,
- Substantial benefits to the smallholders who supply 80% of the market,
- Consumers have paid special concern over food safety issues, especial health risks associated with chemical hazards.

Chemical hazards and pig value chain



Chemical hazards and pig value chain

- Heavy metals: Lead (Pb), Cadmium (Cd), Arsenic (As)
- Antibiotic residues: Sulfonamide, tetracycline, chloramphenicol,…
- Growth promoters: β-agonists (salbutamol, clenbuterol)
- Dioxins and POPs (Persistent Organic Pollutants)
- Additives: Sodium nitrat/nitrit, Potasium nitrat/nitrit
- Heterocyclic aromatic amines (HCAs), polycyclic aromatic hydrocarbons (PAHs).

- ***Antibiotic residue***
- ***Heavy metal***
- ***Growth promoter***

2. Objectives

- ✓ To assess the prevalence and concentrations of antibiotic, growth promoters and heavy metal residues in pork at wet market in Vietnam
- ✓ To provide data for health risk assessment of chemical hazards in pork.

3. Sampling and sample analysis

Study location

Hung Yen:

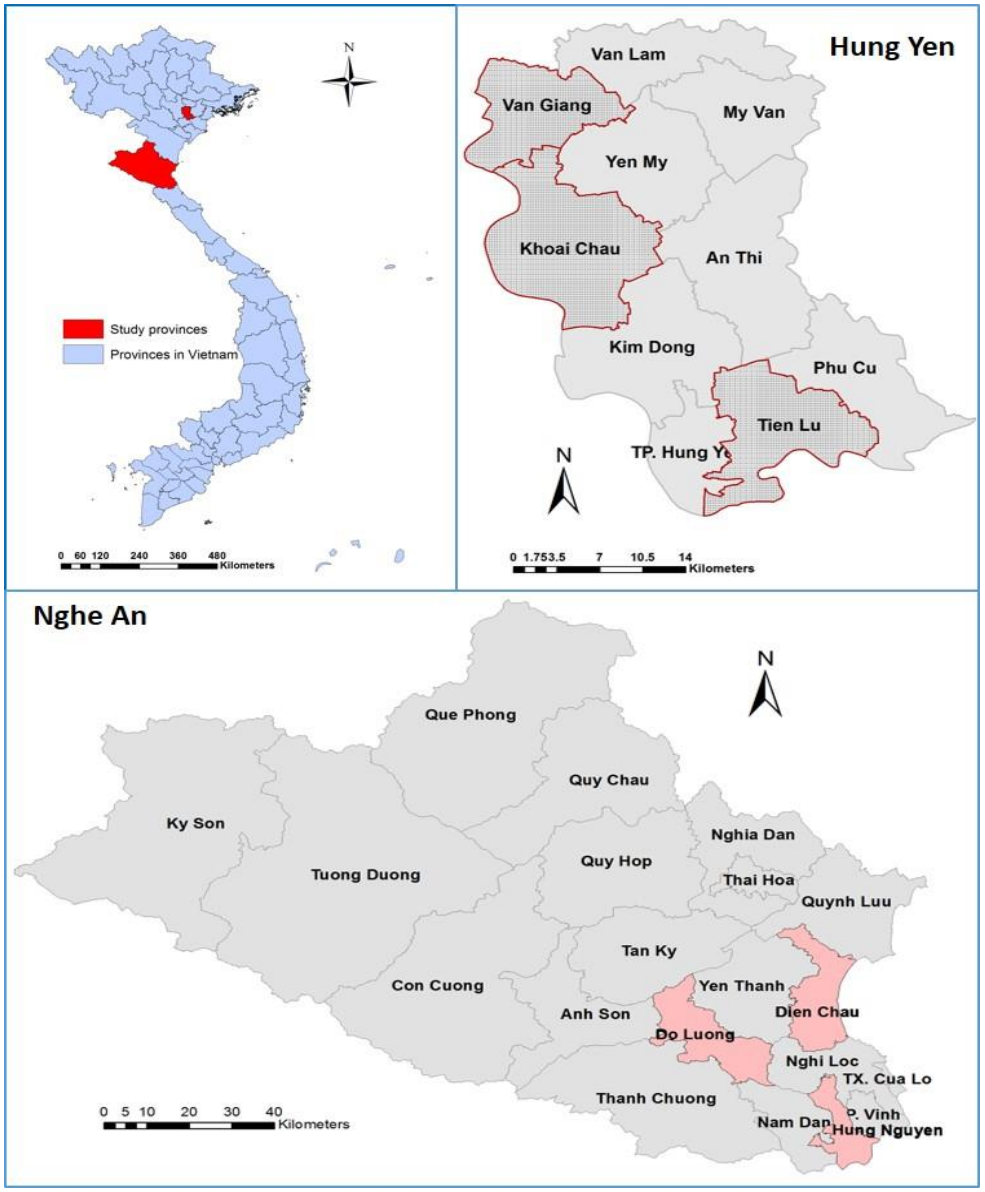
- Van Giang
- Khoai Chau
- Tien Lu

Nghe An:

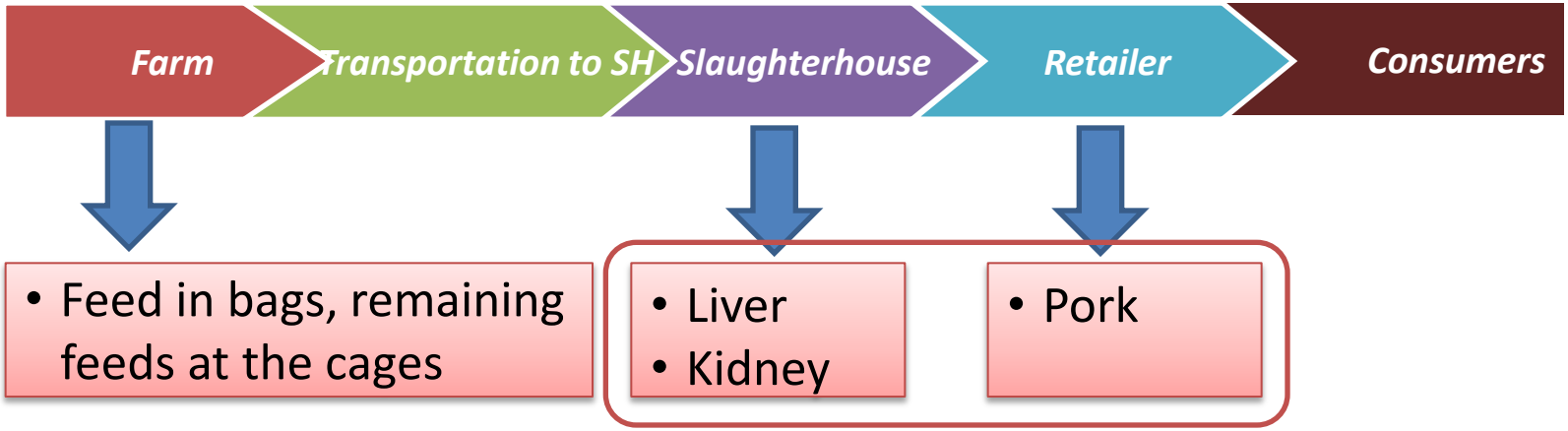
- Hung Nguyen
- Do Luong
- Dien Chau

Each district: 3 communes

Total: 3 * 6 = 18 communes



Sampling points



Total collected samples

Location	Slaughterhouses		Markets
	Kidney	Liver	Pork
Hung Yen	**44**	**44**	**94**
Khoai Chau	15	15	27
Tien Lu	14	14	33
Van Giang	15	15	34
Nghe An	**44**	**44**	**96**
Dien Chau	14	14	34
Do Luong	15	15	32
Hung Nguyen	15	15	30
Total	**88**	**88**	**190**
Pooled*	**18**	**18**	**18**

* Total: 3 communes * 6 districts = 18 communes

18 pooled samples each type => Laboratory analyses

Laboratory analyses:

i. Screening (ELISA)

ii. Confirmation (LC/MS/MS: Liquid chromatography-tandem mass spectrometry)

Chemical	Method	Pork	Liver	Kidney
Tetracyclines group	ELISA, LCMSMS	18	18	18
Fluoroquinolones group	ELISA, LCMSMS	18	18	18
Sulfonamides group	ELISA, LCMSMS	18	18	18
Chloramphenicol	ELISA, LCMSMS	18	18	18
B-agonist	ELISA, LCMSMS	18	18	18
Pb, Cd, As	AAS	18	18	18
Total		108	108	108

4. Results and discussion

Screening 18 pooled samples by ELISA

Number of positive samples by screening antibiotic residue and β-agonist

Samples	Tetracycli-ne group	Fluoroquino-lones group	Sulfonamides group	Chloram-phenicol	B-agonist
Liver (n=18)	0	0	2	0	2
Kidney (n=18)	0	1	2	0	0
Pork (n=18)	0	0	9	5	1

Identification of heavy metals

Number of positive samples by AAS method on heavy metals

Samples	Lead	Cadmium	Arsenic
Liver (n=18)	10	18	0
Kidney (n=18)	7	18	0
Pork (n=18)	5	0	0

Antibiotic, growth promotor and heavy metal residues in liver and kidney samples

Chemical	LoD (µg/kg)	Method	Residue µ(min-max) (µg/kg)	
			Liver	Kidney
Sulfonamides group				
Sulfamethazine	15	LCMSMS	67.8 (44.7-90.8)	86.93
Sulfaquinoxalin	15	LCMSMS	-	-
Chloramphenicol				
Chloramphenicol	0.15	LCMSMS	-	-
β-agonist				
Salbutamol	0.2	LCMSMS	4.24 (2.77-5.71)	-
Clenbuterol	0.2	LCMSMS	-	-
Heavy metals				
Lead (Pb)	70	AAS	117.4 (71.3-302.7)	127.9 (70.5-208.1)
Cadmium (Cd)	10	AAS	17.5 (10.4-31.6)	222.7 (126-382.7)
Arsenic (As)	50	AAS	-	-

Vietnamese MRL for Pb: in pork: 100 µg/kg; other parts 500 µg/kg
for Cd: in pork, liver: 50 µg/kg; kidney 1000 µg/kg, not allow to find Beta-agonist, chloramphenicol in liver, kidney

Antibiotic, growth promotor and heavy metal residues in pork

Chemical	LoD (µg/kg)	Method	Residue µ(min-max) *(µg/kg)*
Sulfonamides group			
Sulfamethazine	15	LC-MS/MS	155.5 (35.6-263.2)
Sulfaquinoxalin	15	LC-MS/MS	-
Chloramphenicol			
Chloramphenicol	0.3	LC-MS/MS	0.54 (0.34-0.76)
β-agonist			
Salbutamol	0.2	LC-MS/MS	1.09
Clenbuterol	0.2	LC-MS/MS	
Heavy metal			
Lead (Pb)	70	AAS	74.1 (70.14-78.7)
Cadmium (Cd)	10	AAS	-
Arsenic (As)	50	AAS	-

Vietnamese MRL for Pb: in pork: 100 µg/kg
Not allow to find Beta-agonist, chloramphenicol in pork
Vietnamese MRL for Sulfonamide in pork: 100 µg/kg

5. Conclusions

Present of chemical hazards in pork, liver, kidney:

- **Sulfonamides group:** Sulfamethazine found in liver and higher residue level in pork than MLR.
- **Chloramphenicol**-found kidney and pork: banned drug used in veterinary in Vietnam
- **β-agonist:** Salbutamol (liver, kidney): banned substance
- **Heavy metal:** found Pb, Cd in (liver, kidney), Pb in pork

Findings address the potential abused of both antibiotic and growth promotor in the studied pig production chain. There need for further health risk assessment

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Thanks for your attention !