CHOLERA IN VIETNAM: THE SITUATION, LESSONS LEARNED AND CAPACITY FOR PREVENTION AND CONTROL

Prof. Nguyen Tran Hien, MD. MPH,. PhD

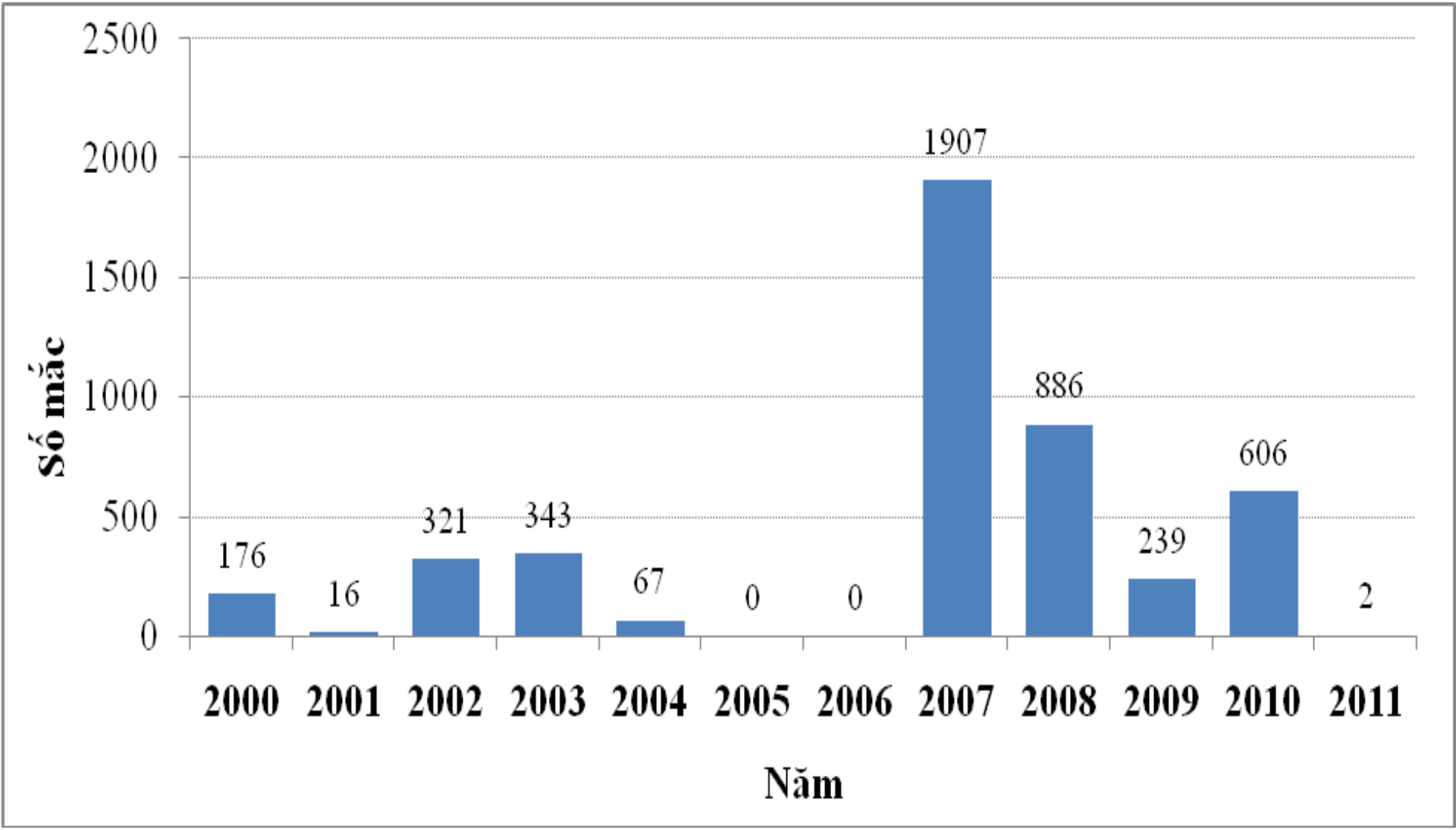
National Institute of Hygiene and Epidemiology

SITUATION

CHOLERA EPIDEMICS IN VIETNAM

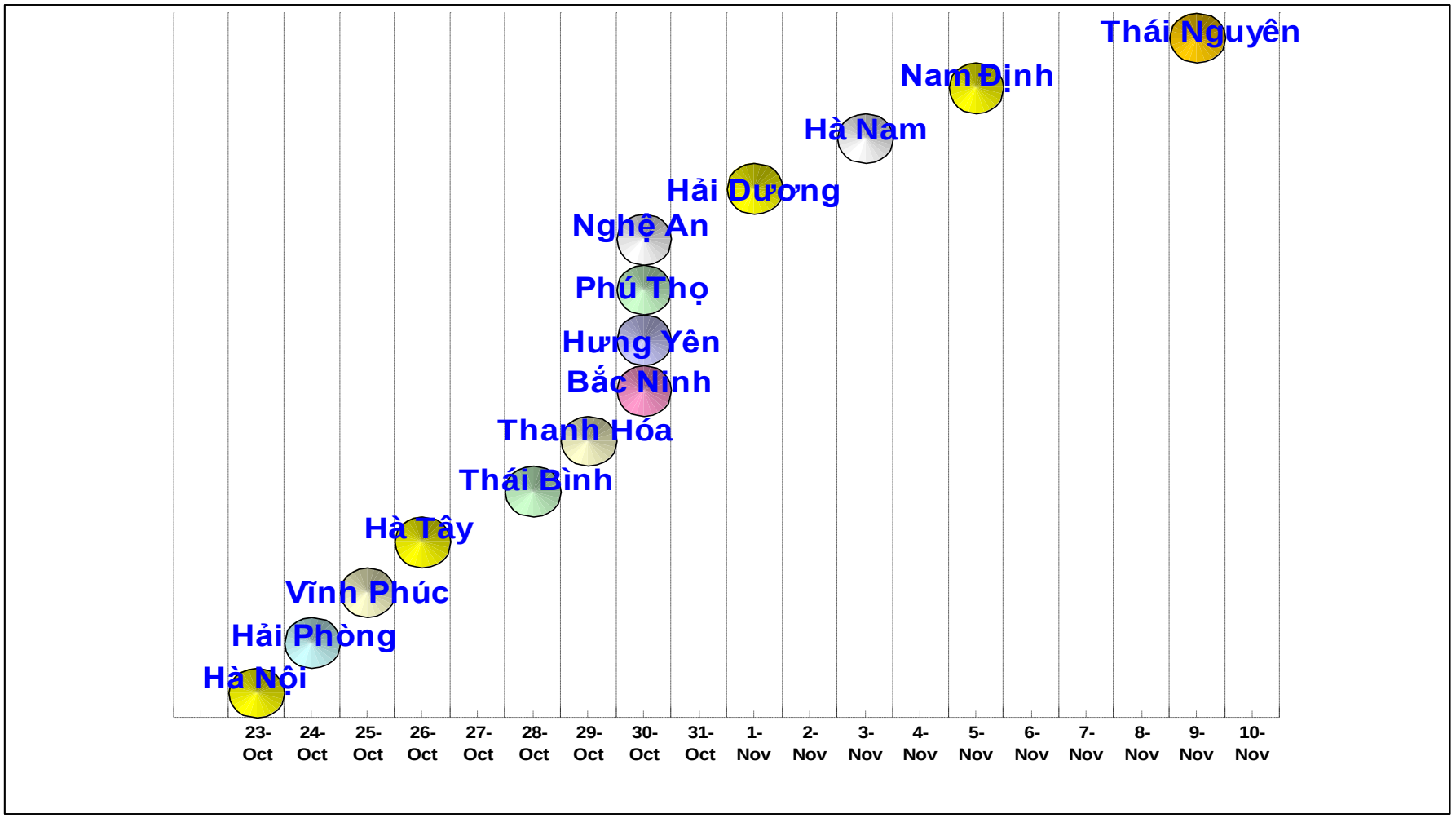
- **The first case of Cholera was described in Viet Nam in 1791. VC El Tor arrived in the South of Vietnam in 1964 accounting for 20,009 cases, 821 deaths.**
- **In 1976, V.Cholerae O1 El TOR was firstly reported in the North of Viet Nam(Hai Phong and Quang Ninh).**
- **In 2007: Big epidemic occurred in the Nord of VN, *V. cholerae O1*, Eltor, Ogawa**

SITUATION OF CHOLERA IN VIETNAM (2000-2010)



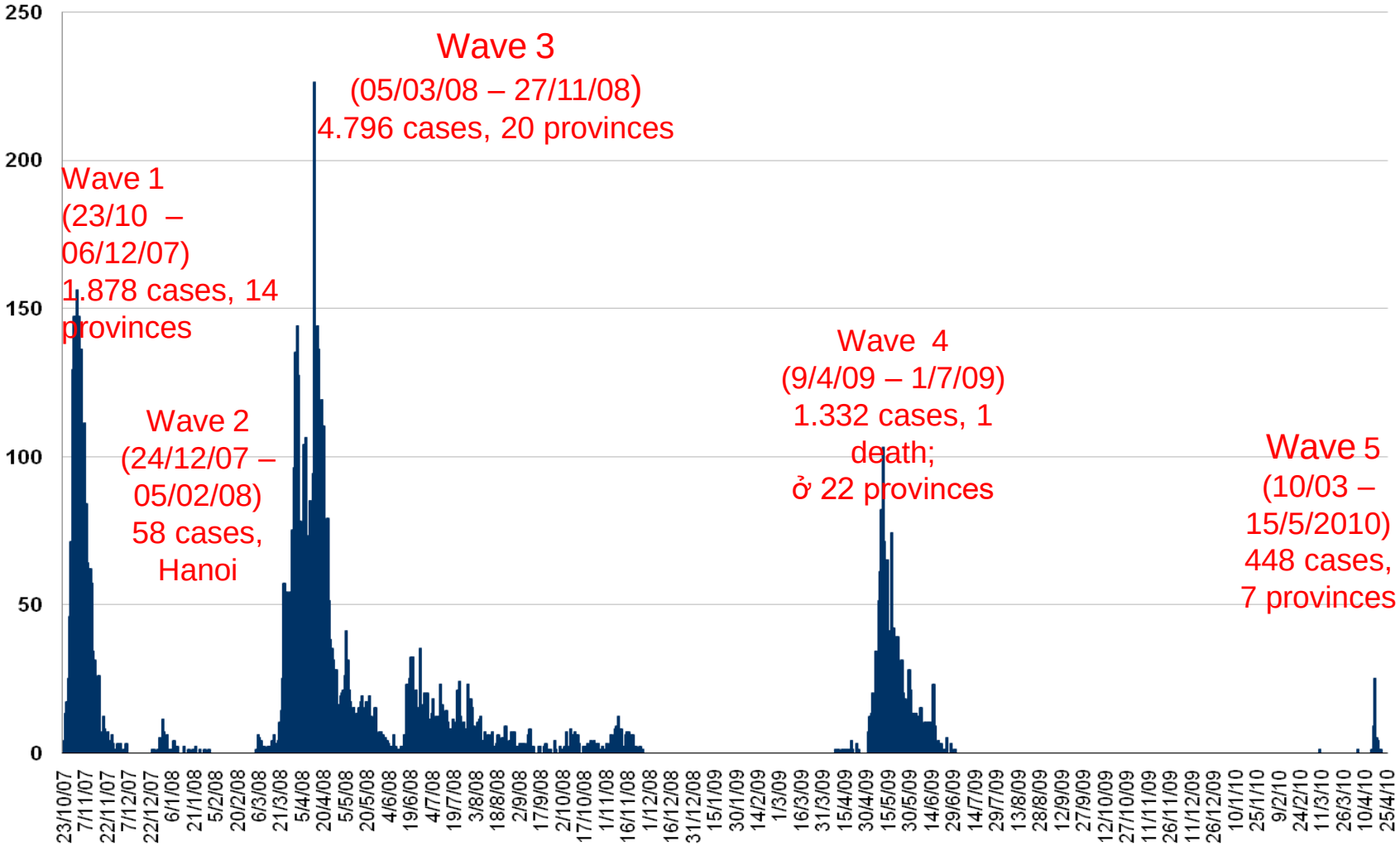
CHOLERA SPREADING IN PROVINCES

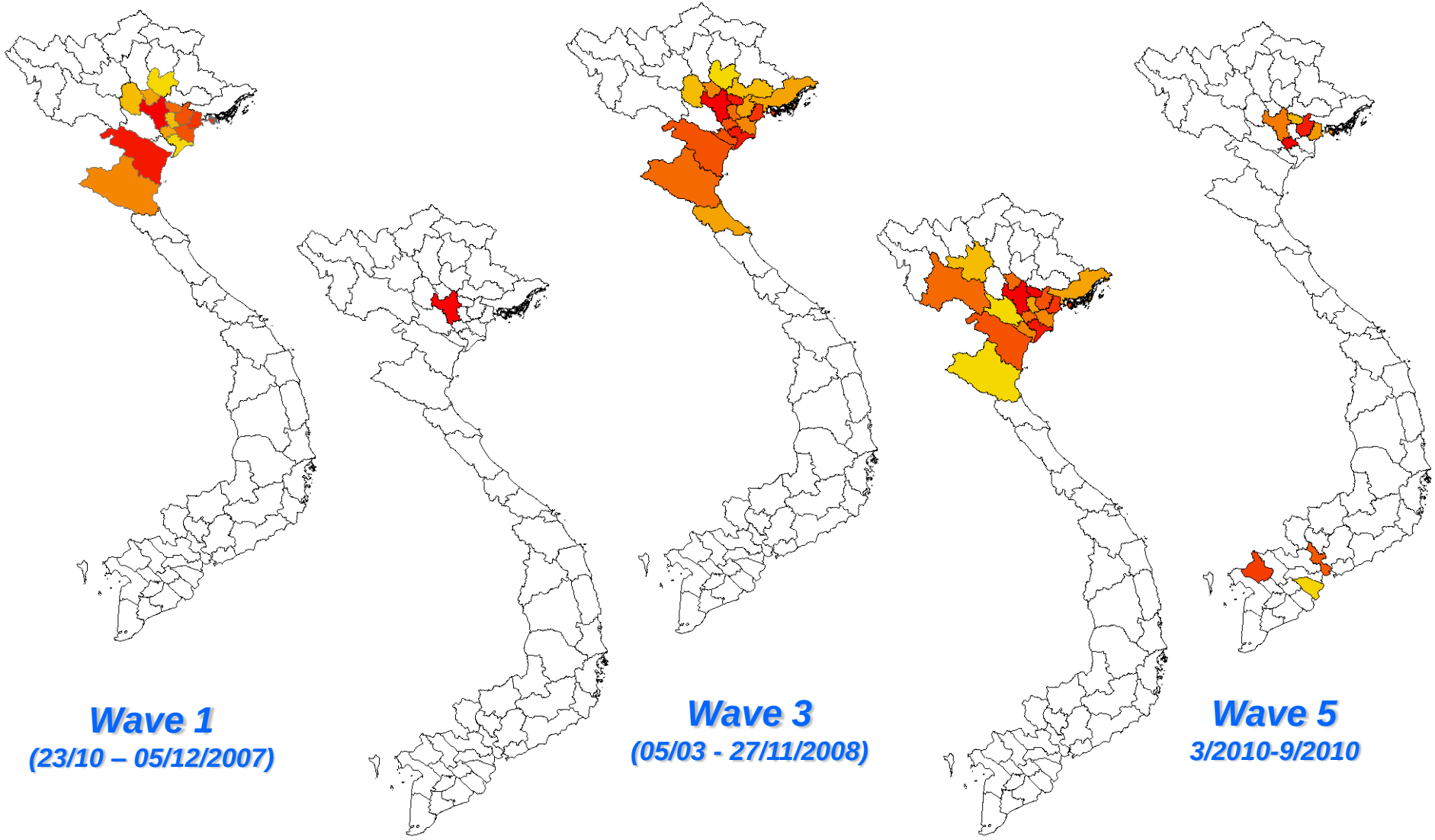
IN THE FIRST TWO WEEKS OF EPIDEMIC (10/2007)



2 WEEKS – 14PROVINCES

CHOLERA EPIDEMIC WAVES (2007 – 2010)





Wave 1
(23/10 – 05/12/2007)

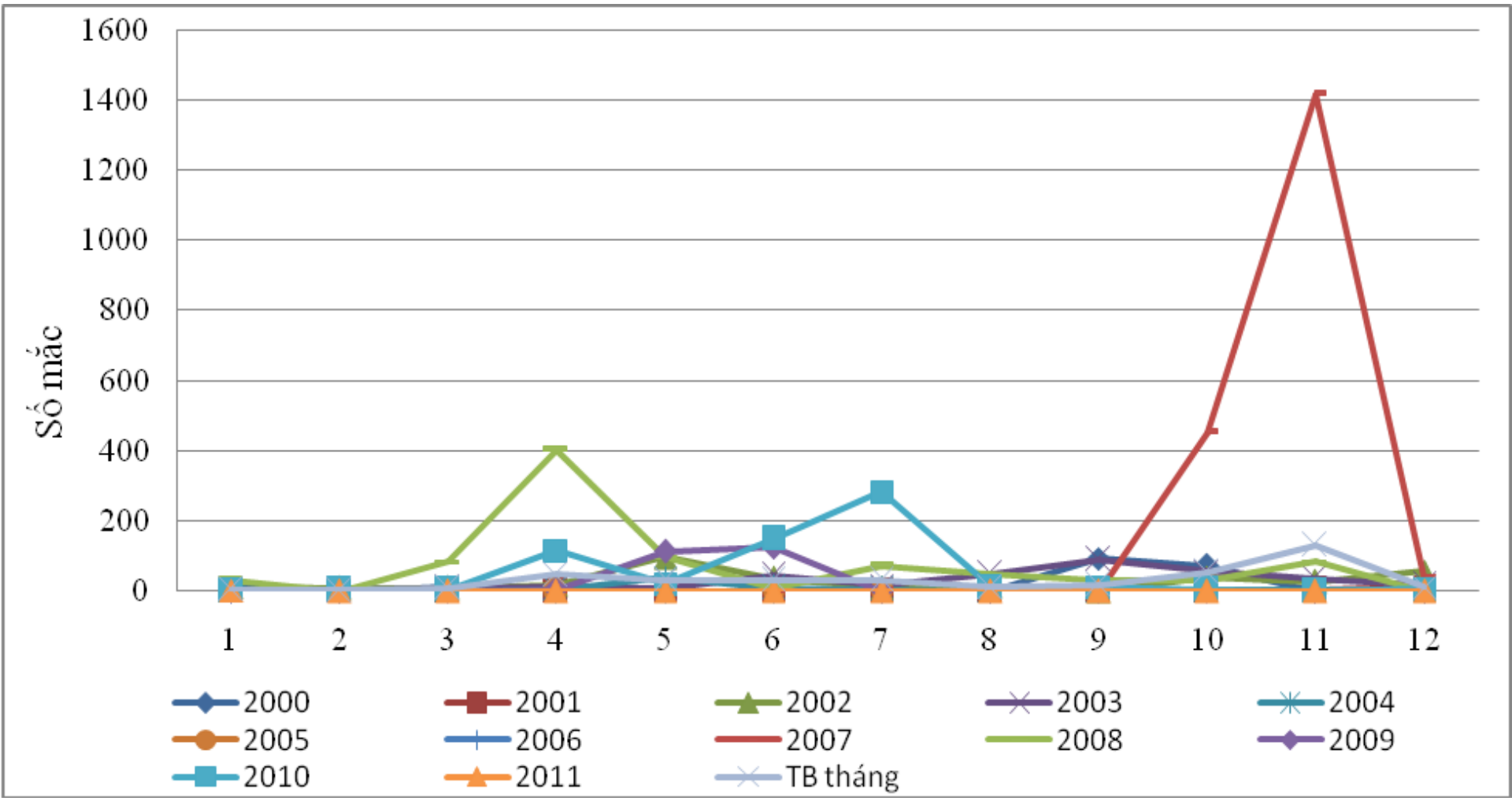
Wave 2
(24/12/2007 - 05/02/2008)

Wave 3
(05/03 - 27/11/2008)

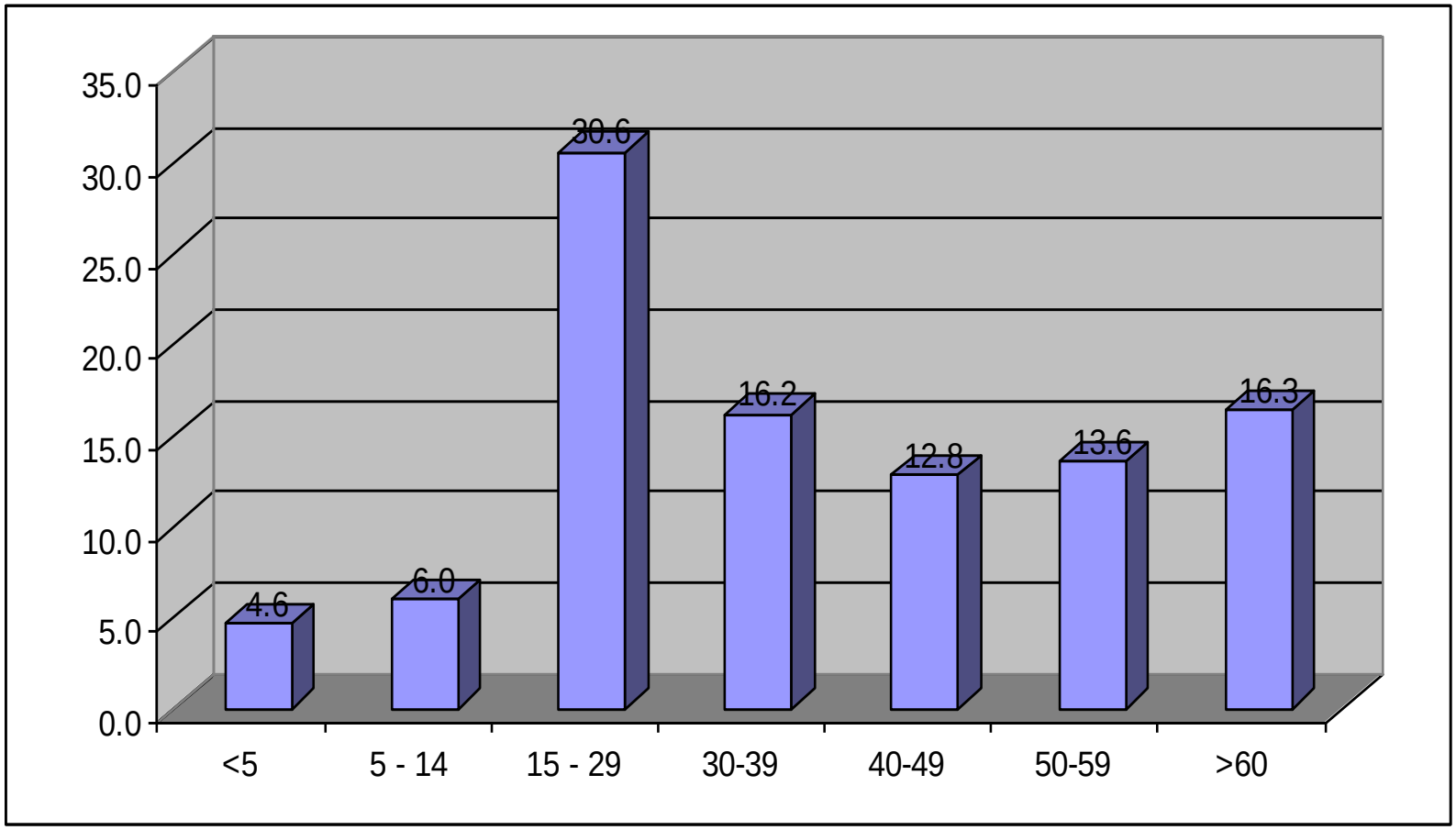
Wave 4
(09/04 - 15/07/2009)

Wave 5
3/2010-9/2010

DISTRIBUTION OF CHOLERA CASES BY MONTHS 2000-2011

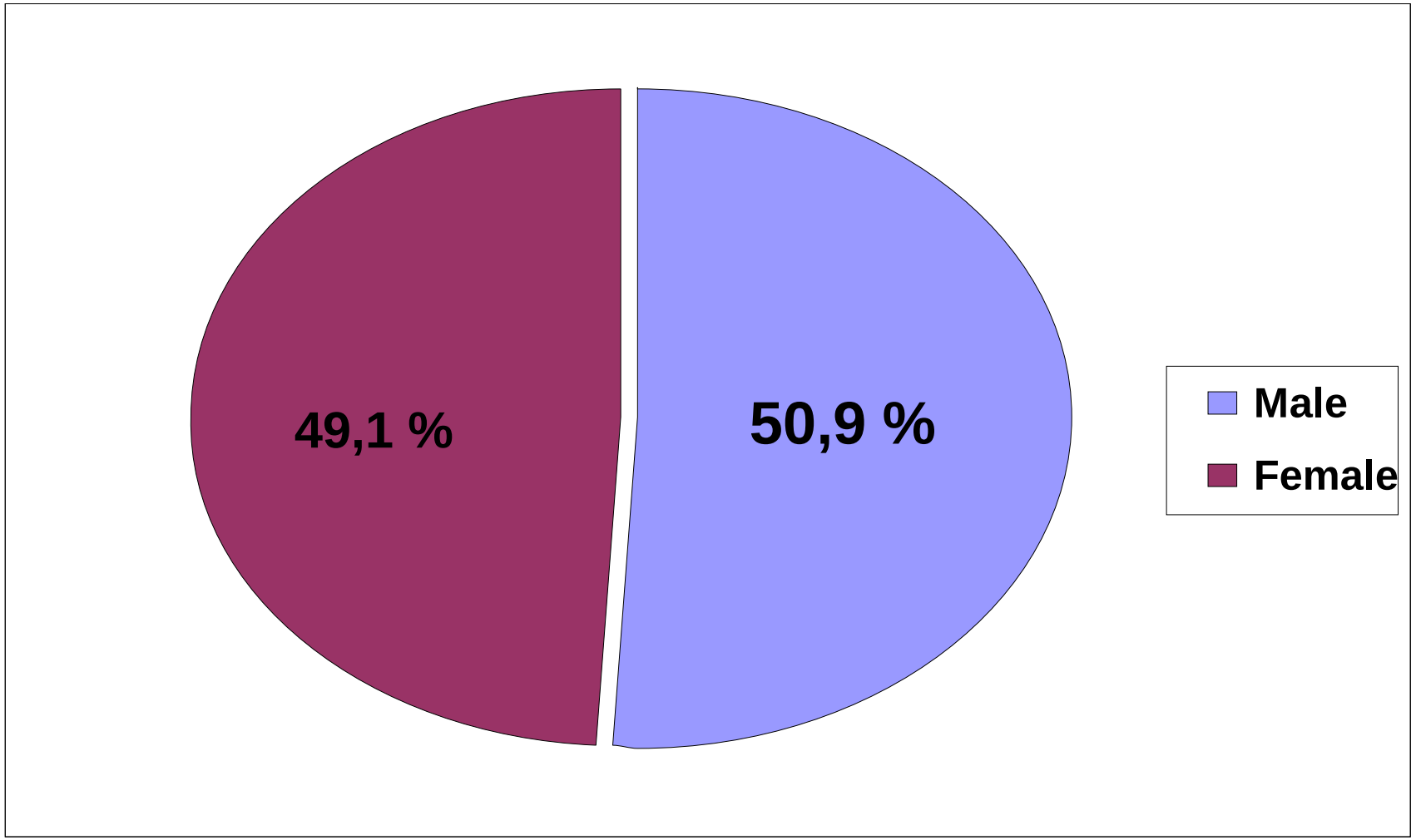


CHOLERA DISTRIBUTION BY AGE GROUPS, (2007 – 2010)



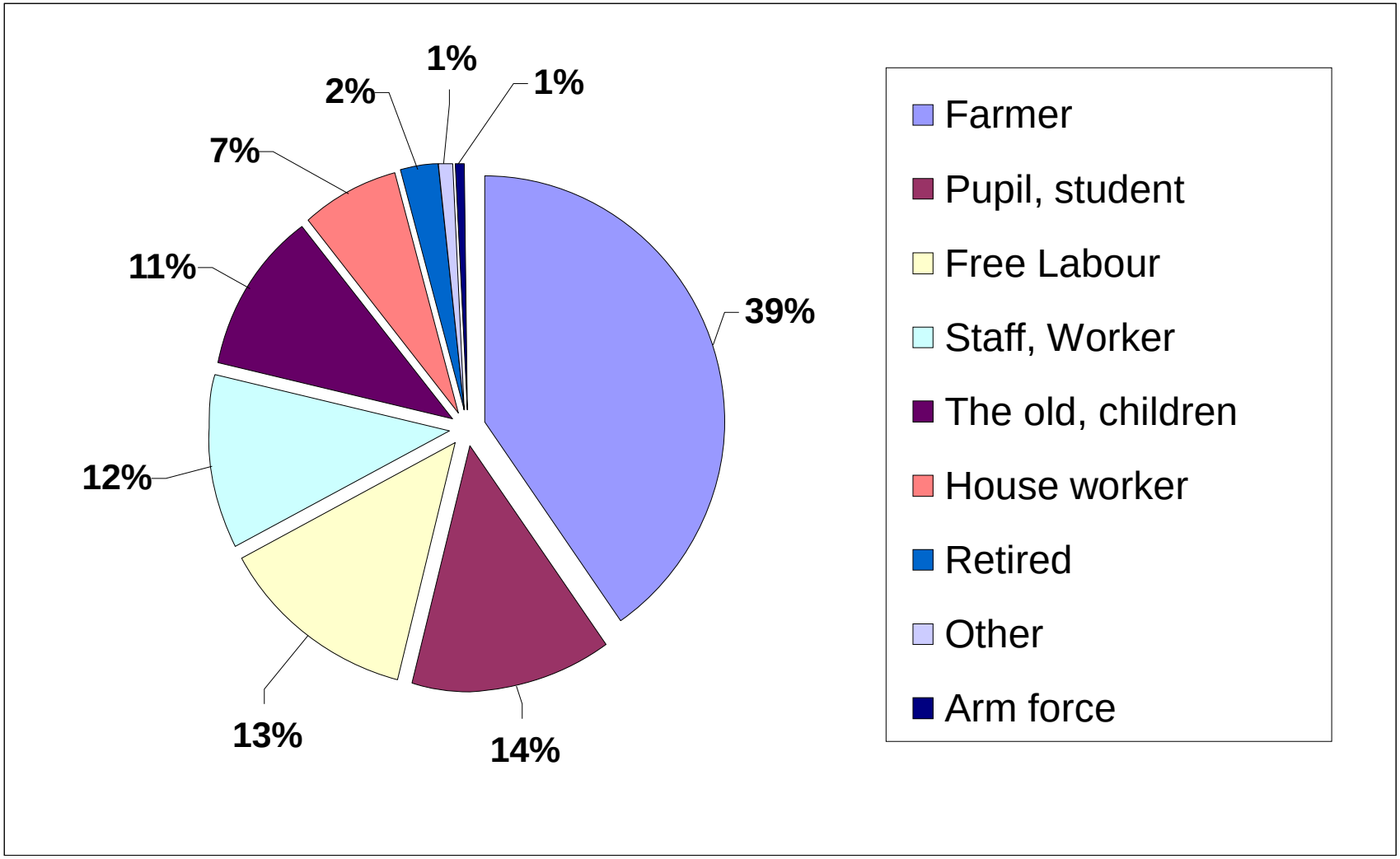
CHOLERA DISTRIBUTION BY GENDERS

2007-2010



CHOLERA DISTRIBUTION BY OCCUPATIONS

2007-2010



SUSPECTED FOOD IN LAST FIVE DAYS IN THE FIRST 2 WEEKS OF THE EPIDEMIC WAVES

Suspected Food	*Wave 1 (n=64)*		*Wave 2 (n=12)*		*Wave 3(n=37)*	
	Number	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*
Dog Meat	41	*64,1*	10	*83,3*	*25*	*66,7*
Shrimp paste	38	*59,4*	8	*66,7*	*25*	*66,7*
Uncooked vegetable	35	*54,7*	9	*75,0*	22	*61,9*
Rice noodles	12	*18,8*	0	*0,0*	4	*9,5*
Raw Blood Pudding	0	*0,0*	0	*0,0*	2	*4,8*
Seafood	21	*32,8*	2	*16,7*	2	*4,8*

Hypotheses

4 hypotheses:

- Related to water source.
- Related to uncooked fresh vegetable.
- Related to shrimp paste.
- Related to dog meat.

WARTER TESTING OF
IN THE FIRST 2 WEEKS OF EPIDEMIC

Type of water samples	*Wave* I		*Wave* II		*Wave* III		*Wave* IV	
	n	*(+)*	*n*	*(+)*	*n*	*(+)*	*n*	*(+)*
Daily used water (treated water, rain water)	25	0	12	0	23	0	8	0
Surface Water (pond, river water ..)	35	1*	13	0	63	0	12	0

(*) Pond water samples -next to the patient M positive with cholera because the waste of patient was poured in to the pond.

TESTING OF MONTHLY COLLECTED WATER IN THE EPIDEMIC AREAS
(12 MONTHS: 04/2008 – 03/2009)

Type of water samples	Result	
	n	*(+)*
Daily used water (treated water, rain water)	302	0
Surface Water (pond, river water ..)	454	0
Total	756	0

VC TESTING OF FRESH VEGETABLES IN RESTAURANTS

Sampling:

120 sample of fresh vegetables in restaurants related to patient.

Result:

- 02 uncooked fresh vegetable samples were positive with *V. Cholera*.
- 118 other samples were negative with *V. Cholera.*

TESTING OF FRESH VEGETABLES COLLECTED IN THE MARKETS

Sampling:

Taking 950 samples of fresh vegetables in central markets supplying vegetables for others smaller markets.

Result:

- All were negative with *V. Cholera.*

TESTING OF FRESH VEGETBLES COLLECTE IN FARMS/GARDENS

Sampling

Fresh vegetables, water for vegetables in farm/garden (8 apricot leaves, 82 other vegetables, 32 water for vegetable,) collected.

Result:

- All were negative with *V. Cholera.*

TESTING OF SHRIMP PASTE

Sampling:

55 shrimp paste samples were taken from markets in Ha Noi, Ha Tay, Hai Phong, Hai Duong,Thanh Hoa.

Result: All were negative with *V. Cholera*

Testing in dog slaughter houses

Type of samples	No. of samples	Positive
Tools for dog meat processing	6	2 (33,3%)
Floor	4	1 (25%)
Waste water after dog killing	5	2 (40,0%)
Pipe water	4	0 (0%)
Dog stool	7	2 (28,6%)
Uncooked dog meat	8	3 (37,5%)
Total:	**34**	**10 (29,4%)**

Comment:

- 29,4% of samples- positive with *Vibrio cholerae Group O1, serum type* Ogawa
- Dog meat has the highest positive percentage.

Testing in a dog house

Type of samples	No of samples	Positive
Dog foods	2	0 (0%)
Drinking water of dog	2	1 (0,6%)
Wastewater	1	0 (0%)
Ditch water	10	0 (0%)
Pipe Water	1	0 (0%)
Dog stool	144	2 (1,2%)
Total	**159**	**3 (1,8%)**

- *Vibrio cholerae* O1 was detected in 02 samples of dogs stool
- 1 water sample used by dog – positive with *Vibrio cholerae* O1

TESTING OF SAMPLES FROM 30 DOG MEAT RESTAURANTS

Type of samples	n	No of positive with V.cholera	No of negative with V.cholera
Vegetable	76	0	76
Water	60	0	60
Stool of staffs in restaurant	35	0	35
Hand of staff in restaurant	25	0	25
Cooked dog meat	24	1	23
Knife, Chopping board	24	0	24
Uncooked dog meat	22	1	21
Shrimp paste	17	0	17
Dog pudding	9	0	9
Rice noodles	6	0	6
Bamboo sprout	2	0	2
Excessive food	1	0	1
Sticky rice alcohol	1	0	1
Total	308	2	306

CASE-CONTROL STUDY (1)

Case definition:

Case: Acute diarrhea with VC positive cultures

Control: Healthy neibourgh, VC negative culture, in the 5 days before or after case collection

Sample size:

120 cases (matched by sex and age) with ratio of 1:4; power 80% ; OR=2, 95 %CI .

Variables:

52 Variables including environment, living conditions, hygiene practices, water supplies, food consumption… by interviewing with the structured questionnaire.

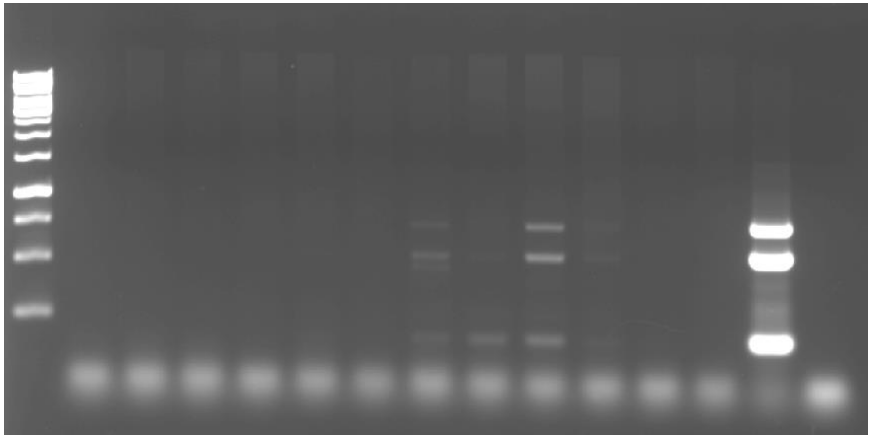
RISK FACTORS
(Multivariate analysis)

No	Risk factors	Case n (%)	Control n (%)	Adjusted OR	*95% CI*	p
1	Eating Dog meat	77 (53,47)	54 (10,23)	7,54	2,70-21,03	0,0001
2	Eating Apricot Leaf	24 (16,67)	13 (2,46)	14,58	2,97-71,52	0,001
3	Eating Raw Blood Pudding	29 (20,86)	46 (8,76)	3,26	1,31-8,09	0,011
4	Hand wash	111 (78,72)	485 (91,86)	0,21	0,08-0,56	0,002
5	Eating Eggs	100 (70,42)	459 (86,93)	0,19	0,09-0,40	0,001
6	Eating Boilded Fish	46 (31,94)	286 (54,17)	0,16	0,07-0,37	0,001

- **PCR result showed *V. cholerae* O1 in dog stool samples**

multi primers PCR

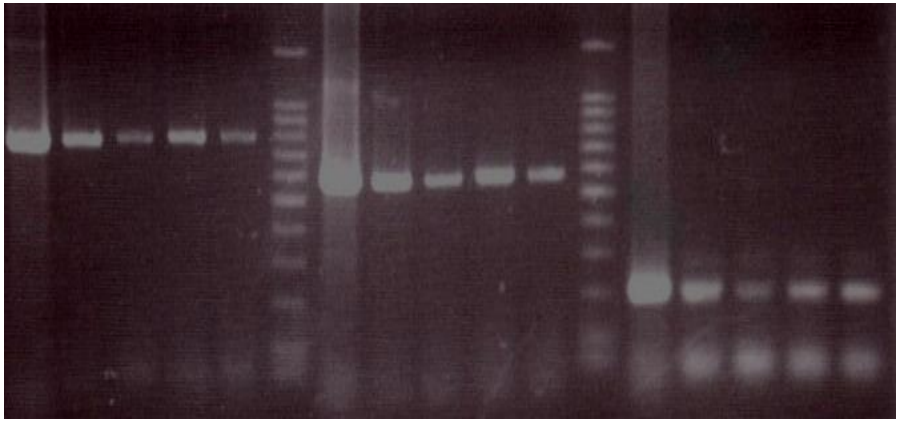
M 1 2 3 4 5 6 7 8 9 10 11 12 + -



Reconfirmed by multi primer PCR

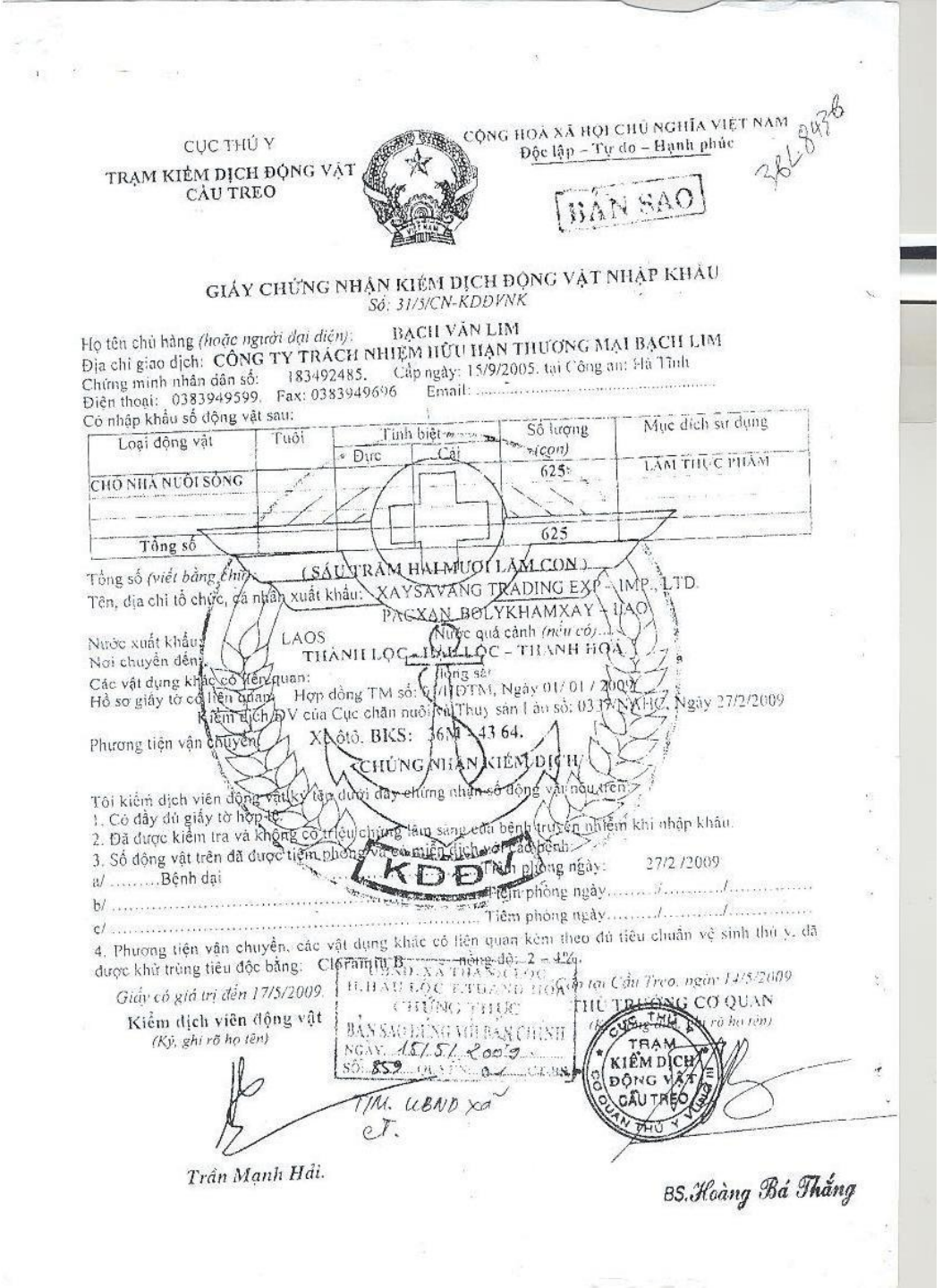
toxA ctx O1

P 7 8 9 10 M P 7 8 9 10 M P 7 8 9 10



The trafficking of dog from Lao to Viet Nam

THE PERMISSION OF DOG IMMIGRATION FROM LAO TO VIET NAM THROUGH CAU TREO BORDER IN HA TINH



CỤC THÚ Y
TRẠM KIỂM DỊCH ĐỘNG VẬT CẦU TREO

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

BẢN SAO

GIẤY CHỨNG NHẬN KIỂM DỊCH ĐỘNG VẬT NHẬP KHẨU
Số: 31/5/CN-KDĐVNK

Họ tên chủ hàng *(hoặc người đại diện)*: BẠCH VĂN LIM
Địa chỉ giao dịch: CÔNG TY TRÁCH NHIỆM HỮU HẠN THƯƠNG MẠI BẠCH LIM
Chứng minh nhân dân số: 183492485. Cấp ngày: 15/9/2005. tại Công an: Hà Tĩnh
Điện thoại: 0383949599. Fax: 0383949696 Email:
Có nhập khẩu số động vật sau:

Loại động vật	Tuổi	Tính biệt Đực	Tính biệt Cái	Số lượng (con)	Mục đích sử dụng
CHÓ NHÀ NUÔI SỐNG				625	LÀM THỰC PHẨM
Tổng số				625	

Tổng số *(viết bằng chữ)*: (SÁU TRĂM HAI MƯƠI LĂM CON)
Tên, địa chỉ tổ chức, cá nhân xuất khẩu: XAYSAVANG TRADING EXP – IMP., LTD.
PAKXAN, BOLYKHAMXAY – LAO
Nước xuất khẩu: LAOS Nước quá cảnh *(nếu có)*:
Nơi chuyển đến: THÀNH LỘC – HẬU LỘC – THANH HOÁ Cửa khẩu:
Các vật dụng khác có liên quan:
Hồ sơ giấy tờ có liên quan: Hợp đồng TM số: 01/HĐTM, Ngày 01/ 01 / 2009 Kiểm dịch ĐV của Cục chăn nuôi/Thuỷ sản Lào số: 03 /TY-NAHG, Ngày 27/2/2009
Phương tiện vận chuyển: Xe ôtô. BKS: 36M - 43 64.

CHỨNG NHẬN KIỂM DỊCH

Tôi kiểm dịch viên động vật ký tên dưới đây chứng nhận số động vật nêu trên:
1. Có đầy đủ giấy tờ hợp lệ
2. Đã được kiểm tra và không có triệu chứng lâm sàng của bệnh truyền nhiễm khi nhập khẩu.
3. Số động vật trên đã được tiêm phòng và có miễn dịch với bệnh
a/ .....Bệnh dại Tiêm phòng ngày: 27/2 /2009
b/ ..... Tiêm phòng ngày...../...../.....
c/ ..... Tiêm phòng ngày...../...../.....
4. Phương tiện vận chuyển, các vật dụng khác có liên quan kèm theo đủ tiêu chuẩn vệ sinh thú y, đã được khử trùng tiêu độc bằng: Cloramin B nồng độ: 2 – 4%.

Giấy có giá trị đến 17/5/2009.

Kiểm dịch viên động vật
(Ký, ghi rõ họ tên)

Trần Mạnh Hải.

Cầu Treo, ngày 13/5/2009

THỦ TRƯỞNG CƠ QUAN
(Ký, ghi rõ họ tên)

BS. Hoàng Bá Thắng

T/M. UBND XÃ
CT.

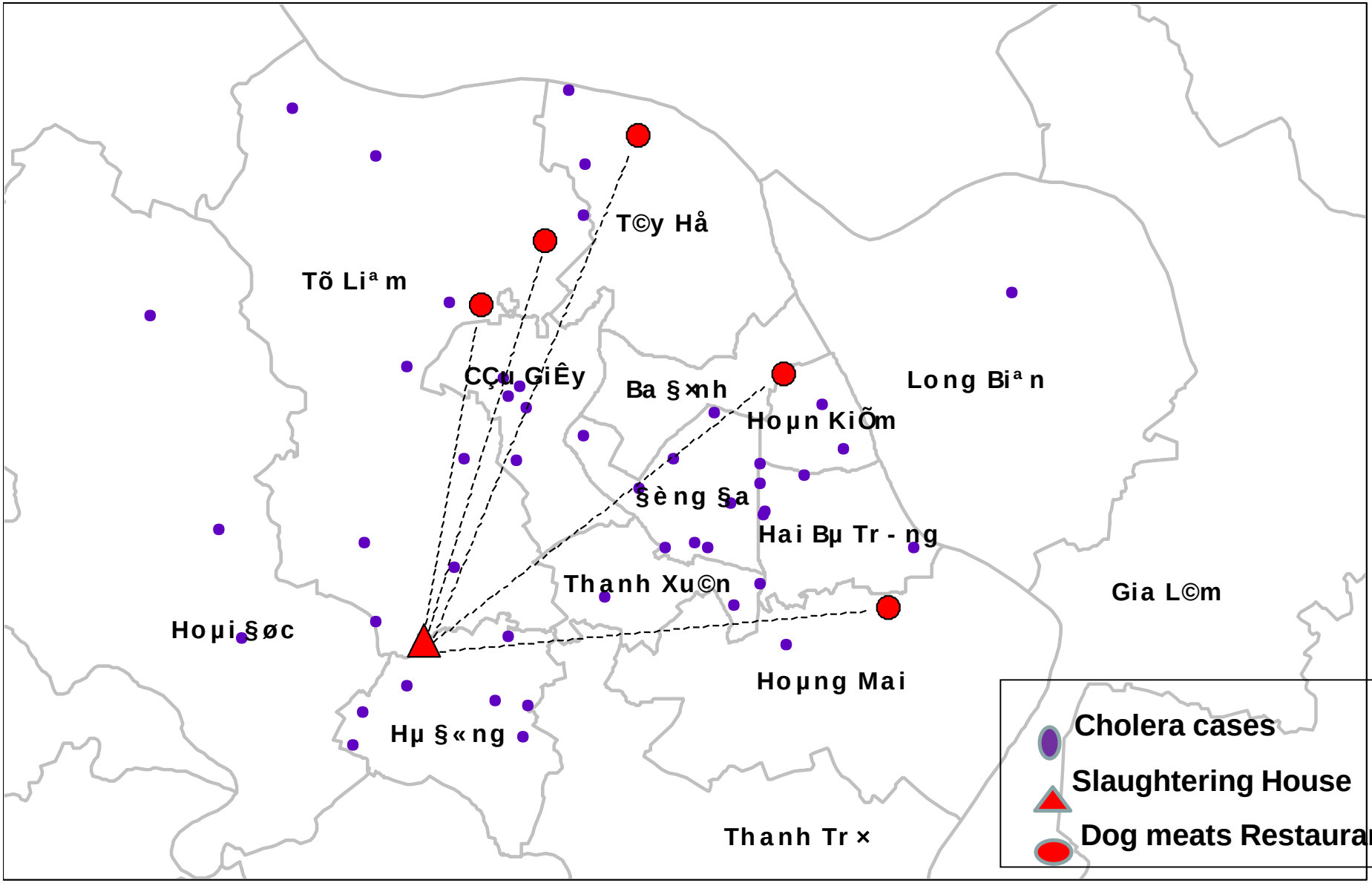
UBND XÃ THÀNH LỘC
H. HẬU LỘC T. THANH HÓA
CHỨNG THỰC
BẢN SAO ĐÚNG VỚI BẢN CHÍNH
NGÀY: 15/5/2009
SỐ: 859 QUYỂN SỐ: 01/2009 SCT/BS

TRẠM KIỂM DỊCH ĐỘNG VẬT CẦU TREO
CỤC THÚ Y VIỆT NAM

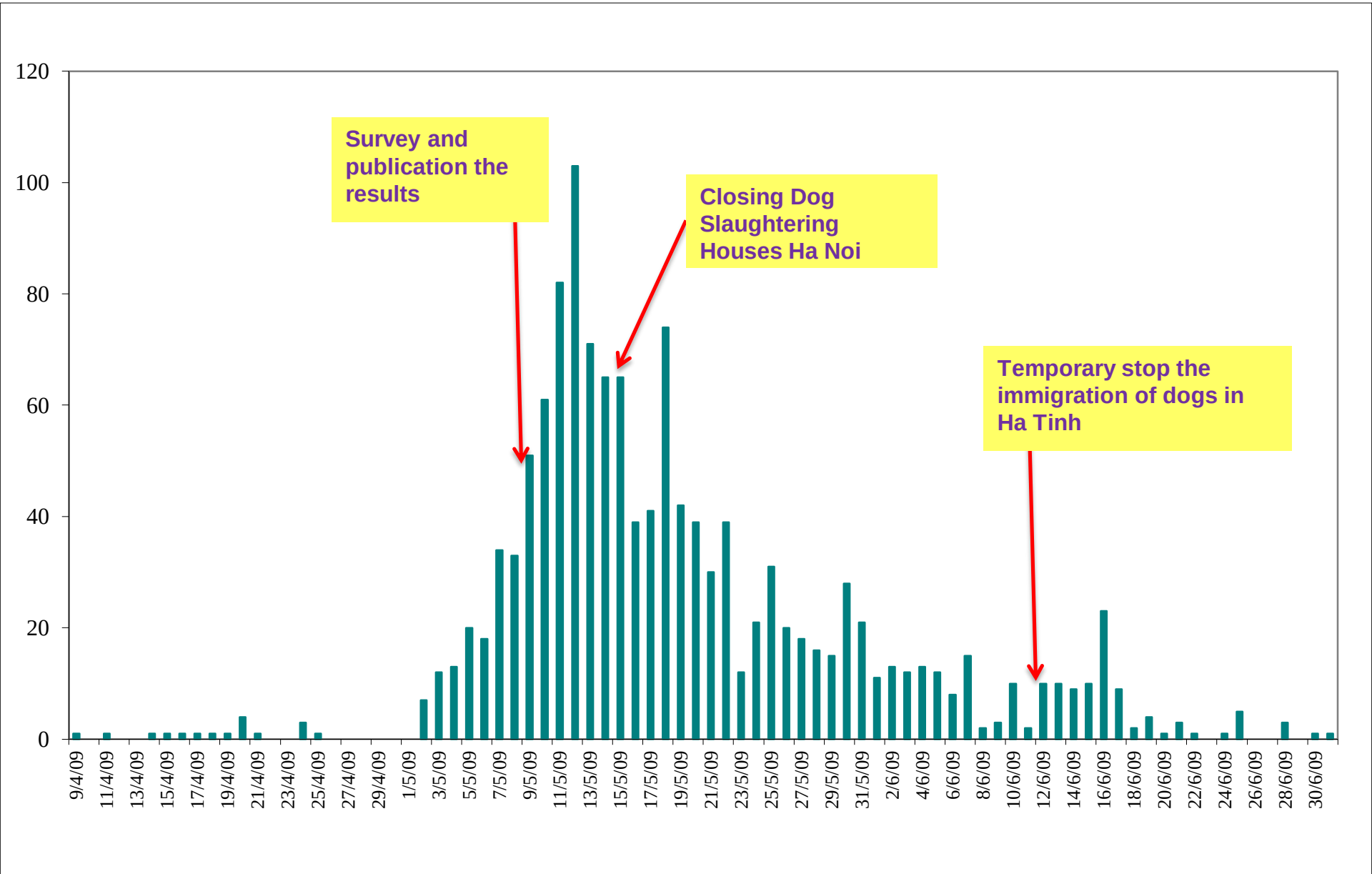

HYUNDAI
PS.355
5 ton
36M 2023


ĐẶC SẢN
THỊT CHÓ
CÁC MÓN SỐNG - CHÍN - CHẢ
Tiến Hương Kính mời!
ĐẶC SẢN
THỊT CHÓ
CÁC MÓN SỐNG - CHÍN - CHẢ - RƯỢU MẬN
SÁO XƯƠNG - SÁO CHÂN
Nhận đặt hàng theo yêu cầu
TIẾN HƯƠNG Kính mời
ĐIỆN THOẠI DĐ:

Dog meat supplies from a dog slaughtering house in Ha Noi



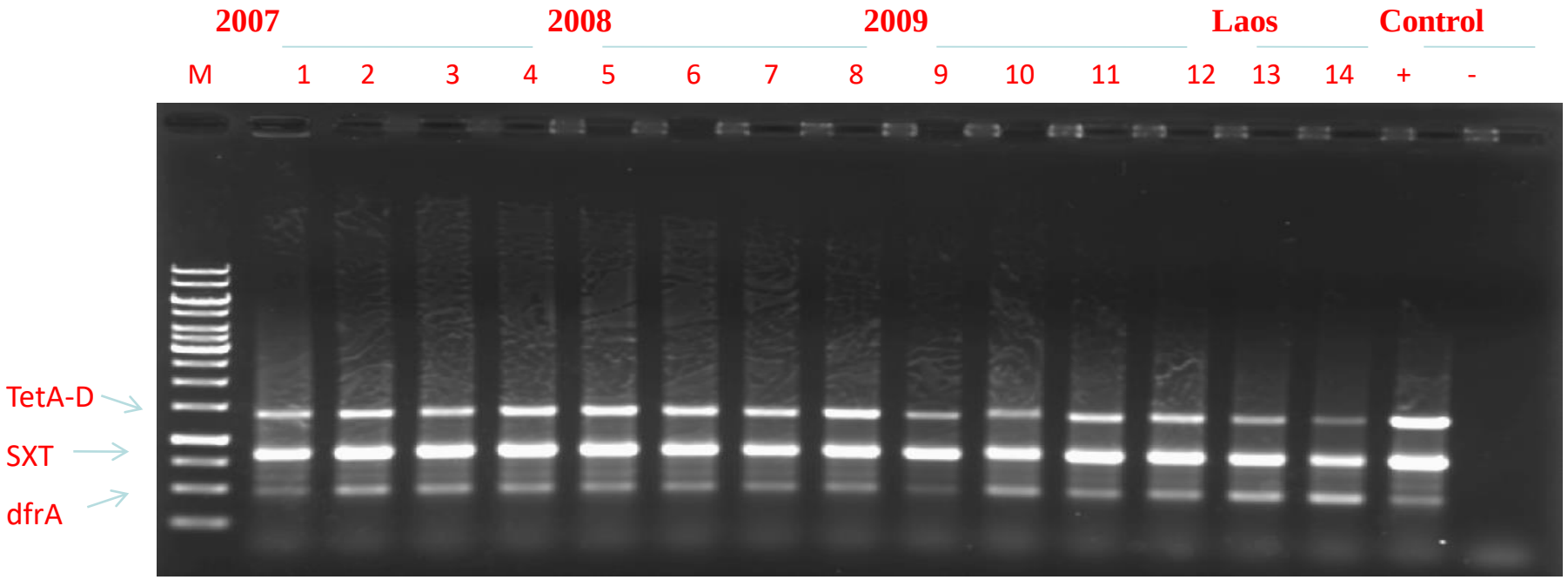
EPIDEMIC PROGRESS – EPIDEMIC 4



ANTIBIOTIC RESISTANCE

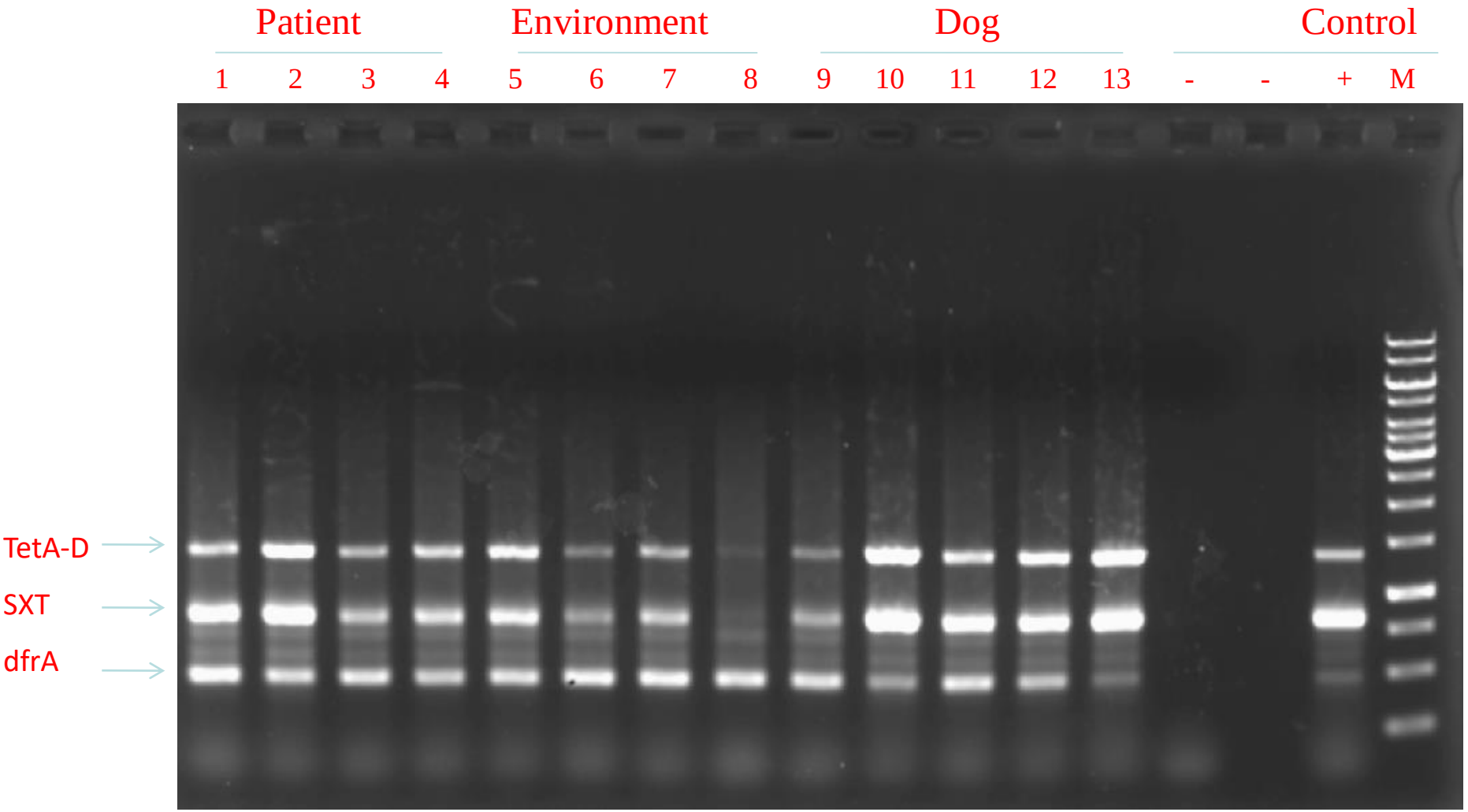
- **The strains V. cholerae O1 isolated in Viet Nam and Lao:**
  - **Full resistant to: trimmethoprim/sulphamethoxazole, nalidixic acid, tetracycline, clindamycine and streptomycin**
  - **Medium resistant: augmentine and ciprofloxacin**
  - **The strains of *V. cholera* O1 have the same features on resistance and genes coded for resistance → The strains of *V. cholerae* O1 have the same source**

Genes coding SXT and antibiotic of *V. cholerae* O1

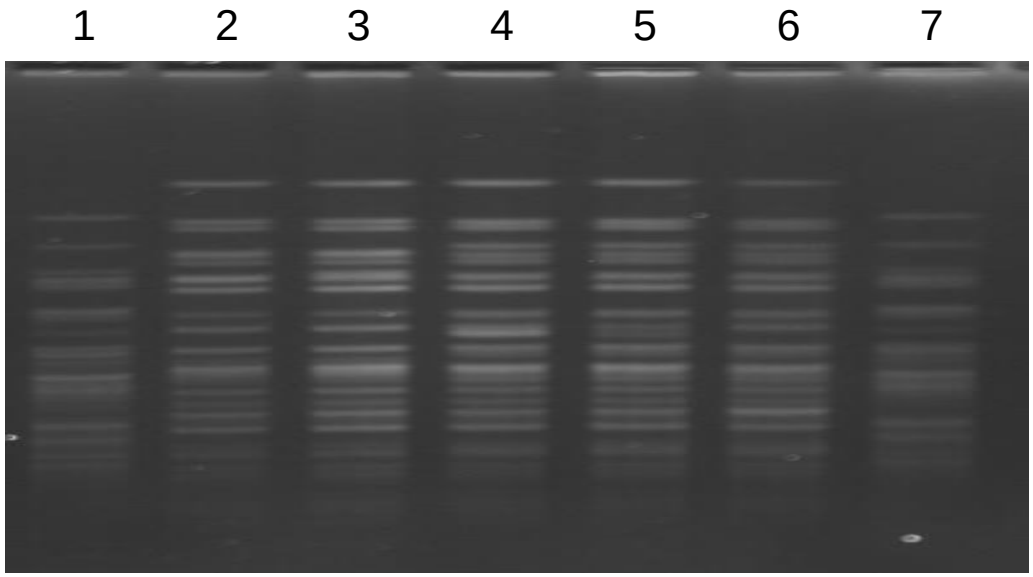


- **All strains have genes:**
  - tetA-classD : Resistant to tetracycline.
  - SXT: coding genes resistant to sulfonamide, trimethoprim, chloramphenicol and streptomycin
  - *dfrA:* resistant to trimethoprim

Genes coded for SXT and antibiotics of *V. cholerae* O1 trains isolated in patients, environment and food



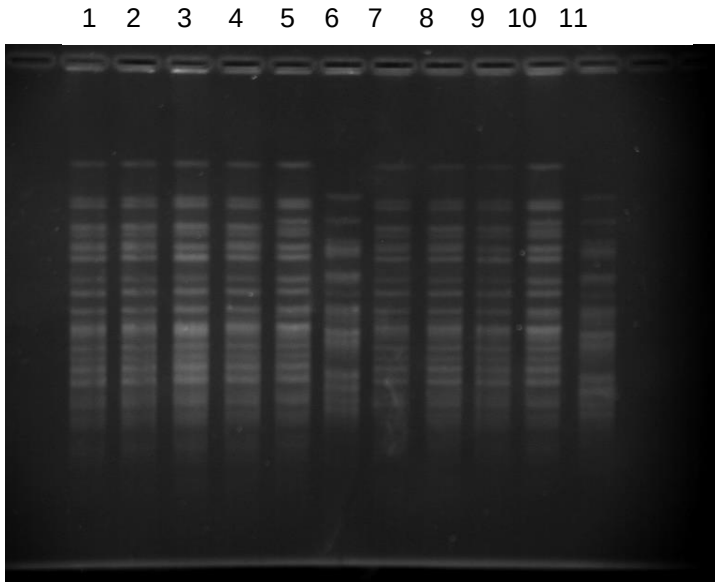
RESULTS ON PFGE OF THE STRAINS OF *V.CHOLERAE* IN VIET NAM

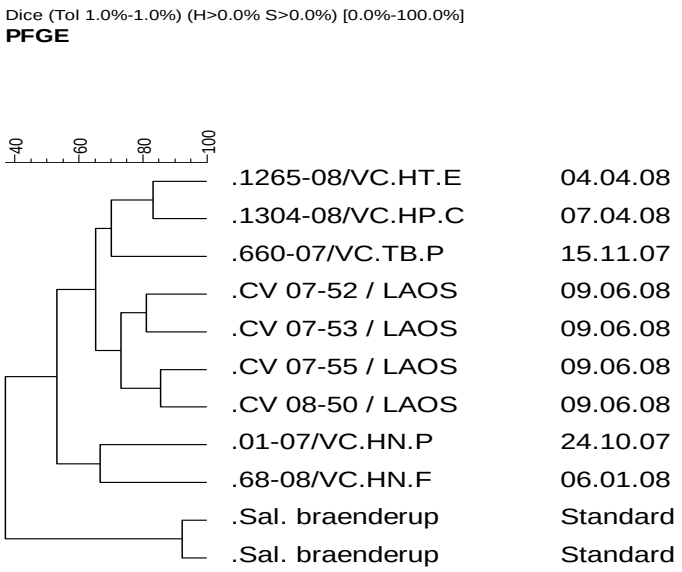


1, 7: *S. braenderup*
2 - 6: *V.cholerae*

The total 85 experimented strains which isolated from different locations and dates have the same features on PFGE. The result illustrated the same source of the cholera strains.

RESULTS ON PFGE OF THE STRAINS OF *V.CHOLERAE* IN VIET NAM AND LAOS

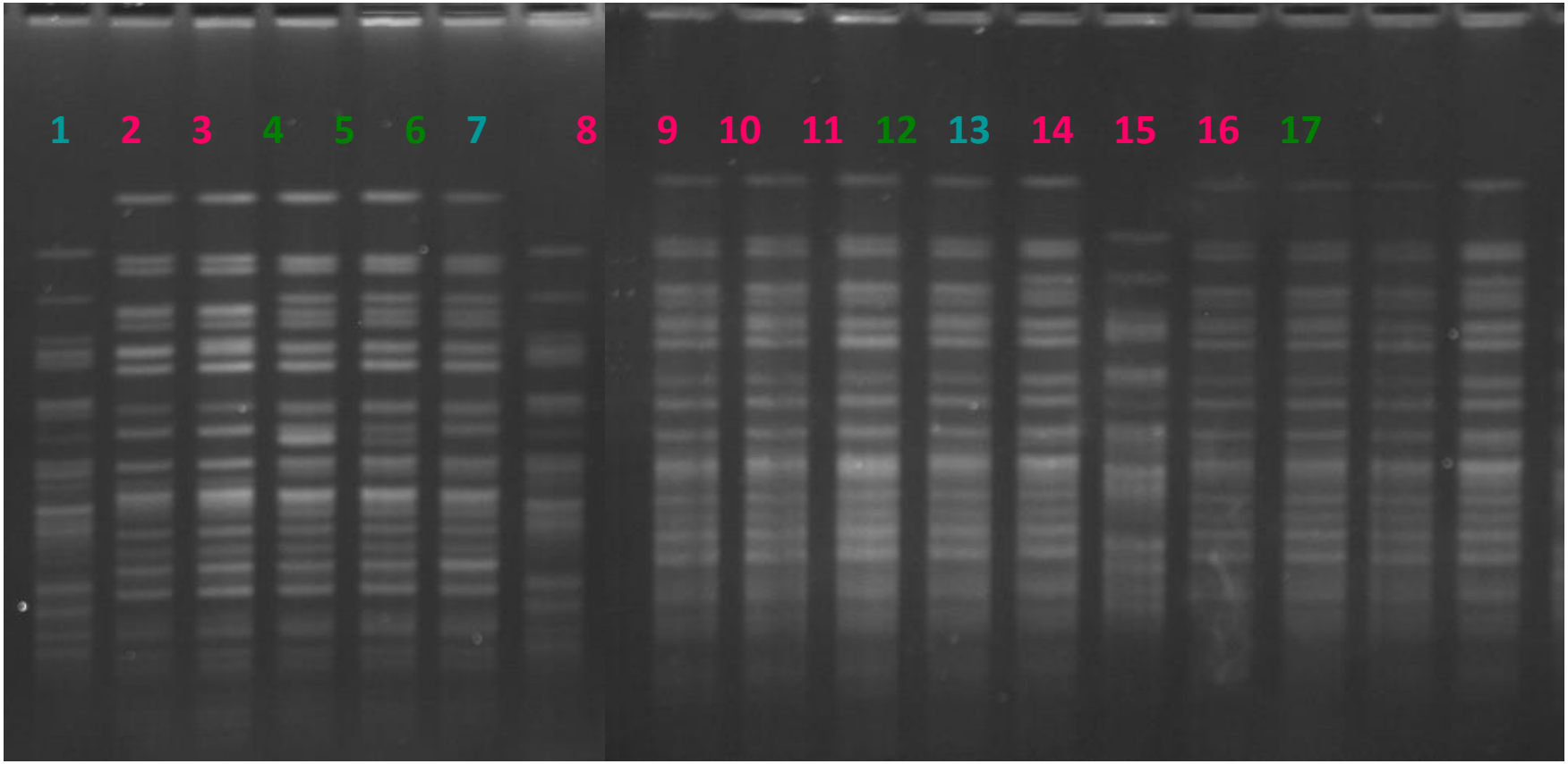




1 - 5: Chủng tả Việt Nam 7 - 10: Chủng tả Lào
6, 11: S. braenderup

There is similarity on PFGE phenotype between V.cholera in Vietnam and Laos

ANALISIS OF STRAINS BY PFGE
Before and after 2007



1, 7, 13: *Salmonella braenderup*

2:	55.04/Vc.P	8:	07.95/Vc.P	14:	12.02/Vc.P
3:	73.04/Vc.P	9:	32.02/Vc.P	15:	307.03/Vc.P
4:	55.07/Vc.P	10:	272.03/Vc.P	16:	43.04/Vc.P
5:	550.07/Vc.P	11:	84.04/Vc.P	17:	17.08/Vc.P
6:	1692.08/Vc.P	12:	01.07/Vc.P		

CONCLUSIONS
ON CHOLERA EPIDEMICS 2007-2010

1. **In all cholera epidemic waves, the first cases were in Ha Noi and then were spreading to neighboring provinces afterward.**
2. **The cases in the first weeks of epidemics were scattered but concentrated in specific time in some districts and wards**

– **There was no epidemiological linkage between epidemics, between epidemics and water sources.**

– **By the end of epidemics, it related to parties especially in country side.**

CONCLUSIONS
ON CHOLERA EPIDEMICS 2007-2010

3. Epidemics occurred in summer and winter. However, most of epidemics concentrated in summer.
4. Most of first cases related with special foods: dog met.
5. Majority of patients were adult, 17-73 years old
6. Equal distribution in both genders
7. By profession, high incidence among farmer (39%), pupil, student (14%), free labor (13%).

LESSONS LEARNED

CONCLUSIONS

9. The isolated cholera strains from epidemics in the North of Vietnam from 2007 to 2009 had the same "clone" with each other and with the Lao strains. The cholera strains of Vietnam in the period 2007 – 2009 were different with cholera strains prior to 2004.

→It was possible that immigration of *V. cholera* affected dogs *was the reason of cholera epidemic in 2007=2010 in Nothern Vietnam.*

LESSONS LEARNED

1. **Enhance the leadership of political system and of Local Steering Committee on cholera control.**
2. **Close collaboration between related sectors on food hygiene and safety, clean water supply and environmental sanitation.**
3. **Enhance the activities on cholera control and prevention in the community:**
   - **Health education**
   - **Clean water supplies and Environment sanitation**
   - **Food hygiene and safety**
   - **Oral cholera vaccination**
4. **Enhance the work of outbreak mobile teams for early detection and investigation. Urgent reporting to higher level of health care system**
5. **Close collaboration between treatment and preventive systems in reporting, specimen collection, sharing specimen.**

LESSONS LEARNED

6. **Timely treatment for patient to ensure the control of serious complication and death;**
7. **Strengthen active surveillance to detect early the existence of V.cholera in environment and foods:**
8. **Oral Cholera vaccination**
   - ❑ From 1998 to 2012, more than 10.9 million doses of the locally produced OCV were deployed in 16 provices with higher incidence
9. **Strengthen collaboration among neiboughring countries on cholera molecular epidemiology ; sharing information, isolates, experiences…**

CAPACTY FOR CHOLERA PREVENTION AND CONTROL

1. SURVEILLANCE

1. Law on Infectious Disease Control and Prevention (2007)
2. Law on Food Safety (2010)
3. Global Health Project: To enhance the capacity of the health system in the surveillance, early detection, coordination and response to diseases and outbreak, in order to meet requirements of IHR)

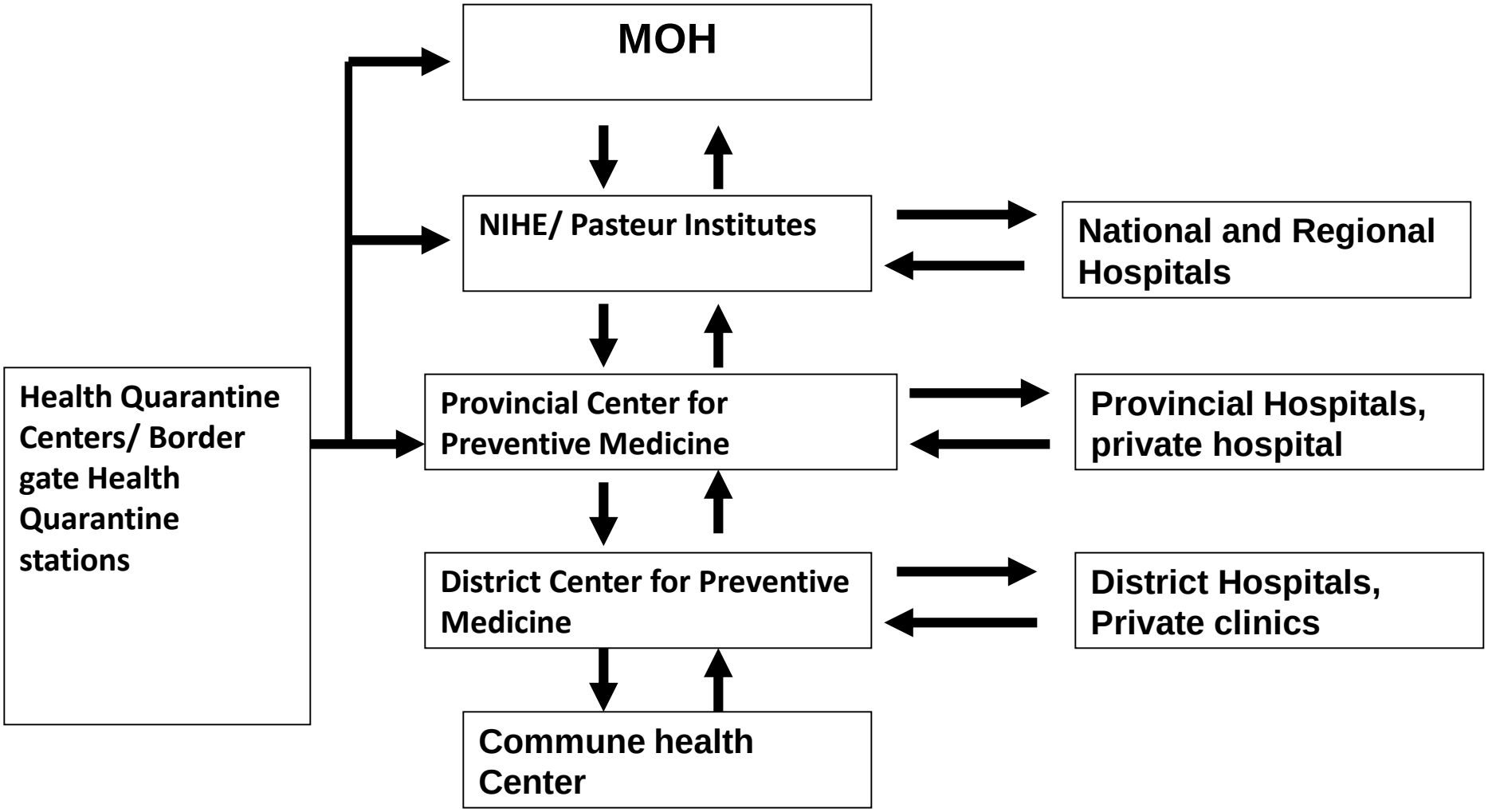
– To provide assistance in the establishment of an Emergency Operation Center (EOC) in Vietnam.

- Focal Point: General Department of Preventive Medicine (GDPM), Ministry of Health (MOH)
- Collaborating Agencies:
  - National Institute of Hygiene and Epidemiology (NIHE)
  - Pasteur Institute of Ho Chi Minh City (PI-HCMC

– To enhance capacity of the PH laboratory system to meet the core capacities in the implementation of IHR.

– To enhance application of information technology in disease surveillance, and the capacity to respond to public health events.

COMMUNICABLE DISEASE SURVEILLANCE SYSTEM IN VIETNAM



1. SURVEILLANCE

❖ **National Guideline on Cholera control and prevention**

1. **Confirmation of outbreak**
2. **Reporting**
3. **Establish the Committee of Cholera control and prevention**
4. **Respond to outbreak**
   a) **Patient**
   b) **Contact persons, preventive therapy**
   c) **Water sources: drinking, washing, surface water**
   d) **Environment: Disinfection and sanitation**
   e) **Ensure food hygiene and safety**
   f) **Health education: hygiene and sanitation practices**

1. SURVEILLANCE

- **Active surveillance to detect early the existence of V.cholera in environment and foods:**
  - ✓ **Selection sentinel surveillance sites where epidemics occurred**
  - ✓ **Regularly (monthly) collection of specimen for V.cholera testing: water (pipe, well, container, surface …), highrisk foods (vegetables, crustacean …)**
  - ✓ **Testing for VC and warning indicators:**
  - – **Isolate VC: O1, O139**
  - – **Identify Vibriophage (from shrimp sample)**
  - – **Identify NAG strains in water and CtxA, toxR gene by PCR technique.**

2. LABORATORY TESTING

1. At national and regional levels:

- Rapid testing (Crystal VC® dipstick rapid test), culture, serologic identification (serotyping)
- Antibiotic resistance tests
- Molecular testing:
  - PCR (multiplexPCR, single PCR)
  - Real-time PCR
  - RAPD (Random Amplification of Polymorphic DN
  - PFGE (Pulsed field gel electrophoresis)
  - MLST (*Multilocus sequence typing*)
  - MLVA (Multiple-Locus Variable number tandem repeat Analysis

2. LABORATORY TESTING

2. At provincial level:

- Culture,
- Serologic identification (serotyping)
- PCR (applied at some provinces)
- Suspected samples wil be sent to NIHE for confirmation.

3. At district level

- Specimen collection, storage and transportation.
- Microscope examination, Gram staining,

3. CASE MANAGEMENT

- **National Guideline on cholera dignosis and treament**
  - Health worker at all levels were trained

4. CLEAN WATER SUPPLIES AND SANITATION

- National program on clean water supplies and sanitation in rural area
  - 86% people using clean water, 65% housholds using toilets with hygienic conditions (2015)

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5. ORAL CHOLERA VACCINATION

- mORCVAX, a killed whole cell vaccine, is identical Shanchol, is manufactured by VABIOTECH in Vietnam. 10 mil. doses/year. Vietnam NRA is qualified by WHO
- It contains 5 different V. cholerae strains: 1 V. cholerae serogroup O1 Inaba El Tor, 1 serogroup O1 Inaba classical, 2 serogroup O1 Ogawa classical and 1 serogroup O139.
- Safety and immunogenicity was evaluated. No adverse effects were evident in either group while vibrocidal antibodies were significantly induced after vaccination.
- Efficacy has been only evaluated for a similar previous formulation (ORC-Vax), which contained a different V. cholerae serogroup O1 Inaba strain and only 1 serogroup O1 Ogawa strain. The study was carried out in an outbreak scenario in Hanoi, Vietnam, including 54 matched cholera ses and controls. Vaccination was found to be significantly higher in controls (16/54) than in cases (8/54), with an efficacy 54% (95% CI: -31-84%). By taking into account other factors that were significantly associated with cholera cases in a univariate alysis efficacy was raised 76% (95% CI: 4-94%).


Thank you very much!