

HOG CHOLERA IN THE PHILIPPINES

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Hog cholera, the English or the classical swine fever, an acute, highly contagious, viral disease affecting swine of all ages is still considered the most destructive of swine diseases in the Philippines. This disease is endemic in our country.

Historical background

It is not known exactly when hog cholera first occurred in the Philippines but evidence shows that it has existed in our country many years before 1900. The first authentic report of its occurrence was in the later part of 1901, when Dr. David G. Moberly, an American Veterinarian found the disease in the province of Bulacan where it had widely spread throughout the province at that time. This report was corroborated by the result of the first investigation made on the disease at Angat, Bulacan in 1903 by Dr. David G. Kretzer who was working at that time for the Philippine Government. In this province alone there were reports of 500 hogs dying each month. From that year on, the disease has been reported in every province.⁶⁾

Hog cholera situation

Statistics from the year 1934 to 1950 show that the disease incidence has continued to rise year after year.¹⁾ It appears that the number of hog cholera cases has increased with the progress of the swine industry, the mortality from the disease ranging from 70 to 95% (Table 1).

Up to the present, the hog cholera situation has not improved very much as the number of cases either continues to fluctuate at a high level or is still on the rise although with a reduced rate of mortality, in spite of the continued immunization being instituted. This is the situation depicted from 1964 to 1978 data (Table 2). During this current year (1979) for only a period of 5 months some eleven (11) provinces have already registered more or a little less than the total number of cases in the preceding year (1978) (Table 3).

A more detailed analysis of the disease situation in the country for the period, 1970 - 1978, as shown on Tables 4 & 5, revealed the following: In general, in the relatively progressive provinces based on the hog population, i.e., where most of the swine are raised individually or in the backyard, the number of deaths recorded, with a few exceptions, was quite high ranging from 411 to as high as 22,369 swine afflicted, with the number of reported cases being quite high, too (63 to 6,935), i.e. a mortality rate ranging from less than 1% to as high as 100% in certain provinces, or an average of 35%.

The number of cases in relation to the swine population of the provinces where pigs are raised in the backyard ranges from less than 1% to as high as 58%. The high rate was especially encountered in places with frequent outbreaks.

In the provinces where the greater part of the swine population is commercially raised, the percentage of those that are affected with hog cholera in relation to the hog population of the province is comparatively much lower (0.7 - 9.2%) than in the case of those raised at the backyard level, but the mortality is still quite high ranging from 2.5% to as high as 81%, or an average of 35% also. This may be attributed to the much better preventive measures commercial farms are instituting, but once the animals become infected the loss is as high as in the case of backyard raising.

Considering, therefore, the number of pigs that suffer from the disease including those that finally die, the loss is really tremendous.

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Table 1 Year, number of months in a year, cases and deaths, number of animals vaccinated and number of provinces infected

Year	Number of months	Cases	Deaths	Number vaccinated with		Number of provinces infected
				Simultaneous method	Vaccines	
1934	3	67	49			6
1936	10	401	361	1,060		8
1937	5	264	248	2,787		14
1938	3	499	376	5,322		16
1939	12	1,719	1,445	2,611	317	20
1940	12	2,566	2,070	2,902		20
1941	12	3,233	2,915	4,760	2,765	30
1945	12	2,057	2,122		191,000	12
1946	12	2,316	1,598		17,628	29
1947	12	3,403	2,492	7,832	4,085	39
1948	12	7,642	5,611	35,182	10,941	28
1949	12	4,916	4,128	28,351		25
1950	12	7,554	6,434	29,162	5,960	30

Table 2 Hog cholera situation for the fifteen year period, 1963 – 1978

Year	Number of hog cholera cases	Number of deaths from hog cholera	Number of hogs vaccinated against HC	Mortality in %
63-64	—	—	96,773	
64-65	10,131	6,495	197,518 (1,075 private included)	54.2
65-66	—	—	—	—
66-67	1,527	—	555,186	
67-68	7,586	4,131	292,076	54
68-69	9,117	5,182	395,446	57
69-70	91,117	10,726	451,368	12
70-71	17,433	9,451	606,181	54
71-72	19,352	9,081	641,338	47
72-73	37,902	11,910	742,609	31
73-74	49,793	13,397	1,039,323	27
74-75	59,796	16,427		27
75-76	44,949	9,815	849,826	22
76-77	6,491	1,167	1,014,755	18
77-78	90,072	6,296	925,112	0.7

The situation depicted above is indeed so true that even at this stage of the development of the swine industry in our country, where we claim to have advanced so much in the technology of swine production, hog cholera is still with us. Even at this stage where we have a variety of sulfonamide preparations, narrow or broad spectrum antibiotics and all sorts of anti-microbial preparations, including sera and vaccines, it appears that the disease is to stay with us.

Table 3 Hog cholera situation for the first 5 months of 1979 in a few selected provinces

Provinces	Number of hog cholera cases	Number of deaths from hog cholera	Mortality in %	Remarks
Ilocos Norte	1	1	100	
La Union	8	8	100	
Pangasinan	98	35	36	No. of cases higher than that in the 6 months of the preceding year.
Bulacan*	416	225	54	No. of cases higher than the total number of cases of the preceding year.
Tarlac*	25	5	20	-- do --
Aurora	5	5	100	
Cavite	11	11	100	
Laguna	1	1	100	
Mindoro Occidental	2	2	100	
M. Oriental	4	4	100	
Palawan*	54	9	17	No. of cases higher than the total no. of cases of the preceding year.
Romblon*	60	—		No. of cases little less than that in 1978.
Sorsogon*	112	25	22.3	No. of cases 3-1/2 times that in 1978.
Aklan*	1,730	1,646	95	No. of cases 34 times that in 1978.
Cebu*	462	39	8.5	No. of cases a little less than the total of 1978.
Sulu	1	1	100	
Misamis Occ.	3	3	100	
Davao Oriental*	306	31	10.13	No. of cases exceeding the total no. of cases in 1978.
Davao del Sur*	242	123	51	No. of cases 3-1/2 times that in 1978.
Lanao del Norte*	312	25	8	No. of cases exceeding the total no. of cases in 1978.
Antique*	91	14	15.4	171% increase in cases compared to 1978.

* The eleven provinces that registered high number of cases.

Table 4 Hog cholera situation in some selected provinces where the greater number of hogs are raised in the backyard

Provinces	% of Hog raised in the bkyd.	Tot. hog pop. as of Jan. '78	Tot. no. of HC cases	Tot. no. deaths fr. HC	Mortality range in %	Average mortality in %
Pangasinan 9	90	214,510	2,898	1,410	29 – 67	49
Cagayan 7	99	315,888	4,051	2,073	11 – 73	51
Isabela 8	81	207,650	4,345	2,698	22 – 87	62
Quezon 9	96	189,400	3,939	2,827	44 – 89	72
Albay 9	96	108,440	411	63	1 – 47	15
Camarines Sur 9	97	200,340	5,631	2,564	8 – 83	46
Iloilo 9	95	147,050	22,369	6,935	13 – 62	31
Negros Occ. 9	75	145,330	18,994	3,212	6 – 83	16
Bohol 9	99	220,680	7,840	3,818	9 – 98	47
Cebu 9	85	318,230	6,589	1,173	3.4 – 77	18
Negros Oriental 9	98	147,500	17,275	1,231	5 – 41	7
Nueva Ecija 9	88	108,600	5,658	3,021	2 – 95	53
Leyte 8	99	317,820	18,001	942	1.5 – 39	5.2
Zamboanga del Norte 6	98	125,810	1,125	611	20 – 94	54
Zamboanga del Sur 7	99.7	151,070	1,908	473	12 – 65	25
Bukidnon 4	78	142,370	499	300	51 – 100	60
Misamis Or. 9	95	171,400	4,454	1,063	11 – 49	24
Batangas 9	66	150,240	51,688	2,762	0.2 – 66	5.3
Davao del Norte 8	99	110,920	3,058	392	2.5 – 79	13
Pampanga 9	66	139,640	22,061	1,005	2 – 8	5
Tarlac 8	68	118,520	18,671	1,099	2 – 100	6
**Palawan 9	99.8	50,970	29,621	7,033	18 – 85	24
**Lanao Norte 8	83	54,110	966	336	6 – 88	35
**Siquijor 6	100	35,670	25	20	60 – 100	80
**Ifugao 4	99.4	34,990	335	247	33 – 100	74

* Selection based on hog population

Numbers following the name of the provinces indicate the number of years data were collected; period covered, 1970 – 1978.

** Provinces that registered quite high number of cases or high mortality rate.

Table 5 Hog cholera situation in provinces where more hogs are commercially raised

Provinces	% of Hogs raised commercially	Total hog population as of Jan., 1978	Total no. of HC cases	Total no. deaths fr. HC	Mortality range %	Average mortality %
Bulacan 9	77	288,410	1,913	861	15 – 61	45
Laguna 9	57	99,070	9,160	5,654	8 – 81	62
Rizal 9	74	161,250	10,967	1,763	2.5 – 60	16
South Cotabato 7	77	240,940	3,223	523	4 – 52	18

Numbers following the name of the provinces indicate the number of years data were collected; period covered, 1970 – 1978.

Mode of transmission or dissemination of hog cholera

Hog cholera is transmitted principally by intimate contact with sick animals and directly or indirectly with fresh secretions and excretions that contain the spherical RNA virus.

In the early days when hogs were allowed to run at large and forage for themselves, they came in contact with sick pigs and acquired the infection this way. The other means are: the selling of slaughtered pigs without veterinary inspection; the clandestine slaughter and peddling of pork, feeding of pork trimmings, scraps and washings from infected slaughtered animals; allowing movement of pigs from province to province without veterinary health certificate or permit; and the sale of the newly immunized swine vaccinated by the simultaneous serum-virus method or the indiscriminate use of the virus and serum for the immunization.¹⁾

At present, the sale of slaughtered pigs without veterinary inspection is completely banned although there may still be a few secrete slaughters and sales of pork. This, of course, is not much of a problem now. Pigs are now generally raised in confinement or pens, so that dissemination of the disease through this way has been partly prevented. However, the movement of swine which may be in subclinical condition or have been exposed to infection and may be in the incubation period still continues. Sometimes piglets are peddled from place to place to those who raise one or two pigs in their backyards. At times, the introduction of an animal into the herd without previously undergoing quarantine has been incriminated. The movement of people, from infected places or herd to another, especially hog dealers has also been incriminated. Birds and rats were also suspected in certain outbreaks.

The feeding of garbage or kitchen scraps is still practiced especially by the backyard raisers. Even semi-commercial piggeries feed their animals with kitchen scraps or leftovers from hotels and restaurants, but the possibility of transmission through this means has been greatly reduced by first cooking this kind of feed. Since swine lungworm has been demonstrated to act as reservoir and intermediate host of the hog cholera virus, and since swine lungworm infection is common in the Philippines, the possibility of spreading the infection this way may not be remote.

Manifestations of hog cholera

During the early years of 1900, when the disease was first reported and investigated, the acute form was mostly encountered, especially in the slaughterhouses and hog corrals in Manila.⁶⁾ As this form of hog cholera runs a rapid course, cases of this disease were rarely diagnosed in life at that time. The first few signs of the disease are indifference of animals to their surroundings. An affected animal may or may not lose appetite and in some cases may even eat until a few minutes before death. Usually they stay quietly in a corner or may crowd together and force themselves taking refuge under litter. Death in the acute form generally comes in a few hours and rarely does an animal with this form live more than a day or two. They refuse to move when disturbed and appear unmindful of their suffering.

Constipation is ordinarily observed in the beginning and is then followed by diarrhea up to the time the animal dies or up to the time that it recovers. Sick pigs register temperatures ranging from 101 - 104°F and have difficulty in breathing. There is reddish or bluish discoloration of the skin around the nose (snout), ears and abdomen and inner surface of the thigh. The conjunctiva is generally reddened and a mucopurulent discharge from the eyes is frequently seen. The nervous symptoms are manifested by local paralysis, incoordination of movement and occasional sluggishness and at times convulsions.

Diagnosis

During the June 25, 1933 hog cholera outbreak in a local farm which killed some 76 swine, consisting of sucklings, sows and boars, veterinarians found difficulty in diagnosing the disease. It was only after autopsies were conducted in August 1934 and definite lesions of hog cholera were found that the outbreak was declared.⁵⁾

Knowing that prompt diagnosis is extremely important as delays in diagnosis will often result

in the loss of the entire herd, in case of doubt, the disease is treated as hog cholera until proven otherwise. The presence of hemorrhages in the larynx, kidneys and bladder and the button ulcers near the ileo-caecal valve are strong indications of hog cholera.

The discovery of the presence of swine erysipelas in the country, especially the acute type of infection has often caused serious difficulties in the diagnosis of the acute form of hog cholera. Fluorescent antibody method which is the preferred method with diagnostic laboratories for the detection of hog cholera virus is not yet employed in the country, although there are already experiments along the line.

Most of the cases of hog cholera are diagnosed clinically in the field based on the history, symptoms and lesions. Confirmation of suspected cases of hog cholera is done in the central diagnostic laboratory of the Philippines Bureau of Animal Industry by autopsy, histopathology and sometimes by animal inoculation. The specimens often submitted for the diagnosis are dead or sick piglets, viscera or head.

Prevention and control

Since the discovery of hog cholera up to 1928, practically little has been done toward its control and eradication.¹¹ During those years less attention was given to this disease because of the ravage of rinderpest at that time. The only method of handling the infection then was the institution of sanitary measures such as disinfection and quarantine. Hogs clinically positive were isolated and infected pens were cleaned and disinfected. Pens were disinfected with creolin, lysol or crude carbolic acid solution. Infected and exposed animals were disinfected with mild solution of the same disinfectants.

It was in the early part of 1928, when infected and exposed pigs were actually treated. The serum alone and the simultaneous serum-virus treatment which were the methods developed and widely used in the United States were adopted by our country on a small scale. The technique is as follows:

- (1) Animals' temperature is taken and those found with fever are given serum alone;
- (2) Animals which are apparently normal receive simultaneous serum and virus injections.

The larger portion of serum used then was imported from the United States and a limited amount was produced by the Philippine Bureau of Animal Industry Research Laboratory (PBAIRL). The virus was completely supplied by the PBAIRL. The amount of biologics utilized was negligible in relation to the population of swine (Table 6).

This treatment was instituted by the Bureau's veterinarians or their authorized representatives and never entrusted to the private sector.

This was the method employed that freed Alabang Stock Farm, a Government Farm, of hog cholera.

In 1939, the hog cholera vaccine—crystal violet vaccine and tissue vaccine—came into use. With limited amount of vaccine available—partly imported and partly locally manufactured—immunization went on non-exposed animals and herds. With very insignificant amount of biologics used at that time the mortality from hog cholera was tremendous. For instance, in 1948, the reported 7,642 cases resulted in 5,611 deaths and in 1950, among the 7,554 cases, the deaths numbered 6,434 (Table 1).

During the campaign in those years for the prevention and control of hog cholera, the BAI personnel were guided by the following:

- (1) The use of attenuated vaccine in towns or municipalities where pigs are raised individually and where they are turned loose to forage for themselves; this method is also employed for off-springs intended for stock which are confined for at least a week after immunization before being turned loose again. Animals exhibiting severe reactions are to be given serum and confined for further observation. Offsprings from non-immunized sows which are intended for the market are to be immunized with crystal violet blood vaccine or tissue vaccine soon after weaning and revaccinated after 3 months, while those of immune dams are vaccinated a month

Table 6 Amount of biologics used in relation to the swine population

Year	Hog cholera virus in doses	Hog cholera serum in cc.	Hog cholera vaccine in doses	Swine population
1929				2,454,286
1930				2,774,758
1931				2,491,245
1932				2,594,620
1933				2,742,120
1934				2,880,029
1935	1,638	?		3,018,758
1936	1,060	?		3,120,222
1937	2,288	7,925		3,183,039
1938	5,322	2,795		3,558,274
1939	2,611	6,430		3,348,515
1940	2,907	22,600		4,446,790
1941	4,760	16,100	5,705	
1942	375	12,000	12,150	
1943	2,850	10,300	11,100	
1944	2,375	40,350	11,170	
1945				1,983,720
1946	6,079	171,500		1,460,780
1947	12,494	362,500		1,752,933
1948	10,263			2,636,820
1949	12,684			3,448,861

or so after weaning and revaccinated also after 3 months. These immunized pigs are confined for 2 to 3 weeks after vaccination. Stock and market pigs are to be housed separately.

- (2) In organized piggeries where the original stock are immunized by any standard method or are not immunized at all, either blood or tissue vaccine is to be used for all offsprings.
- (3) Inter-provincial and inter-island traffic of swine must be regulated with permits for shipment being issued only to healthy swine and those which come only from places free of infection.
- (4) There should be strict enforcement of the meat inspection regulation.
- (5) During the information campaign, one should promote the importance of swine hygiene and sanitation, methods of disposal of dead and sick animals and of their discharges and secretions, effective method of disinfection and prompt reporting of the presence of the disease.

Some problems met during those years in the control of hog cholera in the Philippines were the following:

- (1) Non-availability of an ideal vaccine—a vaccine that is cheap, safe and potent; one that would confer life long immunity with a single injection, and which is not eliminated or, if eliminated by inoculated hog, has no power to infect non-vaccinated susceptible swine.
- (2) The custom of allowing pigs to roam.
- (3) There were some deaths occurring during the use of the simultaneous serum-virus treatment.

At present, the serum alone treatment is still used in the prevention and control of hog cholera. The hyperimmune anti-hog serum is used especially for exposed susceptible pigs to provide immediate protection. It is effective but is expensive and the immunity afforded is of short duration. The serum treatment is also being resorted to for the therapy of hog cholera, but likewise, the animal dies once symptoms of the disease become apparent.

The simultaneous serum-virus treatment for immunizing swine is not anymore practiced and in its place two types of modified live virus vaccine are in use. These are the lapinized hog cholera vaccine and the attenuated tissue culture hog cholera vaccine. The lapinized hog cholera vaccine is presently being produced by the Philippine Bureau of Animal Industry. It forms part of the total amount of vaccine used for immunizing our swine population. This type of vaccine is used by our fieldmen in the vaccination program. The volume of vaccine produced by our Bureau of Animal Industry can hardly meet the demand for our immunization program (Table 7). The vaccine produced, at least, answers for about 20% of the total demand. The rest of the hog cholera vaccine requirement is supplied by importation.

The attenuated tissue culture vaccine is imported from countries producing it, usually from the United States. This type of vaccine is the one usually used by the private sector.

The serum is also being used by others in cases where severe reactions to vaccination with either the lapinized or the attenuated tissue culture vaccine take place.

Researches on hog cholera

A few studies have been conducted on hog cholera.

At the time when the simultaneous serum-virus method of immunizing pigs against hog cholera was employed, attempts were made to adapt and propagate the virus in rabbits by serial passage, which failed.²⁾ The other trials with the same objective, were series of rabbit to rabbit passages using this time different passage levels of the alternately passed virus. Although the process is a very slow one, it was found possible to adapt and propagate the hog cholera virus in rabbits.

Researches were later directed into producing a vaccine. This was at the time when the crystal violet vaccine, an inactivated virus preparation was in use. We found the inactivated crystal violet vaccine not so appropriate for use in the Philippines where hog cholera is endemic, as this vaccine confers effective immunity on the 14th to 21st day after inoculation (meaning too slow) and the protection afforded lasts for only 6 months to 12 months at most. The modified live virus vaccine was found more appropriate for the Philippine conditions so that experiments toward producing this

Table 7 Amount of hog cholera vaccine produced in relation to the number of animals vaccinated

Year	Hog cholera vaccine manufactured (in doses)	Hog cholera vaccine dispensed for disease control	Hog cholera vaccine sold	No. of animals vaccinated against hog cholera
1964-65	26,175	20,095	1,075	197,518
1965-66				
1966-67	41,100	23,810	35	555,186
1967-68	272,920	252,530	3,400	292,076
1968-69				395,446
1969-70	287,600	263,500	3,560	451,368
1970-71				
1971-72	393,126	390,116	3,010	641,338
1972-73				
1973-74	308,041			1,039,323
1974-75	680,420			
1975-76	484,650			849,826
1976-77	700,000			1,014,755
1977-78	227,000			925,112
1978-79	163,630			

kind of vaccine were undertaken. Adaptation and attenuation of the hog cholera virus by the alternating technique in rabbits was started.³⁾ This gave variable results because of the tendency of the virus to get lost or die during the process.

The 20th passage in rabbit failed already to infect, but the product has a low keeping quality when stored. In potency trials conducted at this passage level some animals are already protected but such degree of attenuation cannot yet be recommended. Based on these findings it was concluded that not all rabbits are suitable passage animals; certain animals are susceptible while others are resistant.

In another study⁴⁾ with the same objectives of attenuating the hog cholera virus, the alternating passage of the virus through pigs and duck embryonated eggs was employed in two batches of embryonated eggs. The intravenous route of inoculation was used in one batch and the allantoic sac in the other. The attempt failed to attain the desired results. From the limited data obtained from the study it was tentatively concluded: that duck embryonated egg truly attenuates, but to the extent that it completely denaturalized the hog cholera virus; that the duck embryonated egg is not a suitable medium for adaptation and/or attenuation of the virus.

The immunity afforded by the lapinized vaccine lasts for 8 to 12 months and failures in vaccination happened because of low keeping quality and may be by improper handling.

There were also some failures reported on the use of imported vaccines and these, too, have been ascribed to improper handling or improper storage during shipment. Hence, researches are geared towards improving the hog cholera vaccine. To produce the tissue culture hog cholera vaccine is one study now being conducted.

As the production of the lapinized vaccine is now getting too expensive due to the rising cost of rabbits, the development and production of a tissue culture hog cholera vaccine that can match in quality the imported preparation and which can be produced in our country economically and in sufficient quantity is considered a very timely undertaking.

There are also researches to improve our methods of diagnosing hog cholera. There are already trials employing the fluorescent antibody technique, a technique which is already in use in foreign laboratories. These researches aim to make accurate and faster the diagnosis of hog cholera.

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Discussion

Kumagai, T. (Japan): What is the cause of the variability in the mortality rate of infected pigs among affected areas?

Answer: The variability in mortality rate can be explained by the fact that commercial farms are following a strict vaccination program whereas the backyard raisers at times do not vaccinate at all because of unavailability of vaccines. The virulence of hog cholera (HC) strains may be mentioned but no studies have been conducted along that line, yet.

Koh, J.G.W. (Singapore): 1. Is there any difference in the susceptibility of indigenous breeds

of pigs and commercial breeds in the Philippines? 2. Is there any difference in the virulence of various isolates of hog cholera virus in the Philippines?

Answer: 1. We do not see any difference in susceptibility of the indigenous breeds of pigs and commercial breeds as long as they are not vaccinated or previously exposed to the infection. 2. As far as the virulence of various isolates of hog cholera (HC) virus is concerned, we have just started a study in this regard.

Shimizu, M. (Japan) Comment: I would like to make a few comments on the virulence of HC virus. We have obtained several isolates differing in pathogenicity from field cases of hog cholera. The relationship between the antigenicity and the virulence was investigated in these isolates. Eleven strains were examined for the degree of neutralization by antibodies against bovine viral diarrhea (BVD) virus which is antigenically related to HC virus. The HC virus strains were divided into two groups: 1. a group showing weak neutralization by BVD antibodies. 2. a group with marked neutralization depending on the kind of BVD virus strains used. The findings suggest the existence of variability in antigenicity in both HC and BVD viruses. The pathogenicity of the strains was also investigated. When HC virus strains which were neutralized weakly by BVD antibodies were inoculated to pigs, they gave rise to severe symptoms (acute form) whereas those well neutralized by the BVD antibodies had a low pathogenicity (subacute and chronic forms, inapparent infection). The clinical and immunological response of pigs inoculated with Kanagawa/74 strain (the representative strain of the second group) enabled to divide the pigs into four categories. 1. These pigs developed a subacute form and showed a severe response 2-3 weeks after the inoculation. 2. These pigs showed severe symptoms and even died 14 weeks after inoculation. Virus was recovered from the serum and the tissues. In both cases 1 and 2 the titers of serum neutralizing antibodies were low. 3. These pigs showed mild signs and recovered 4 weeks after inoculation. the virus could be isolated from the serum at the early stage of infection. 4. These pigs showed no clinical response. Both 3 and 4 categories were rare and in these cases the antibody titers were high. It thus appears from these studies that the antigenic properties of HC virus are related to the pathogenicity in pigs.