

## IMMUNE RESPONSE OF PIGS WITH DIFFERENT LEVELS OF COLOSTRAL ANTIBODY TO INOCULATION WITH LPC-CHINESE STRAIN OF HOG CHOLERA VACCINE

S. S. LAI<sup>1</sup>, C. S. CHEN<sup>1</sup>, T. H. HUANG<sup>1</sup>, W. C. HO<sup>1</sup>,  
J. T. WANG<sup>2</sup> and F. M. WU<sup>3</sup>

**Piglets with maternal antibody titers of 1:32 or below receiving one dose of LPC-Chinese (HC) strain of hog cholera (HC) vaccine virus containing 100 pig infective doses (PID) survived normally after challenge with virulent HC virus. Maternal antibody titers between 1:32 and 1:64 survived with clinical and histopathological reactions. However, maternal antibody titers above 1:64 died after virulent challenge. Epizootiological data indicated that 1 to 4 weeks old piglets with maternal antibody titers below 1:32 were 69%, 75%, 95% and 97% respectively. Experimental data suggest that the optimal vaccination age is 3 weeks old, about 95% vaccinated piglets will gain solid immunity.**

Extensive vaccination with viral vaccines always creates a serious problem, which early vaccination of young animals frequently fails to establish solid immunity due to the interference of colostral antibody upon vaccination<sup>(1)</sup>. HC vaccination in Taiwan is one of the examples; LPC strain of HC vaccine has been extensively applied in the field for the control of HC since 1954<sup>(2)</sup>. Although the incidence of HC cases has been considerably reduced, sporadic HC outbreaks are still frequently reported. The failure of HC control is mainly incriminated to the interference of colostral antibody at time of vaccination, particularly in those piglets delivered from sows receiving multiple vaccinations with the vaccine. Experiments related to the interference phenomenon of HC colostral antibody upon vaccination and the distribution of maternal

antibody in piglets have been reported by Lin *et al.* in 1969<sup>(3)</sup>. The data showed that piglets with colostral HC antibody titers of 1:16 or below receiving one dose of LPC strain of HC vaccine containing 100 PID could survive from challenge with 10<sup>4</sup> MLD of virulent HC virus, ALD strain, two weeks after vaccination. Investigation on distribution of HC maternal antibody in piglets indicated that 80% of 6-week-old piglets had serum antibody titer of 1:16 or below. Therefore, the current policy of HC vaccination, all 6-week-old piglets required HC vaccination, was made on the basis of maternal antibody levels and distribution, and the weaning period of piglets.

Current epizootiological data showed that the occurrence of HC outbreaks is mainly due to the early movement of the HC susceptible piglets at 3-4 weeks of age, that HC vaccination can not legally be carried out<sup>(4)</sup>. Accordingly, the current vaccination program is not adequate and practical because the weaning period and movement of the piglets are three weeks earlier before receiving vaccination. The purpose of this report is to re-evaluate the HC vaccination program in Taiwan.

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1. Taiwan Provincial Research Institute for Animal Health, Tamsui, Taiwan.
2. Department of Veterinary Medicine, National Chung-Shin University Taichung, Taiwan.
3. Council for Agricultural Planning and Development, Taipei, Taiwan.

## MATERIALS AND METHODS

**Viruses:** A<sub>76</sub> strain of HC virus with a titer of 100 TCID<sub>50</sub> was used for the END method. Miyadela strain of Newcastle disease virus cultivated in allantoic fluid of 10 days old chick embryos was used for challenge in the END method.

**Cell:** Primary swine testicle (ST) cells were prepared by trypsinization of testes obtained from 4 to 6 weeks old healthy pigs. The procedures for preparing the cells were previously described<sup>(1)</sup>.

**Serum samples:** A total of 1064 serum samples evenly collected from 1 to 4 weeks old piglets in Pingtung, Tainan, Nantou, Yuanlin, Taichung, Shinchu, Taoyuan and Taipei, were used for investigation of HC colostral antibody prevalence in piglets.

**Animals:** Fifteen piglets aged from 5 to 33 days with different levels of HC maternal antibodies ranging from 0 to 1:64 were intramuscularly vaccinated with one dose of LPC strain of HC vaccine containing 100 PID. The vaccinated pigs were challenged with virulent HC virus, ALD strain containing 10<sup>4</sup> MLD, 7 weeks after vaccination. Two non-vaccinated pigs were served as control. Serum samples from the piglets were collected at vaccination, pre-challenge, 7 and 14 days post-challenge respectively. After challenge, clinical signs were daily recorded.

**END method:** A simple and rapid

microtiter procedure for END method to determine HC antibody titers as described elsewhere was used for titration of HC antibody<sup>(1)</sup>. All serum were inactivated at 56°C for 30 minutes before use.

## RESULTS

### Immune Response of Piglets with Different Levels of HC Colostral Antibody to HC Vaccination and Challenge.

As indicated in Table 1, 11 piglets with maternal antibody titers of 1:32 or below receiving one dose of LPC strain of HC vaccine survived normally after challenge. Piglets with maternal antibody titers between 1:32 and 1:64 survived with transient fever reactions. Pathologically, those survived pigs also showed mild macroscopic and histopathological HC lesions. Typical HC reactions were found in two vaccinated piglets with maternal antibody titers of 1:64 or higher and two control pigs died within ten days after challenge. Immunologically, piglets with maternal antibody titers lower than 1:12 had an increase antibody titers at 5 weeks after receiving vaccination. On the contrary piglets with antibody titers of 1:32 or higher showed no antibody production but a decrease antibody titer was found after vaccination. However, antibody production in those piglets with lower levels of maternal antibody was found not so rapid at one week

Table 1. Immune Response in Pigs with Different Levels of HC Maternal Antibody after Receiving 1 Dose of LPC-Strain of HC Vaccine

No. of Pig	Serum Neutralizing Antibody					Survival & reactions
	Vaccination			Challenge		
	0 (Week)	5	7	1	2	
6	2*	80	40	140	180	6S -
2	12	45	22	256	>360	2S -
3	32	4	5	>360	>360	3S -
2	45	6	0	>360	>360	2S ++
2	64	0	7	5	-	2D ++
2	2 (Control)	0	0	0	-	2D ++

\*: Mean of antibody titer, S: Survival, D: Dead.

+: One "+" indicates one survived pig with reactions.

-: No reaction with survived pigs.

after challenge as compared to those piglets with higher levels of maternal antibody.

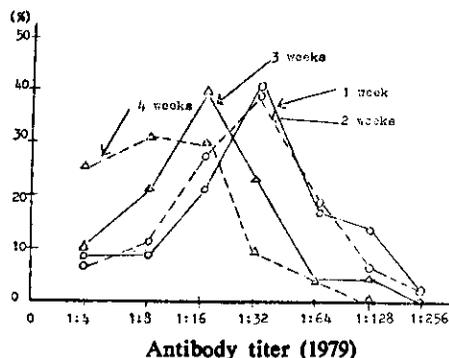


Fig. 1. Distribution of HC Maternal Antibody in 1 to 4 Weeks Old Piglets in Taiwan in 1979.

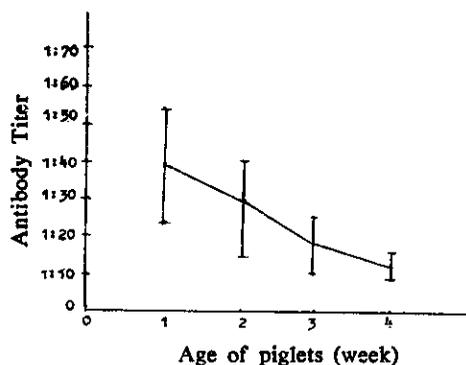


Fig. 2. Average of HC maternal Antibody Titers in 1 to 4 Weeks Old Piglets in Taiwan in 1979.

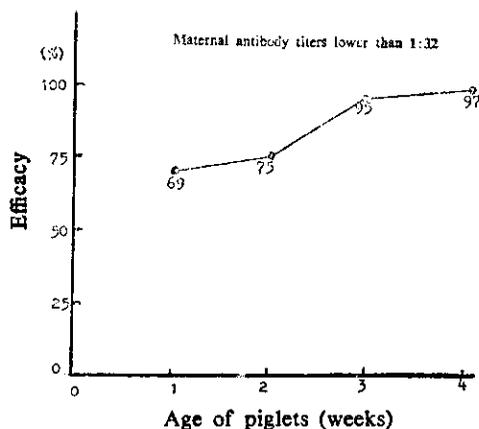


Fig. 3. Estimated Efficacy of 1 to 4 weeks Old Piglets receiving 1 dose of LPC strain of HC vaccine in the field.

#### Distribution of HC Colostral Antibody in 1 to 4 Weeks Old Piglets.

The distribution of HC colostral antibody in 1016 piglets aged from 1 to 4 weeks were illustrated in Fig. 1. Sixty-nine percents of one week, 75% of 2 weeks, 95% of 3 weeks and 97% of 4 weeks old piglets had their serum neutralization antibody titers of 1:32 or below. The average of serum antibody titers indicated in Fig. 2 was found 1:40, 1:30, 1:18 and 1:12 in 1 to 4 weeks old piglets respectively. Geographically, there was no significant difference in the distribution of maternal antibody in the tested piglets.

#### Estimation of Efficacy in 1 to 4 Weeks Old Piglets Receiving One Dose of LPC Strain of HC Vaccine.

Based on the results obtained from the survival of vaccinated piglets with different levels of maternal antibody and the distribution of maternal antibody, the efficacy of 1 to 4 weeks old piglets receiving one dose of vaccine are 69%, 75%, 95% and 97% respectively (Fig. 3).

## DISCUSSION

The relationship between different levels of colostral antibody and immune response of Piglets induced by vaccination with 1 dose of LPC strain of HC vaccine was found different from the previous experimental data that piglets with colostral antibody titers of 1:16 or below obtained solid immunity after vaccination<sup>(4)</sup>. The difference may be due to the different techniques, time and persons who performed the neutralization test. Current HC vaccination program, 6 weeks old piglets required vaccination was based on the previous experimental data that 80% of piglets at the indicated age would obtain solid immunity after vaccination. Although the older of the piglets receive vaccination, the higher percentages of efficacy will be, the piglets will become more susceptible to HC virus. Also during that time (1969) the weaned age was 7 to 8 weeks old so that the

vaccinated piglets would have enough time, at least one week, to gain solid immunity before movement.

However, the present investigation on the prevalence of HC maternal antibody in 1 to 4 weeks piglets revealed that much lower levels of colostral antibody in piglets was found as compared to those previously surveyed in 1969<sup>(1)</sup>. The difference of antibody prevalence presumably was due to the different status of vaccination in sows. In other words, sows may receive less HC vaccination every year. As the rapid improvement of pig raising techniques, the weaned age of piglets is shortened to be 3 to 4 weeks old instead of 7 to 8 weeks. The farmers usually sell their piglets right after weaning which result in the main cause of current HC outbreaks because of the movement of non-vaccinated or vaccinated piglets, those not gained solid immunity against HC. Therefore, based on the current distribution of HC maternal antibody, immunity response to vaccination and the weaned age of young piglets, the optimal vaccination age is suggested to be 3 weeks old. Estimatly, 95% of vaccinated piglets will be resistant to HC virus infection if weaning and movement are done at 4 weeks old. For those piglets kept for breeding purpose, re-vaccination at 6 or 8 weeks of age is also suggested.

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## 帶不同移行抗體之仔猪對 豬瘟疫苗之免疫反應

賴秀穗<sup>1</sup> 陳忠松<sup>1</sup> 黃天祥<sup>1</sup> 何維莊<sup>1</sup>  
王吉德<sup>2</sup> 吳福明<sup>3</sup>

仔猪移行抗體在 32 倍或以下者注射一劑量兔化豬瘟疫苗可無任何反應耐過豬瘟強毒之攻擊，移行抗體介於 32 到 64 倍間者可耐過但呈熱反應及輕度豬瘟病變。移行抗體在 64 倍或以上者，攻擊後均斃死。一到四週齡移行抗體調查結果，其移行抗體低於 32 倍者，一至四週齡分別為 69%，75%，95%及 97%，綜合不同移行抗體與一劑量注射免疫之關係及移行抗體之分佈情形，目前最佳之免疫週令為三週，約有 95%之免疫仔猪可抵抗豬瘟毒。

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1. 臺灣省家畜衛生試驗所。
  2. 國立中興大學獸醫系。
  3. 行政院農業發展委員會。