Extension Folder 521–1980

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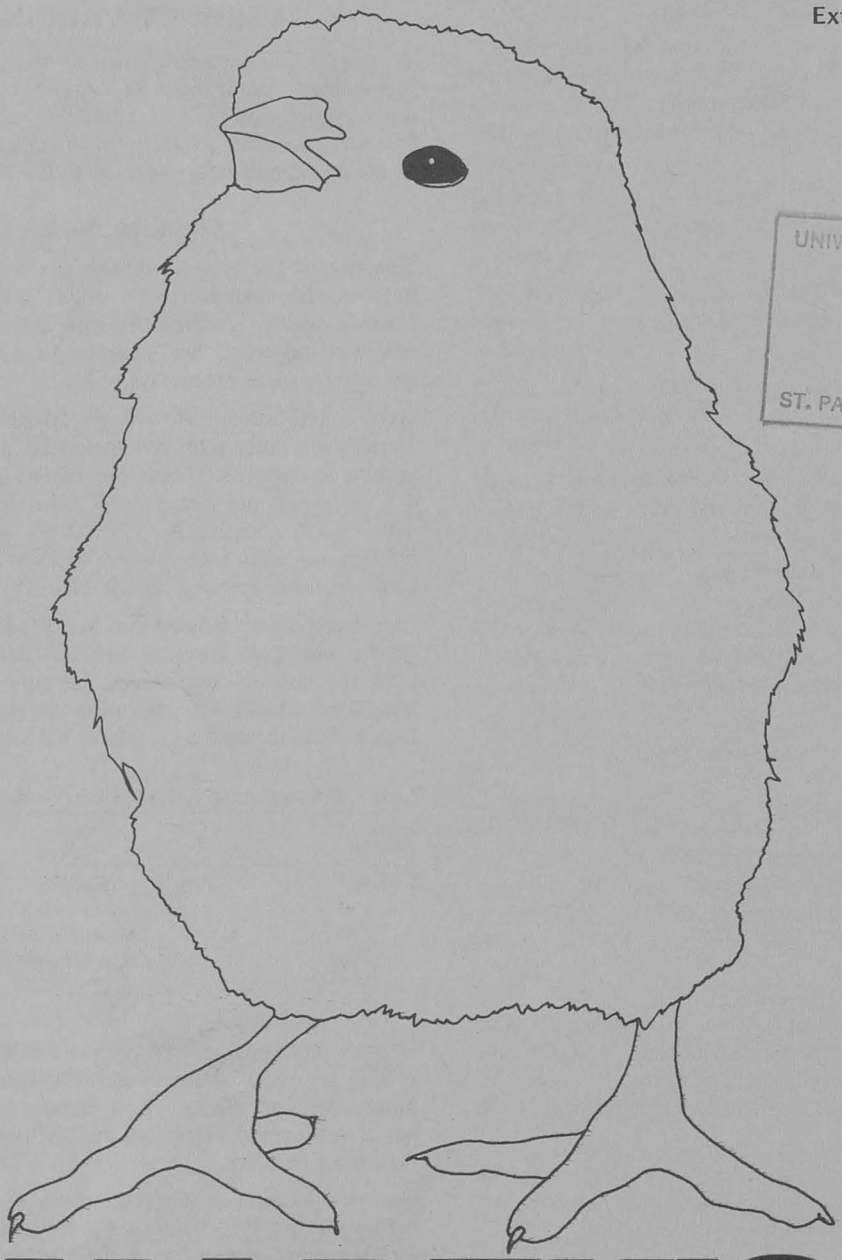
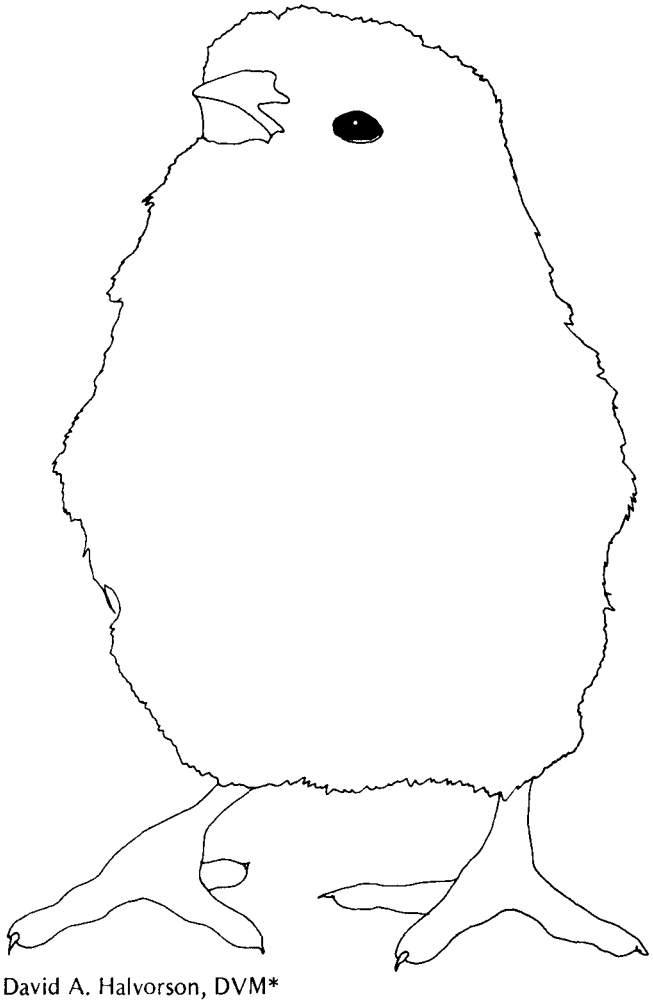


MAREK'S DISEASE CONTROL

AGRICULTURAL EXTENSION SERVICE UNIVERSITY OF MINNESOTA



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Marek's disease, which results in considerable economic loss, is caused by a virus with worldwide distribution. Mortality and morbidity are due to the development of tumors in various internal organs and to paralysis resulting from infiltration of the nerves by lymphocytes.

Because the virus is widespread and hardy, virtually all flocks and all pullets (no matter how normal they appear) are infected with the virus and, thus, are a source of the infection.

In 1970, the effectiveness of the turkey herpesvirus (HVT) as a vaccine was discovered. The vaccine, which prevents the formation of tumors but *does not prevent infection* with the Marek's virus, is 80- to 90-percent effective in protecting chicks against Marek's disease *if* it is given a chance to immunize the chicks before they are exposed.

A lack of 100-percent immunity to Marek's disease is recognized but should not be an excuse for tolerating Marek's disease losses. Proper vaccination in conjunction with management factors in the chicken house can result in neglibible losses.

This folder discusses prevention and control of Marek's disease. It is divided into two parts: 1) hatchery vaccination factors which may contribute to or help prevent Marek's disease outbreaks and 2) steps the poultryman can take to prevent or control the disease once the chicks are delivered from the hatchery.

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HATCHERY VACCINATION

To obtain 100-percent control of this disease, every available management factor must be considered, including vaccine production methods, vaccine additives, vaccination errors in the hatchery, parental antibody in the chick, genetic background of the chick, and early exposure to the Marek's disease virus.

Choosing the Vaccine

Selection of the type of vaccine to use is the first decision the hatcheryman makes which might affect the incidence of Marek's disease. Studies comparing cell-associated ("wet") vaccine with cell-free ("dry") vaccine have revealed some interesting differences in protection.

Gavora and others showed an advantage of half as much Marek's mortality with cell-associated (as opposed to cell-free) vaccine in leghorns. This improvement in livability resulted in 4.4 more eggs per hen housed. Nine strains of chickens were evaluated in this study. One strain suffered 17.5 percent Marek's mortality with cell-free vaccine, compared to 10.4 percent for those receiving cell-associated vaccine.

Eidson and others showed that Marek's disease lesions in broiler chicks with high parental antibody levels were affected by both the dose of vaccine and the type–wet or dry (table 1). Vaccinated chicks were placed in contact with 3-week-old, infected birds for challenge. Marek's disease lesions were greater

Table 1. Effect of vaccine type and titer on Marek's disease lesions.

Vaccine titer (FFU/dose)	Vaccine type	Marek's lesions
1,360	Cell-free	24.3%
6,360	Cell-free	22.5%
1,250	Cell-associated	12.5%
5,650	Cell-associated	11.3%

in birds receiving cell-free vaccine and were greater in birds receiving a lower dose of vaccine. Antibody against HVT is transmitted through the egg from breeder hens to the chicks and has a detrimental effect on the cell-free vaccine, so a higher dose must be used.

Once the vaccine is selected, review the enclosed directional leaflet frequently, so you do not forget proper procedures. Before removing an ampul from the nitrogen container, make sure you are ready! If anything is to be added to the diluent, such as an antibiotic or another vaccine, *do it first.* However, add nothing to your Marek's vaccine unless you *know* it is safe.

Thawing and Reconstituting the Vaccine

When removing cell-associated vaccine ampuls from the liquid nitrogen canister, you must remove only one at a time and quickly replace the others. Put the vaccine ampul into water immediately. Keeping an ampul out of the liquid nitrogen for 2½ minutes and then replacing it results in a 73-percent loss of vaccine potency; an ampul left out for 5 minutes and then replaced results in a 97-percent loss.

Handling and transferring ampuls anytime after production could account for significant losses of vaccine potency. Personnel involved in vaccine production and distribution as well as those using the vaccine should be made aware of such potential for dramatic loss of titer.

When thawing the single ampul, it is important to get it diluted within 60 seconds after removing it from the liquid nitrogen container. Time yourself! See if you can do it in less time. Table 2 shows why thawing the vaccine quickly is so important. Leaving the ampul in water 5 to 15 minutes causes a loss of 17 to 53 percent of the vaccine potency.

Table 2. Effect on titer of leaving ampuls of Marek's vaccine in the water used for thawing them.

Time	Vaccine titer
30 sec. in water (control)	100%
5 min. in water	83%
10 min. in water	68%
15 min. in water	47%

Water used to thaw the vaccine should be the proper temperature. Some vaccine manufacturers specify 80° F. If the water is too warm or too cold, a loss of vaccine potency occurs (see table 3).

Table 3. Effect on titer of the temperature of the water used to thaw Marek's disease vaccine.

Temperature	Vaccine titer
80° F water (control)	100%
104° F water	75%
63° F water	80%

Some vaccines should be diluted and then held in cold diluent. Other brands specify diluting in room temperature diluent and then chilling in an ice bath. Read the directions carefully! The results obtained when vaccine intended for room temperature diluent is put in cold diluent are shown in table 4. A 22-percent loss in titer occurs.

Table 4. Effect on titer of the initial diluent temperature into which the Marek's disease vaccine is added.

	Vaccine titer
control (room temperature)	100%
refrigerated diluent (39° F)	78%

After the virus has been withdrawn from the ampul and injected slowly into the diluent, some diluent is drawn into the syringe and used to rinse the ampul. This rinsing procedure recovers about 14 percent of the vaccine virus. If you don't rinse the ampul, you are throwing away that 14 percent of the potency. Once the vaccine is being administered, it should be kept cold and agitated or swirled frequently.

Cell-free vaccine is easier to mix and use. It is held in a refrigerator until it is used. Both the virus bottles and the diluent should be kept cold. Rinsing, of course, also is important for cell-free vaccine.

Vaccinating the Chicks

Vaccine manufacturers make this product so that there will be a full dose remaining 2 hours after it is reconstituted (providing you have not made too many mixing errors). You can gain about 9 percent more than this amount by using it within 30 minutes.

Since protection depends on each chick receiving the vaccine, use caution to determine that no chick, box, or stack of boxes is missed.

The vaccine must be placed carefully under the skin on the back of the neck. Care is required to avoid injury to the spine and jugular vein.

Check for leaky syringes or missed chicks continuously. If chicks are wet after vaccination, stop until the cause is determined and corrected.

When all the work is done, remember to wash the syringes completely. They must be pressure-cooked or autoclaved to be certain of sterility.

If syringes are left laying around wet and dirty, the introduction of a single bacterium could seriously recontaminate them. Because of the potential for recontamination, you should always sterilize your vaccinating equipment just prior to use, no matter what was done previously.

CHALLENGE AT THE CHICKEN HOUSE

Once the chicks leave the hatchery and are delivered to the poultryman, the control of Marek's disease is in his hands. Many things in the pullet house can influence the incidence of this disease.

Early Exposure

It takes at least 7 days to achieve significant protection with the vaccine. If the birds are challenged during the first day or so after vaccination, the rate of protection will be only 30 to 40 percent, rising to about 70 percent at 7 days after vaccination and 80 to 90 percent at 28 days.

Table 5 shows the mortality experienced when chicks were vaccinated and then exposed at 0, 2, and 7 days after vaccination in a study by Basarob and Hall. Mortality was 29, 23, and 12 percent, respectively, while the controls experienced 41 percent mortality.

Table 5. Effect of time of exposure on Marek's disease.

Group	Time of MD exposure	%MD
control	0 hour	41%
vaccinated	0 hour	29%
vaccinated	48 hours	23%
vaccinated	7 days	12%

What is the source of this exposure? When chickens are infected with Marek's virus, it finds its way to the skin and is shed in the dander or skin flakes. This dander makes up a large part of the dust found in all chicken houses. This dust, then, is the primary source of infection.

If chicks are placed in an inadequately cleaned house, early exposure can result. Marek's disease losses can be expected. *Remember, feathers and dust must be removed to prevent this early exposure.*

House Clean-up

When cleaning-up, be careful to get all the dust. Clean the fan housings carefully so that when a fan comes on it does not draw dust from a different fan housing back into the building.

After washing the barn and equipment with a detergent, choose a disinfectant carefully. Recent research has shown iodine and formaldehyde disinfectants to be highly effective against the Marek's virus within the skin flakes. *It is important that the disinfectant reach the virus within the skin flakes.*

Since normal-appearing pullets carry the Marek's virus, you cannot expect to successfully brood chicks on a multi-age farm. Sooner or later, virus in dander from 5- to 10-week-old birds will find its way to day-old chicks.

Dust also can be carried into the brooder house on clothing or hair. It is no use doing a super clean-up job, if you do not follow through to prevent introduction of the virus later.

Genetic Effects

Selection of which strain of chickens to use is based on many economic factors. Keep in mind that different strains have different susceptibilities to Marek's disease. In addition, there may be interactions between strains of chicken and types of vaccine. Spencer and others showed that strains B and D are more susceptible to Marek's disease, whether they are vaccinated or not (see table 6).

Table 6. Influence of strain of chicken on Marek's disease.

	% Marek's disease mortality (22-90 days of age)	
Strain	Vaccinated	Nonvaccinated
A	3.2	2.1
B	10.8	29.5
C	2.1	2.1
D	11.1	18.5

Other Factors

Bursal disease (or IBD) not only causes mortality in chicks but also causes depression of the immune system, affecting the birds' ability to fight diseases. Note in table 7 the greater Marek's disease observed in IBD-exposed versus nonexposed chicks in this study by Giambrone and others. Even Marek's-vaccinated birds had high losses to Marek's disease following IBD exposure.

Table 7. Influence of IBD on Marek's disease.

	% Marek's disease	
	MD vaccinated	Not MD vaccinated
IBD-exposed	20.66%	56.25%
no IBD	3.00%	18.07%

In a study by Okazaki and others, it was observed that 62 percent of the birds dying of Marek's disease had serological evidence of having received the vaccine. This means that most chicks dying of Marek's have been vaccinated. Why do vaccinated chicks die of Marek's disease? Possibly they lose the turkey herpesvirus from their blood stream.

Stress has been shown to affect the incidence of Marek's disease. In experiments by Gross, birds in a high stress environment had a five times greater incidence of Marek's tumors (table 8). Stress can be caused by overheating, overcrowding, bright lights, other diseases, drug reactions, vaccinations, moving, and probably the onset of sexual maturity.

Table 8. Influence of stress on Marek's disease.

	% Marek's tumors
high stress environment	25%
low stress environment	5%

For a long time poultrymen and veterinarians have felt that there was "something else" involved in the incidence of Marek's disease. Perhaps Cho has found it. He found on exposing chickens to a reovirus before they were exposed to Marek's disease, that Marek's lesions were *reduced* (table 9).

Table 9. Influence of a reovirus on Marek's disease.

	% Marek's disease	
	Leghorn	Meat bird
Marek's virus	59%	22%
reovirus, then Marek's	5%	0%

Conclusion

Much more research work will be done on this subject before we have all the answers, but today we know that to prevent Marek's disease losses chickens must: (1) be properly vaccinated with a good vaccine; (2) be placed in a clean environment; and (3) not be subjected to severe stress.

We have the knowledge today to prevent most losses due to Marek's disease!

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