Marek’s disease (MD) is a highly contagious disease that is manifested by formation of tumors and suppression of the immune systems of chickens. The disease is caused by the Marek’s disease virus (MDV). Since MDV and the herpesvirus of turkey (HVT) are closely related to each other, HVT is a potential vaccine against the MDV. Currently, MD is controlled by injecting chick embryos or chickens with various vaccines, some of which contain HVT alone, and some of which contain HVT in conjunction with one or more strains of MDV. Unfortunately, these vaccines are not fully protective against highly virulent strains of MDV, the strains that cause the worst forms of the disease. Some scientists have suggested that the HVT vaccine be given to chickens along with chicken interferon-γ in order to boost the chicken’s immune response to the vaccine. Interferon-γ is a protein produced by the immune system in response to the presence of viruses, bacteria, parasites, or cancer cells. Interferon-γ interferes with viral replication, activates immune system cells, and helps the immune system learn to recognize a virus. Adding interferon-γ to vaccines has been successful in other species.

**Keywords:**
Marek’s disease virus, chickens, vaccination, immunity, interferon-γ, herpesvirus of turkey

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**What is this research about?**
Marek’s disease (MD) is a highly contagious disease that is manifested by formation of tumors and suppression of the immune systems of chickens. The disease is caused by the Marek’s disease virus (MDV). Since MDV and the herpesvirus of turkey (HVT) are closely related to each other, HVT is a potential vaccine against the MDV. Currently, MD is controlled by injecting chick embryos or chickens with various vaccines, some of which contain HVT alone, and some of which contain HVT in conjunction with one or more strains of MDV. Unfortunately, these vaccines are not fully protective against highly virulent strains of MDV, the strains that cause the worst forms of the disease. Some scientists have suggested that the HVT vaccine be given to chickens along with chicken interferon-γ in order to boost the chicken’s immune response to the vaccine. Interferon-γ is a protein produced by the immune system in response to the presence of viruses, bacteria, parasites, or cancer cells. Interferon-γ interferes with viral replication, activates immune system cells, and helps the immune system learn to recognize a virus. Adding interferon-γ to vaccines has been successful in other species.

**What did the researchers do?**
Through genetic engineering, the researchers created a small piece of DNA (called a plasmid) that contained the gene for chicken interferon-γ. On hatch day, baby chicks received either: no vaccine; HVT vaccine alone; HVT vaccine and harmless saline; or HVT vaccine and one of two doses of interferon-γ. Except for a small control group, all chicks were infected with the very virulent MDV strain RB1B on day 5. The chicks were monitored for signs of disease for 21 days and then the researchers checked all organs for tumours and lesions, and measured the level of viral replication, number of viruses present, and the level of immune response.

**What you need to know:**
Baby chickens developed greater protection against a very virulent strain of Marek’s disease virus if they were given the herpesvirus of turkey (HVT) vaccine alongside interferon-γ. Interferon-γ enhanced the immune response, decreased the incidence of tumours, lowered viral loads, and lowered rates of viral replication.
What did the researchers find?
In the HVT+interferon-γ group the incidence of MD was only 33%, compared to 80% in the HVT alone group, and 100% in the unvaccinated group. Vaccinated chickens without clinical and pathological signs of MD had the lowest rates of viral replication and viral loads, although vaccinated chickens with clinical/pathological signs of MD still performed better than unvaccinated chickens. Lower levels of the immune system protein IL-10 were not associated with protection against MD. Vaccinated chickens without signs of Marek’s disease had lower levels of other immune system mediators, including IL-18 and IL-6 compared to vaccinated chickens with signs of MD.

How can you use this research?
Poultry producers and veterinarians can use this research to better understand how injections of interferon-γ, given alongside the herpesvirus of turkey (HVT) vaccine, may provide added protection against very virulent strains of Marek’s disease virus (MDV).

Vaccine scientists can further this research by developing a more effective HVT vaccine against MDV, perhaps by genetically engineering the herpesvirus of turkey to produce interferon-γ itself.

Microbiologists can further this research by investigating how very virulent strains of MDV are able to evade or work around the host immune response.

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