VIRSAL E

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BIOVAC

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Itzuvim Perfect

VIRSAL E

Salmonella enteritidis live vaccine to induce protective response against salmonellosis in chickens

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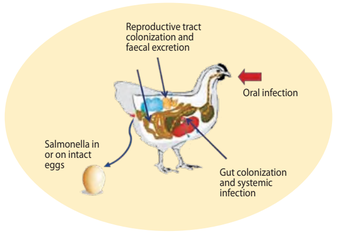
Salmonella enteritidis live vaccine

INTRODUCTION

The genus name Salmonella was first suggested by Lignierres in 1900 in recognition of the work carried out by the American veterinarian D.E. Salmon, who with T. Smith in 1886 described the hog cholera bacillus causing "swine plague" that they named bacterium suipestifer. In 1888, Gaertner isolated Bacterium enteritidis (later re-named S. enteritidis) from both the meat of an emergency-slaughtered cow and the organs of a man who was one of 58 people who consumed the meat and developed food-poisoning.

Salmonella species are bacteria that can infect people, birds, reptiles, and other animals. They are recognized as very important foodborne and waterborne organisms and the cause of significant range of illness.
The genus includes approximately 2500 different species, which can be categorized into five serogroups – A, B, C, D and E. The two groups which are particularly relevant to the poultry producer are B and D as they contain the Salmonella enterica serovar typhimurium and serovar enteritidis respectively – responsible for the majority of food poisoning incidents in humans.
In poultry, salmonellosis is a multi-etiology zoonotic infection.

Salmonella infection in layers



VIRSAL E

VIRSAL E contains an attenuated Salmonella enteritidis bacteria, MTR2 strain.
The vaccine was developed by Biovac Biological Laboratories, using metabolic drift mutations. These are drift mutations in essential enzymes and metabolic regulatory centers.

Strain characteristics:

- Prolonged generation time (grow more slowly).
- No survival in the environment.
- Genetic stability.
- Avirulent for human, poultry and other animal species in contact.
- Do not revert to pathogenicity (stable).
- Strain specific antibiotic resistance (to rifampicin and streptomycin).

MODE OF ACTION

On per-oral vaccination, Salmonella invade and multiply in the mucosa associated lymphatic tissues (MALT) and gut-associated lymphatic tissues (GALT) such as Peyer's patches [1]. The vaccine strain survives and multiplies for a period of time just sufficient for eliciting a protective response.
This characteristic dissemination pattern allows **VIRSAL E** strain to stimulate cell-mediated, and secretory antibody immune responses.

SAFETY

The **VIRSAL E** vaccine is invasive but still safe to induce durable immunity without causing any disease in vaccinated birds or in their progeny. It is totally avirulent both for animals and humans. The **VIRSAL E** is safe and do not revert to pathogenicity.

EFFICACY

The **VIRSAL E** provides long lasting protection from invasion and colonization of Salmonella enteritidis in internal organs and gastro-intestinal tract. Thus, guarantee protection right up to the end of lay (protection starts a few days after the first vaccination until the end of the laying period). Maternal antibodies show no influence on immunity development after vaccination with **VIRSAL E**.

ENVIRONMENTAL FRIENDLY

The mutations presented in the MTR2 vaccine strain prevents the pathogen to propagate further, and as a feature of those mutations it does not survive in the environment (very short duration of shedding from the birds). Three weeks after vaccination the vaccine strain MTR2 is no longer excreted.

INTERACTIONS WITH OTHER VETERINARY PRODUCT

VIRSAL E does not interfere with other vaccines used in tandem. Chemotherapeutics should not be administered 3 days before and 3 days after vaccine administration.

DIFFERENTIATING FIELD ISOLATES FROM VIRSAL E STRAIN

The **VIRSAL E** vaccine strain can be easily distinguished from wild type Salmonella enteritidis in bacteriological laboratories by genetic markers. These markers are non-transferable to the wild type homologous or heterologous strains. The MTR2 vaccine strain has been developed and selected using the principle of metabolic drift mutation and is genetically stable.

VIRSAL E shows a typical growth pattern in the presence of specific antibiotics. Using antibiotic discs on agar, vaccine strain can easily differentiate from field isolates.

Using antibiotic discs containing Rifampicin (30µg) and Streptomycin (25 µg) on agar, the MTR2 vaccine strain is found resistant.

Differentiating method using antibiotic sensitivity test

Salmonella strain	Antibiotic	
	Rifampicin (µg 30)	Streptomycin (µg 25)
VIRSAL E (MTR2)	Resistant (Growth)	Resistant (Growth)
Field strains	Sensitive (No growth)	Sensitive (No growth)

*The vaccine strain is resistant to erythromycin

SALMONELLA VACCINES

The salmonella vaccines can be categorised as either live or inactivated, and their use will be determined by their individual features and benefits.

Advantages and Disadvantages of Live and Inactivated Vaccines

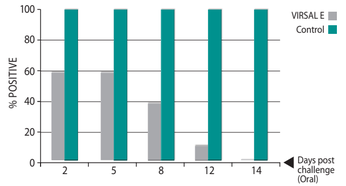
Criteria	Live Vaccine	Inactivated Vaccine
Method of application	Oral (Drinking water - mass application)	Injection
Requirement of adjuvant	No	Yes
Cross protection from related strains	Present	Rare
Horizontal spread of the vaccine strain	Possible	Not applicable
Stability and maintenance	Need attention	Good and easy
Cell-Mediated Immunity induction	Good	Poor
Secretory IgA and local mucosal immunity	Good	No
Vaccine marker	Genetic markers	Serological markers
Potential for use in multivalent combination	Less	Good
Maternal antibodies	No	Yes

Recommended Vaccination schedule for VIRSAL E

		1 day old	4-6 weeks of age	12-14 weeks of age	18-22 weeks of age	Remarks
Pullet designated to produce table eggs	Program I	VIRSAL E	VIRSAL E	VIRSAL E		
	Program II	VIRSAL E	VIRSAL E	VIRSIN 361#		This program calls for three vaccinations: two live followed by one inactivated.
Broiler-breeder pullets	Program I	VIRSAL E	VIRSAL E		VIRSAL E	
	Program II	VIRSAL E	VIRSAL E		VIRSIN 361	This program calls for three vaccinations: two live followed by one inactivated.
	Program III	VIRSAL E	VIRSAL E	VIRSIN 361	VIRSIN 361	This program calls for four vaccinations: two live followed by two inactivated. It is recommended in cases of high infectious Salmonella challenge.

* A vaccination program will only be successful if all the other interventions measures are in place; including biosecurity, clean chick source, clean feed and water, proper dead bird disposal and good rodent and insect control.
# VIRSIN 361 is an inactivated combined vaccine, produced by Biovac Biological Laboratories, which includes Salmonella enteritidis & typhimurium strains.

Efficacy of VIRSAL E in chicks vaccinated at day-old, after challenge at 14 days old



LIVE VS INACTIVATED SALMONELLA VACCINES

Live vaccines
The ease administration of live Salmonella vaccines by mass application through drinking water represents one of the easiest methods of administration, as compared to the injection of inactivated Salmonella vaccines.

Inactivated vaccines
Many different Salmonella serotypes were used to produce bacterins for veterinary use such as S. typhimurium [2,3], S. infantis [4], S. dublin [5], S. virchow [6], S. gallinarum [7] and S. enteritidis [8]. Inactivated vaccines are serotypes specific.

It is generally accepted that a live attenuated vaccine of Salmonella constitutes a better vaccine against systemic infection than an inactivated vaccine.

It may be that some protective antigens are not present thus giving an incomplete protective antibody response; the persistent presentation of an antigen on actively multiplying bacterial cells is a more effective means of stimulating the host immune system than a single administration of killed cells; inactivated vaccines do not elicit cell-mediated immune response, which is important for long-term protection from salmonellosis; inactivated vaccines do not elicit production of secretory immunoglobulin (sIgA) response critical for protection of mucosal surfaces from colonization with salmonella.

Reviews of live Salmonella vaccines [9,10,11] have concluded that they are superior to inactivated vaccines in controlling Salmonella infections.

Cell-Mediated Immunity (CMI) and Mucosal Immunity
CMI and mucosal immunity are thought to be more important in affording solid protection than humoral responses in protection against Salmonella (12). Inactivated vaccines are criticized for their inability to induce good CMI and mucosal immune response. Only live vaccines are able to stimulate the cell-mediated components which are important for the immune defense of intracellular persisting agents, like Salmonella.

Domestic poultry constitutes the single largest reservoir for Salmonella infection in man via consumption of raw or partially cooked Salmonella enteritidis contaminated eggs. Vaccination will reduce the level of Salmonella in the food we produce.

References:

1. Lelouard et al. (2010) Pathogenic bacteria and dead cells are internalized by a unique subset of Peyer's patch dendritic cells that express lysozyme. Gastroenterology 138:173-184.
2. Mendel et al. (1972) Degree of immunity induced by killed vaccines to experimental salmonellosis in mice. Infect.Immun. 5:83-90.
3. Nicholas et al. (1991) Degree of immunity induced by killed vaccines to experimental salmonellosis in mice. Vet. Record.128:98-100.
4. Deguchi et al. (2009) Efficacy of a novel trivalent inactivated vaccine against the shedding of Salmonella in a chicken challenge model. Av Dis 53:281-286.
5. Liberal (1989) Control of salmonellosis in young calves by vaccination. J. Braz. Pesargrorio. 1:11-17.
6. Ghosh (1989) Comparative efficacy of four vaccines against Salmonella virchow in chicks in India. Res. Vet. Sci. 47:280-282.
7. Mohrah & Zaki (1955) Trials to prepare potent vaccine against Salmonella gallinarum-pullorum infection. Vet. Med. J. Giza 43:97-102.
8. Gast et al. (1993) Evaluation of the efficacy of oil-emulsion bacterins for reducing fecal shedding of Salmonella enteritidis by laying hens. Avian Dis. 37:1085-1091.
9. Singh et al. (2005) Salmonella vaccines for veterinary use: an overview. Haryana Vet. 44:1-12.
10. Cooper & Mac Farlane (1974) Single or double vaccination schedules in sheep against experimental infection with Salmonella typhimurium or S. bovismorbificans. N Z Vet. J.22:95-99.
11. Cooper (1994) Salmonellosis infections in man and chicken pathogenesis and the development of live vaccine - a review. Vet.Bull. 64:123-143.
12. Collins (1974) Vaccines and cell-mediated immunity. Bacteriological Rev. 38:371-374.