Mycoplasma hyopneumoniae vaccines

Mycoplasmas

Mycoplasmas are members of the class Mollicutes, a group of bacteria that lack cell walls and which infect a wide variety of plants and animals, including humans. *Mycoplasmas* are the smallest known micro-organisms that are able to propagate in a cell-free medium. Their genomes are small. Their limited number of genes results in a lack of biosynthetic pathways leaving Mollicutes to obtain amino acids, purines, pyrimidines, and membrane components from their growth environment and making them slow and fastidious to cultivate in vitro.

Mycoplasma hyopneumoniae was first isolated in 1965 and is a micro-organism infecting only pigs. It is present worldwide and mainly associated with intensive swine production.

M.hyopneumoniae infections are initiated by the colonization of the animal respiratory tract, provoking damages to the pulmonary tissue and persistence of the micro-organisms in the respiratory tract.

M.hyopneumoniae, also known as enzootic pneumonia, plays a primary role in the porcine respiratory disease complex (PRDC), a leading cause of economic loss for swine producers. *M.hyopneumoniae* will often be the primary infection agent, helping opportunistic bacteria and viruses to establish themselves in the respiratory tract, which will increase the severity of the clinical signs and reduce the animal appetite, lowering the average daily weight gain and ultimately delaying pig's growth.

The disease

The diagnosis of enzootic pneumonia is generally made at herd level rather than at an individual level. Dry coughing is the most obvious clinical sign, although the disease can sometimes be sub-clinical. Clinical signs will be accompanied by macroscopic lung lesions which may be seen at slaughter, unless already healed in case of early infection. The clinical picture is often complicated by secondary, opportunistic infections.

In most pig herds, the highest infection levels of *M.hyopneumoniae* occur during the grow-finishing period, equivalent to the period between 10 and 26 weeks of age. The infection's onset and severity vary between herds and are influenced by various environmental factors such as herd management and housing conditions.

The vaccination

Vaccination against *M.hyopneumoniae* has been carried out for decades and has demonstrated that vaccines were effective in reducing the enzootic pneumonia clinical disease including percentage of lung lesions and coughing; however, vaccines do not prevent the host colonization by the micro-organism. In addition to vaccination, *M.hyopneumoniae* infection control includes optimization of animal management and housing practices as well as antimicrobial treatment.

Current *M.hyopneumoniae* vaccines available in Europe are all adjuvanted and inactivated whole-cells preparations. Their safety is not a real differentiation factor, although some formulations present more reactogenic adjuvant systems triggering larger or longer-lasting injection site reactions. These injection

site reactions have however no demonstrated impact on the condemnation rate of carcasses at slaughter.
There are very few differences in the registered efficacy claims amongst these vaccines. The large majority of the vaccines provide a reduction of lung lesions sometimes defined in terms of severity and/or duration. A minority of vaccines have documented evidences of a positive effect of the vaccination on body weight or feed conversion over time compared to diseased animals.
The animal's minimum age recommended for vaccination varies from vaccine to vaccine in function of the age of the animals used to demonstrate the safety and efficacy in the registration dossier studies. Likewise, the period between last vaccination and start of immunity (onset of immunity) and the duration of immunity vary following the data generated during clinical trials on minimum age animals. If the onset of immunity of *M.hyopneumoniae* monovalent vaccines varies from 3 days to 3 weeks, the duration of immunity generally covers the 26 weeks (6 months) growth period of the pigs.

The accompanying table provides a summary of the indications for use of *M.hyopneumoniae* monovalent and multivalent vaccines currently registered in Europe. Other *M.hyopneumoniae* vaccines are available outside Europe, but were not considered for comparison as they were registered using other sets of regulatory and/or technical guidelines rendering the comparison meaningless.

References and further readings:

J.D. Pollack et al, (1997). The comparative metabolism of the Mollicutes (Mycoplasmas), Crit. Rev. Microbiol.: 23 (4):269–354.
E.L. Thacker and F.C. Minion (2012). Mycoplasmosis. In: J.J. Zimmerman et al (Ed. Wiley-Blackwell): Diseases of Swine, 10th ed., 57, pp. 779- 788.

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The product profiles captured in the table are based on published information available at the time of composing the table (April 2016). The table is provided for comparison purposes only. Always refer to the latest officially published SPC (Summary of Product Characteristics) of each product before purchasing, using or recommending the product, as SPC do get updated from time to time. Product tradenames may differ between countries. This information is provided "as is" and free of charge. Cantum Biosciences Ltd will not accept any responsibility or liability resulting from the use, mistakes or omissions in the information provided. The information presented does not constitute an incentive to use any of the vaccines reviewed.

Table of efficacy comparison for major *Mycoplasma hyopneumoniae* vaccines registered in Europe

Vaccine name	Minimum age at vaccination	Route	MDA override	# of doses	Indications for use (SPC)										Date 1st registration	Registration procedure
					Reduction					Improved			Immunity			
					Coughing	Respiratory problems	Lung lesions	Weight loss	Colonization	Weight gain	Feed conversion	Control of M. hyo. pneumonia	Onset	Duration		
Hyogen	3 weeks	IM	ND	1 x 2ml			Y		Y**				3 w	26 w	2015	DCP
Ingelvac M hyo	3 to 10 weeks	IM	ND	1 x 2ml			Y						2 w	118 d	2002	MRP
Ingelvax Mycoflex	3 weeks	IM	ND	1 x 1ml			Y						2 w	26 w	2008	MRP
M+Pac	7 days	IM	Yes (in field)	2 x 1ml			Y						35 d	6 mo	2001	MRP
	21 days		Yes (in lab for 1 x 2ml)	1 x 2ml or 2 x 1ml			Y						24 d			
Mypravac suis	7 to 10 days	IM	ND	2 x 2ml			Y	Y		Y*	Y*		ND	70 d	2002	MRP
Porcilis Mhyo	1 week	IM	ND	2 x 2ml			Y						2 w	20 w	2004	MRP
Porcilis Mhyo Once	2 weeks	ID	ND	1 x 0.2ml			Y	Y					3 w	22 w	2012	DCP
Stellamune Mycoplasma	1 week	IM	ND	2 x 2ml								Y	ND	ND	1996	National
Stellamune One	3 days	IM	ND	1 x 2ml			Y						18 d	26 w	2001	MRP
	3 weeks				Y			Y					3 w	23 w		
Suvaxyn MH-One	7 days	IM	ND	1 x 2ml			Y						2 w	6 mo	2008	MRP
Suvaxyn M Hyo	1 week	IM	ND	1 x 2ml			Y						ND	ND	1995	MRP
Porcilis PCV- Mhyo [$]	3 weeks	IM	ND	1 x 2ml			Y	Y					4 w	21 w	2014	CP
Suvaxyn Circo+MH[$]	3 weeks	IM	ND	1 x 2ml			Y						3 w	16 w	2015	CP
Suvaxyn M.hyo-Parasuis[$]	7 days	IM	ND	2 x 2ml			Y						1 w	6 mo	2006	MRP
Rhinanvac cerdos[$]	12 weeks	IM	ND	2 x 2ml		Y							4 w	6 mo	1985	National

ND: Not available; d: days; w: weeks; mo: month; Y: claim authorised; IM: intramuscular; ID: Intradermal
* Under field conditions, observed after 6 months; **In laboratory conditions, 44 to 50 days post vaccination; [$]: Combination vaccine, data only on *M.hyopneumoniae*
Registration procedures: CP: Centralised, MRP: Mutual Recognition; DCP:Decentralised
Comparison table composed in April 2016 - www.cantumbio.co.uk