



FOCUS ARTICLE: GLANDERS

Fatima Cruz, DVM, MRCVS, MPhil, Animal Health Trust.

Introduction

Glanders is a bacterial infection caused by *Burkholderia mallei* (previously known as *Pseudomonas mallei*) which mainly affects *equidae* (horses, mules and donkeys) and has a zoonotic potential.

The most common source of infection is the ingestion of contaminated food or water via discharges from the respiratory tract or ulcerated skin lesions from carrier animals; however subclinical carriers often prove to be more important in the transmission of disease than clinical cases.

Glanders was widespread in Great Britain in the nineteenth century and was finally eradicated from this country in 1928. However, it still continues to be reported from various areas of the Middle East, Asia, Africa and South America and has been reported very recently in Brazil and Bahrain.

Clinical signs and lesions

According to the OIE, the incubation period of glanders varies depending on the route and intensity of exposure and intrinsic factors of the host; therefore it can range from a few days to many months.

According to the location of the primary lesions, there are three described forms of the disease: nasal, pulmonary and cutaneous (also known as farcy).

Nasal form:

- Clinical signs: At the beginning only pyrexia, loss of appetite and laboured breathing with coughing may be present. Affected animals show a highly infectious, yellowish-green mucopurulent discharge; a purulent ocular discharge may also be present. Nodules in the nasal mucosa may produce ulcers.
- Lesions: Ulcers of the nasal area, trachea, pharynx and larynx that may resolve in the form of star-shaped scars.

Pulmonary form:

- Clinical signs: Usually requires several months to develop; initial signs are pyrexia, dyspnea and a persistent dry cough. Diarrhea and polyuria may also occur; all leading to a progressive loss of condition.
- Lesions: Lung lesions commence as small light-coloured nodules surrounded by a haemorrhagic zone or as a consolidation of pulmonary tissue and a diffuse pneumonia; pulmonary nodules then progress to caseous or calcified state eventually discharging their contents and spreading the disease to the upper respiratory tract. Nodules can also be found in the liver, spleen and kidneys.



Picture 1: Nodules in the spleen



Cutaneous form:

- Clinical signs: This form develops insidiously over an extended period; it also often begins with coughing and progressive debilitation. Pyrexia and enlargement of the lymph nodes may also be present.
- Lesions: Nodules begin to appear in the subcutaneous tissue along the course of lymphatic vessels of the legs, costal areas and ventral abdomen and upon rupturing excrete an infectious purulent, yellow exudate. Infected lymphatic vessels may result in swollen, thickened, cord-like lesions (often referred to as “farcy pipes”). Nodular lesions can also be found in the liver and spleen. Orchitis may also be present in affected stallions.



Picture 2: Subcutaneous nodules in the skin



Picture 3: . Lesions in the skin around the hock

Diagnosis

In most countries these days diagnosis of any suspected cases would be undertaken by a government veterinary service according to approved methods available at the time. However the following summarises some of the methods available or traditionally employed in the past.

Clinical signs alone do not allow a definitive diagnosis of glanders since the respiratory form can be confused with equine viral arteritis (EVA), strangles (*Streptococcus equi equi*) and fungal pneumonia whereas the cutaneous form of the disease (farcy) may be confused with epizootic lymphangitis (*Histoplasma farciminosum*), ulcerative lymphangitis (*Corynebacterium pseudotuberculosis*) or pseudotuberculosis (*Yersinia pseudotuberculosis*). Specific diagnosis can be done by either identification of the agent, the mallein test or by serological tests.

Identification of the agent:

The ultimate confirmation of any infection is agent identification. However this can be quite a challenge with glanders. The optimal sample for isolating the organism is pus recovered from lung, choanal and organ abscesses or nasal mucosa. Even multiple sampling can give a disappointing identification rate since these abscesses do not contain many bacteria. In addition, these samples are often contaminated with other bacterial species such as *Pseudomonas spp.* and *Pasteurella spp.* which makes isolation very difficult. Subcutaneous abscesses contain good numbers of the pathogen whereas ulcers are usually free of *B. mallei*. As glanders has a zoonotic potential, all samples must be handled with great care in a laboratory that meets the requirements for “containment group 3” pathogens, and equally serious concerns exist over the conditions and justification for carrying out necropsy of suspected cases.

Other methods of identifying the agent are the confirmation by conventional polymerase chain reaction (PCR) or quantitative (real-time) PCR, and the intraperitoneum inoculation of suspected material into a male guinea



pig and observation for peritonitis and orchitis has been reported (*B. mallei* must be re-isolated from the lesions).

Mallein test:

This test is one of the tests recommended by the OIE for the diagnosis of carriers and it consists of the evaluation of the hypersensitivity of the horse after the inoculation of a small volume of a mallein purified protein derivative (PPD) intradermally into the lower eyelid (intradermo-palpebral test), into the eye at the canthus (ophthalmic test) or subcutaneously in the middle of the neck (subcutaneous test). The intradermo-palpebral test is preferred since it is more sensitive, reliable and specific. The test was used extensively in the past, but has been superseded by serological testing in much of the western world. There has been concern that the test can interfere with subsequent serological diagnosis since a seroconversion can occur after subcutaneous injection.

Serological tests:

The complement fixation (CF) test is an accurate serological test that has been used for glanders diagnosis for many years. Serum is positive within one week of infection and remains positive (sometimes) in chronic cases. It is presently the only test prescribed by the OIE for international trade of equids. The specificity of the CF test is very high, but it is known that occasional equine sera show false positive reactions (probably cross reactions).

Experimental Enzyme-linked immunosorbent assays (ELISAs) and membrane (blot) serology tests have also been developed; none of them has yet been extensively validated and are not fully recognized by the OIE, but there may be further developments along these lines in the future.

Control

As a result of the severity of the effects of glanders and its social and economic impact, it is listed as notifiable by UK law, and also by the World Organisation for Animal Health (OIE), by the European Commission in Brussels under Directive 92/25/EC. This means that, without exception if there is any suspicion of glanders, a suitable authority such as Divisional Veterinary Manager of Defra (Animal Health) must be notified immediately. Imported horses from countries outside the European Union are subjected to import controls and risk-based testing for glanders.

No vaccines are available against glanders. The disease can only be prevented by biosecurity and sanitary measures. Although *B. mallei* is sensitive to many antibiotics, treatment probably leads to chronic and occult cases. Treatment is somewhat academic since most countries have a slaughter policy for glanders.

For more detailed information on this disease, see the OIE Technical Disease Card for glanders at http://www.oie.int/eng/maladies/en_technical_diseasecards.htm

Acknowledgements

We would like to acknowledge Ian Mawhinney from the Veterinary Laboratories Agency (VLA) for providing us with valuable comments and Holger C. Scholz from the Bundeswehr Institute of Microbiology in Munich, Germany for the pictures included in this focus article.