Guidelines for certification with respect to the movement of livestock for Mycobacterium avium subsp paratuberculosis (MAP) infection

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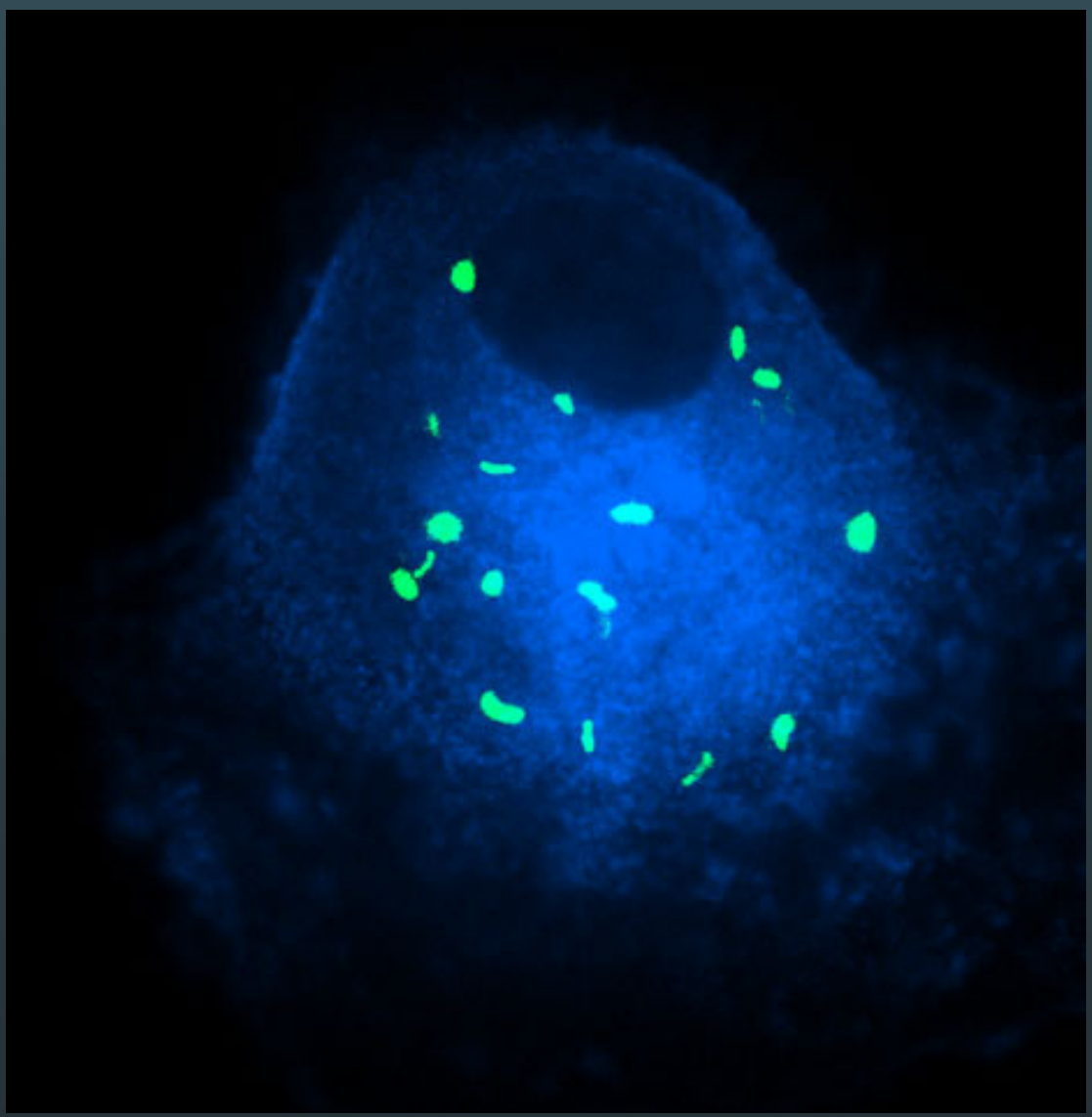


CONTENTS

Note from the Editor

This edition contains an important document from the IAP describing recommendations for reducing the risk of spreading paratuberculosis when trading livestock.

With less than six months to go before our next colloquium the IAP is calling for applications for awards to support travel for participants from lower income countries and to recognise outstanding graduate students as well as members who have contributed significantly to the Association – read on if you would like more information.

If you would like to post comments or discuss any of the articles in the newsletter with IAP members, just click on the 'Post comments' links provided.

Kumi de Silva

Cover photo: An ovine macrophage infected with GFP-MAP courtesy of Matt Johansen

IAP business

Guidelines for certification with respect to the movement of livestock for MAP infection

It is a pleasure for me to introduce the ***Guidelines for certification with respect to the movement of livestock for Mycobacterium avium subsp. paratuberculosis (MAP) infection***. This is a document elaborated by a group of experts, IAP members and non-members that results from their voluntary work during many months since the first ideas started circulating in January 2016.

The authors have done a very good job taking into account different views and have come out with a highly consensual set of rules that no doubt will be of seminal value for control of such a difficult slow infectious disease as ruminant paratuberculosis. This document is just a scientific statement that does not pretend to take the place of national or international regulatory animal health authorities. On the contrary, it could be a starting point to help them to develop their task.

The document is also the first IAP approved document stating a standing on a specific control issue. For this, in the name of the International Association for Paratuberculosis, I want to congratulate and thank the authors and, in particular to David Kennedy for his leading role.

Ramon A. Juste
President of the IAP

Post comments on the IAP website

International Association for Paratuberculosis

Guidelines for certification with respect to the movement of livestock for *Mycobacterium avium* subsp *paratuberculosis* (MAP) infection

Contents

1. Purpose

To provide guidance for scientifically sound risk assessment of MAP infection that can be used by risk managers to reduce the risk of spread of MAP between populations of **livestock**, consistent with WTO standards for international trade.

NOTE: These guidelines do **not** consider the risks of

- MAP infecting people (EFSA 2017, Chiodini et al 2012, Waddell et al 2015, Waddell et al 2016), nor
- Transmission via bovine semen (EFSA 2004).

2. Introduction

Despite increasing understanding of MAP and paratuberculosis (Johne's disease), little progress has been made in limiting the spread of MAP between regions and countries. MAP has been detected in most countries where it has been investigated. Regrettably however, interest in MAP often only increases in countries and regions as they realise, too late, that they have endemic Johne's disease (JD) or when another country wants to include MAP in health certification for animals or products. Knowledge gaps constraining successful control have been reviewed recently (Barkema et al, 2017).

Article 3 of the World Trade Organization *Agreement on the Application of Sanitary and Phytosanitary Measures* (the SPS Agreement, World Trade Organisation, 2016) states that

> "To harmonize sanitary and phytosanitary measures on as wide a basis as possible, Members shall base their sanitary or phytosanitary measures on international standards, guidelines or recommendations, where they exist."

There has also been little progress in developing and applying scientifically sound movement requirements for MAP. Since 2001, efforts through official channels such as OIE have not borne fruit and, for the past decade, the OIE Terrestrial Animal Health Code Chapter on Paratuberculosis has provided little guidance in this area (OIEa 2015). Concern about the low accuracy of diagnostic tests in individual animals has been a major reason that the Code chapter has not been developed further. However, the OIE Diagnostic Manual (OIEb 2015) has been updated to also refer to diagnostic testing at herd level. Herd level testing and other certification based on large scale surveillance has been implemented for other diseases for which negative individual animal tests provide limited assurance, such as bovine brucellosis, bovine tuberculosis and the prion diseases.

The International Association for Paratuberculosis (IAP) agreed in 2015 to develop its own guidelines for importers and exporters who want to implement rational movement requirements, based on current understanding of managing MAP risks and consistent with the principles of the SPS Agreement. These recognise and recommend risk management that is justified and appropriate for different situations.

3. Rationale

One of the *Basic Obligations* outlined in Article 2 of the SPS Agreement is that.

> "Members shall ensure that any sanitary or phytosanitary measure is applied only to the extent necessary to protect human, animal or plant life or health, is based on scientific principles and is not maintained without sufficient scientific evidence, except as provided for in paragraph 7 of Article 5."

which states that,

> "In cases where relevant scientific evidence is insufficient, a Member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information, including that from the relevant international organizations as well as from sanitary or phytosanitary measures applied by other Members. In such circumstances, Members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly within a reasonable period of time."

The IAP is a "relevant international organisation" under the SPS Agreement for paratuberculosis. Founded in 1989, the IAP is a non-profit organization devoted to the advancement of knowledge and scientific achievement toward the eradication of paratuberculosis in domestic livestock and other species affected by MAP. It has approximately 150 members from 30 countries, who are broadly representative of scientific and disease control expertise globally.

Flawed Requirements

Many official movement protocols have hindered, rather than enhanced, control of MAP infection as they are scientifically flawed and ineffective.

Certification based on the recent herd or flock history of clinical disease and on testing of the individual animals to be moved is still common for a broad range of types of animals. However, the *negative predictive value* of such certification from endemically infected regions (ie the probability that a test negative animal is truly free from MAP) approaches zero.

- Clinical disease is not a sensitive indicator of MAP infection and requiring a negative clinical history discourages farmers who want to trade from investigating or reporting suspect cases.
- It encourages traders to move, or falsify the identity of, animals so as not to exclude farms with a positive history from trading opportunities.
- Movement testing is often of consignments of young animals and sometimes with outdated tests.

Such protocols also have perverse effects by discouraging participation in herd classification programs and by penalising regions and herd owners actively trying to control MAP through surveillance, testing and vaccination.

Unjustified Requirements

The World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement, World Trade Organisation, 2016) opens,

> "*Reaffirming* that no Member should be prevented from adopting or enforcing measures necessary to protect human, animal or plant life or health, subject to the requirement that these measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between Members where the same conditions prevail or a disguised restriction on international trade"

Furthermore, Article 2 paragraph 3 states that,

> "Members shall ensure that their sanitary and phytosanitary measures do not arbitrarily or unjustifiably discriminate between Members where identical or similar conditions prevail, including between their own territory and that of other Members."

And Article 5 paragraph 4 includes,

> "Members should, when determining the appropriate level of sanitary or phytosanitary protection, take into account the objective of minimizing negative trade effects."

Yet some countries, in which MAP is endemic, require certification when they themselves have no significant surveillance or control programs in place. And some markets require negative farm level assurance for young animals destined for slaughter in the short term.

In contrast, the few regions that have vigorously controlled and stamped out MAP, may struggle for recognition and acceptance that they should set an allowable level of protection and require appropriate entry requirements based on risk analysis.

4. MAP Risk Assessment

Risk assessment and management programs (RAMPs) have become the keystone of modern on-farm JD control programs. Many of the same principles can be applied at a regional level.

Article 5 of the SPS Agreement defines risk assessment as

1. "Members shall ensure that their sanitary or phytosanitary measures are based on an assessment, as appropriate to the circumstances, of the risks to human, animal or plant life or health, taking into account risk assessment techniques developed by the relevant international organizations.

2. "In the assessment of risks, Members shall take into account available scientific evidence; relevant processes and production methods; relevant inspection, sampling and testing methods; prevalence of specific diseases or pests; existence of pest- or disease-free areas; relevant ecological and environmental conditions; and quarantine or other treatment."

The epidemiology and pathogenesis of MAP infection is complex and varies between species. However, on balance, the scientific evidence indicates that the following key characteristics of MAP infection should be considered in assessing the risks of livestock being infected with MAP

Herd or population level

1. MAP is endemic in developed livestock industries worldwide and has been spreading around the world with the movement of livestock for over a century.
2. Any country that has imported large numbers of livestock in recent decades from developed livestock industries is likely to have endemic MAP infection unless it has taken sound and vigorous action to reduce the risk of entry and/or to stamp it out.
3. The likelihood that a country, region or herd/flock is not infected can only be demonstrated by ongoing negative herd or population testing and active surveillance on a large scale over long periods.
4. A negative clinical history of MAP infection has a low negative predictive value of herd or flock status.

Individual animal level

1. Animals may become infected at any age but are most susceptible to becoming infected in the first few months of life.
2. Infected animals may excrete some MAP organisms at any stage but excretion may be intermittent and the likelihood and rate and amount of excretion increases as the infection progresses with age.
3. Diagnostic tests usually have low sensitivity until the later stages of infection and so a negative test of an individual animal has a low predictive value.
4. Clinical signs of Johne's disease occur late in infection and are not pathognomonic; the absence of clinical signs usually has a low predictive value in determining whether an animal is infected.
5. The most important source of MAP is faeces, both in the clinical and pre-clinical stages.
6. Infectious MAP organisms survive in the environment in large numbers for months with longer survival in areas protected from extreme heat, ultraviolet light and dessication (Jørgensen, 1977; Whittington et al 2004; Eppleston et al 2014).
7. MAP strains that have adapted to one species can infect others, but little is known if the dynamics of interspecies transmission and the frequency of transmission may be greater if there is close contact between different species at the farm level (Verdugo et al 2014).

5. MAP Risk Management

The results of risk assessments are not perfect, largely because of uncertainties in the input parameters and assumptions. Therefore, importing countries and regions that require certification for MAP should take responsibility for preventing MAP spreading in their own areas, both from local animals and from imported animals, should it be inadvertently introduced.

The likelihood of MAP infection spreading from introduced animals and infecting populations into which they are introduced may be **managed** by:

1. Preventing exposure of susceptible animals to infectious sources, especially feed, water and other materials contaminated by faeces.
2. Removing from the population introduced and exposed animals that are suspected of being infected.
3. Removing MAP from contaminated environments and disposing of contaminated materials.

Although not permitted in all countries, increasing the immunity of susceptible animals by vaccination has also been successfully used to reduce the risk of spread of MAP in infected populations.

6. Risk Classifications of Areas

Free and low-prevalence areas are recognised under Article 6 of the SPS Agreement:

> 2. "Members shall, in particular, recognize the concepts of pest- or disease-free areas and areas of low pest or disease prevalence. Determination of such areas shall be based on factors such as geography, ecosystems, epidemiological surveillance, and the effectiveness of sanitary or phytosanitary controls.
> 3. Exporting Members claiming that areas within their territories are pest- or disease-free areas or areas of low pest or disease prevalence shall provide the necessary evidence thereof in order to objectively demonstrate to the importing Member that such areas are, and are likely to remain, pest-or disease-free areas or areas of low pest or disease prevalence, respectively. For this purpose, reasonable access shall be given, upon request, to the importing Member for inspection, testing and other relevant procedures."

For the purpose of these guidelines it is recommended that four concepts for area classifications be used:

> ***Free Area***
> A country, zone or compartment in which MAP infection is notifiable and extensive and large-scale surveillance for MAP infection by the animal health authority has not identified endemic infection for ten years or where infection has been introduced it has been demonstrably stamped out by slaughter and intensive tracing of suspect infection

and intensive surveillance has not identified MAP for 2 years. A Free Area will retain its status as long as appropriate area biosecurity and surveillance are maintained.

Eradication Area
A country, zone or compartment in which MAP infection is at low prevalence, is notifiable and extensive and large-scale compulsory surveillance for MAP infection by the animal health authority continues to demonstrate a low herd prevalence of infection and where the herd prevalence of infection is demonstrably being reduced as infection is stamped out.

Officially sanctioned and recognised voluntary or compulsory herd or flock classification programs, with a certification component based on negative herd and/or flock testing and surveillance, may also operate to objectively classify herds and/or flocks for MAP risk.

Certification Area
A country, zone or compartment in which an officially sanctioned and recognised voluntary herd or flock classification programs, with a certification component based on sound farm biosecurity and negative herd and/or flock testing and surveillance operates to objectively classify herds and/or flocks for MAP risk. A certification area may not necessarily be a low prevalence area.

Other Area
All other countries and regions**.**

7. Herd or Flock Classification

In Free Areas, herds and flock status is derived from the area status.

A herd or flock classification program in areas other than Free Areas should satisfy the following criteria:

a. Sanctioned and recognised by the official animal health authority of the Area.
b. Herds and flocks are under the supervision of a veterinarian who has been trained and approved for the purpose of the program.
c. An officially recognised register of classified herds and flocks.
d. Within each herd or flock the program will include:
    - permanent individual animal identification.
    - traceability of animals entering and leaving.
    - a farm-level biosecurity and management component to minimise the probability of MAP entering and spreading.
    - screening of adult animals by a sensitive and specific diagnostic test that is recommended by the IAP and approved by the regulator for the purpose.

- a test-strategy that appropriately documents a specific probability of freedom from infection

For the purposes of these guidelines a single herd or flock classification is proposed in areas other than Free Areas, ***MAP Certified***, which satisfies the importing Area's appropriate level of protection and is defined as follows:

a. Located within an Eradication Area or a Certification Area which is under the control of the animal health authority which also sanctions and recognises the herd or flock classification program for MAP, and
b. Taking into consideration its location, history and management, the herd or flock has
    i. implemented biosecurity measures to minimise the likelihood of introduction and/or spread of MAP, and
    ii. repeatedly screened a representative sample of adult animals from the herd or flock (or the whole adult herd/flock) using IAP recommended tests and appropriate sample sizes to provide a specified level of confidence of detecting a specified low prevalence of infection (if present). See Martin et al (1992) and MacDiarmid (1988) and More et al (2013) for more information.

Individual programs may use other and/or additional classifications to denote various risk statuses.

8. Recommended tests

Numerous tests have been developed for detection of statuses related to MAP, but few have been evaluated using state-of-the-art diagnostic test evaluations. (See Table 1 Test methods available for diagnosis of paratuberculosis and their purpose in the OIE Terrestrial Manual Chapter 2.1.11 adopted 2014).

Testing for only one target condition is currently relevant to trade of livestock:

- ***MAP infected animal***, which is any animal carrying MAP intracellularly

To detect **MAP infection**, the indirect antibody ELISA (for serum or milk), faecal PCR and faecal bacteriological culture are appropriate.

Detection of a ***MAP exposed animal*** (ie any animal that has been known or suspected to have been exposed to MAP infected animals in their lifetime, directly or indirectly via the environment), could also be relevant, but at present no tests have been satisfactorily evaluated.

If "MAP exposure" is included as a target condition for certification, PCR and faecal culture may be considered 100% specific.

For the combined target condition, ie MAP exposure or MAP infection, the sensitivity of PCR is likely to be the highest, followed by culture and ELISA. However, the specific test that is used should be evaluated for the specific purpose prior to use in a certification programme.

Experience with tests such as faecal smears, complement fixation test (CFT) and agar gel immunodiffusion test (AGID) indicate that they have inherently low sensitivity and/or specificity and are therefore not recommended.

9. Test strategies

In developing test strategies to suit the local livestock production systems a number of factors should be taken into account. Most importantly, testing of individuals does not provide sufficient information to certify the individual or the herd/flock. The certification is affected by animal and herd/flock factors, and may be further affected by other local factors. For example:

- The probability of an animal being free of MAP infection can be calculated if multiple animals from the same herd or flock have been tested (Sergeant et al., 2008; More et al., 2013). However repeated sampling is required to achieve a high level of confidence that the herd or flock is free from MAP.
- Current knowledge (ie prior information) about the prevalence of MAP in the region and in the herd or flock of origin and the probability of introduction of MAP into the herd or flock are important. The higher the probability of existing infection, or of past introduction of infection, the higher the number of samplings and the longer the period of time that will be required to attain a high level of confidence of freedom.
- Diagnostic sensitivity does not only depend on the test used, but also on the strain of MAP and age structure of target population.
- Test antigens could be derived from local strains of MAP where required, but for standardisation of interpretation in an international context this should be minimised.
- Average test sensitivity will be lower in a young population, because many infections will not have progressed to detectable stages. On the other hand, an old population may have many animals that are more likely to have remained in the herd or flock because they were un-infected (This is recognised as "healthy worker survivor bias" and should be avoided). Therefore, the highest sensitivity can likely be achieved by testing the age-groups where infected animals would normally be expected to have started excreting detectable amounts of bacteria or to have sero-converted. It is usually recommended to test animals between 2 and 5 years of age. However, consideration should be given to the species, management systems and the pressure of infection in the herd or flock. For instance, in systems with high stocking densities and high faecal contamination, the pressure of infection is likely to be higher and infection is likely to progress more quickly.

Specifically, we recommend that

- As many animals (above 2 years of age) as possible are tested with standardised and evaluated ELISAs, PCRs or culture methods.

- Test-evaluations should be carried out locally and age-stratified, if possible.
- Test-prevalences (ie apparent prevalences) should be converted to true (calculated) prevalences, including 95% confidence intervals, and probabilities of freedom, and historical data should be included in the process, such as described in Sergeant et al. (2008) and More et al. (2013). Where random sampling has been used, these calculations take into account the test-accuracy and the size and age-structure of the tested population.

Table 1. MAP statuses of importing and exporting areas and the recommended standards for various animal movements

Livestock

The following levels of protection and certification requirements are recommended for areas of various MAP status (Column 1) importing various types of livestock (Column 3) from Areas of different MAP status (Column 2).

MAP status of Importing Area	MAP status of Exporting Area	Type of animal	Acceptable Level of Protection/ MAP Certification
Free Area	Free Area	All	Throughout their lifetimes the animals have only resided in a Free Area or have satisfied the requirements to be be introduced to the Free Area.
	Eradication Area	Animals for breeding Other restocking (including feeding for slaughter, but not in quarantine).	Throughout their lifetimes the animals have only resided in a MAP Certified herd or flock.
		Animals for confined feeding for slaughter, in quarantine. Animals for immediate slaughter	No requirements. (The importing regulator will enact quarantine procedures that are sufficient to manage the risk)
	Certification Area	Animals for breeding Other restocking (including feeding for slaughter but not in quarantine).	Throughout their lifetimes the animals have only resided in a MAP Certified herd or flock
		Animals for confined feeding for slaughter,	No requirements. (The importing regulator will enact quarantine procedures that are

		in quarantine. Animals for immediate slaughter	sufficient to manage the risk)
	Other Areas	Animals for breeding Other restocking (including unconfined feeding for slaughter).	Not permitted
		Animals for confined feeding for slaughter, in quarantine. Animals for immediate slaughter	No requirements (The importing regulator will enact quarantine procedures that are sufficient to manage the risk)

Eradication Area	Free Area	All	Throughout their lifetimes the animals have only resided in a Free Area or have satisfied the requirements to be been introduced to the Free Area.
	Eradication Area	Animals for breeding Other restocking (including unconfined feeding for slaughter).	Throughout their lifetimes the animals have only resided in a MAP Certified herd or flock.
		Animals for confined feeding for slaughter Animals for immediate slaughter	No requirements (The importing regulator will enact quarantine procedures that are sufficient to manage the risk)
	Certification Area	Animals for breeding Other restocking (including unconfined feeding for slaughter).	No requirements. (The importing owner will manage the risk.)
		Animals for confined feeding for slaughter Animals for immediate slaughter	.
	Other Areas	Animals for breeding Other restocking (including unconfined feeding for slaughter).	Not permitted
		Animals for confined feeding for slaughter Animals for immediate slaughter	No requirements
Certification Area	All Areas	All	No requirements. (The importing owner will manage the risk.)
Other Area	All Areas	All	No requirements

Embryos.

Embryos that have been sourced from donors that were clinically healthy at the time of collection and have been treated, handled and stored according to the procedures of the International Embryo Transfer Society may be imported into any Area. The IETS classifies MAP as an organism for which, in cattle, "preliminary evidence indicates that the risk of transmission is negligible provided that the embryos are properly handled between collection and transfer according to the IETS Manual" (IETS).

Manure.

Faeces is the most important carrier of MAP. The identification and traceability of manure is problematic and therefore all manure should be assessed as high risk unless it is derived from a Free Area. Managing the risk presented by manure is also difficult as large numbers of MAP organisms may survive in soil and water and be dispersed in the environment (see Grant, 2010).

References

Anon. The Risk of Transmission of Mycobacterium avium subsp. paratuberculosis via Bovine Semen. *The EFSA Journal* (2004) 110:1-59.

Barkema HW, Orsel K, Nielsen SS, Koets AP, Rutten VPMG, Bannantine JP, Keefe GP, Kelton DF, Wells SJ, Whittington RJ, Mackintosh CG, Manning EJ, Weber MF, Heuer C, Forde TL, Ritter C, Roche S, Corbett CS, Wolf R, Griebel PJ, Kastelic JP, De Buck J. Knowledge gaps that hamper prevention and control of Mycobacterium avium subspecies paratuberculosis infection. Transbound Emerg Dis. 2017:1–24.

Chiodini RJ, Chamberlin WM, Sarosiek J, McCallum RW, 2012. Crohn's disease and the mycobacterioses: a quarter century later. Causation or simple association? CritRev Microbiol. 38:52-93. doi: 10.3109/1040841X.2011.638273.

Eppleston J, Begg DJ, Dhand NK, Watt B, Whittington RJ, 2014. Environmental survival of Mycobacterium avium subsp. paratuberculosis in different climatic zones of eastern Australia. Appl Environ Microbiol. 80:2337-42.

European Food Safety Authority**,** 2017**.** Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU) No 2016/429): paratuberculosis**.** http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2017.4960/full.

Grant I, 2010. In *Paratuberculosis – organism, disease, control.* M Behr and D Collins Eds. CAB International, Oxford, UK. p34.

IETS. *IETS Manual* 4th Edition. (http://www.iets.org/pdf/IETS_recommendations_regarding_the_risk_of_disease_transmission_via_in_vivo_derived_embryos.pdf. Accessed 20 March 2017)

Jørgensen JB., 1977. Survival of Mycobacterium paratuberculosis in slurry. Nord. Vet.-Med., 29: 267-270.

MacDiarmid, S.C., 1988. Future options for brucellosis surveillance in New Zealand beef herds. New-Zealand-Veterinary-Journal 36:39-42.

Martin, S.W., Shoukri, M., Thorburn, M.A., 1992. Evaluating the health status of herds based on tests applied to individuals. Prev. Vet. Med. 14:33-43.

More SJ, Sergeant ES, Strain S, Cashman W, Kenny K, Graham D, 2013. The effect of alternative testing strategies and bio-exclusion practices on Johne's disease risk in test-negative herds. J Dairy Sci. 96:1581-90.

OIE a. *Terrestrial Animal Health Code 2015*. Chapter 8.12 Paratuberculosis. http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_paratuberculosis.htm. (Accessed 17 Feb 2016).

OIE b. Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2015. Chapter 2.1.11. Paratuberculosis (Johne's disease).

http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.01.11_PARATB.pdf. (Accessed 17 Feb 2016).

Sergeant ES, Nielsen SS, Toft N, 2008. Evaluation of test-strategies for estimating probability of low prevalence of paratuberculosis in Danish dairy herds. Prev Vet Med. 85:92-106.

Verdugo C, Pleydell E, Price-Carter M, Prattley D, Collins D, de Lisle GW, Vogue H, Wilson P, Heuer C, 2014. Molecular epidemiology of Mycobacterium avium subsp paratuberculosis isolated from sheep, cattle and deer on New Zealand pastoral farms. Prev Vet Med. 117:436-46.

Verna AE, Garcia-Pariente C, Muñoz M, Moreno O, García-Marin JF, Romano MI, Paolicchi F, Pérez V, 2007. Variation in the immuno-pathological responses of lambs after experimental infection with different strains of Mycobacterium avium subsp. paratuberculosis. Zoonoses Public Health. 54:243-52

Waddell LA, Rajić A, Stärk KD, McEWEN SA, 2015. The zoonotic potential of Mycobacterium avium ssp. paratuberculosis: a systematic review and meta-analyses of the evidence. Epidemiol Infect. 143:3135-57. doi:10.1017/S095026881500076X.

Waddell LA, Rajić A, Stärk KD, McEwen SA, 2016. The potential Public Health Impact of Mycobacterium avium ssp. paratuberculosis: Global Opinion Survey of Topic Specialists. Zoonoses Public Health. 63:212-22. doi: 10.1111/zph.12221.

Whittington RJ, Marshall DJ, Nicholls PJ, Marsh IB, Reddacliff LA, 2004. Survival and dormancy of Mycobacterium avium subsp. paratuberculosis in the environment. Appl Environ Microbiol. 70:2989-3004.

World Trade Organisation. Agreement on the Application of Sanitary and Phytosanitary Measures
https://www.wto.org/english/docs_e/legal_e/15-sps.pdf (Accessed 20 March 2017)

END

2 October 2017

Document Control

Version	1.3 of 23 October 2017
Authors	DJ Kennedy, G Benedictus, SS Nielsen, K Lybeck, E Schwan, J Frossling, E Sergeant, D Kelton and H Nauholz.
Comments	R Juste, R Whittington, K Stevenson, S Singh, E Momotani, V Rutten.
Approved by IAP Board	

Call for member support and recognition awards for the 14th ICP

Awards:

- Emeritus
- Richard Merkal Memorial Fellowship
- Helping Hand

IAP Member Support and Recognition Committee

Chairman: Ramon A. Juste

Members: Lucy Mutharia
Douwe Bakker
Douglas Begg
Nicola Pozzato

Emeritus Awards

The status of Emeritus member of the IAP has the goal of acknowledging the merits of long standing members that have retired and that have made significant contributions to the goals of the Association. In order to continue fulfilling this objective for the 14 ICP, the IAP launches a call for nominations according to the following guidelines.

Award contents:

Up to 3 awards will be granted based on the number and quality of nominees and the available funds.

Each award will include:

1) free full registration for the 14 ICP and following editions
2) free lifelong IAP membership
3) Up to US$1500.00 reimbursement for travel expenses (payable on arrival at the 14 ICP)
4) a certificate
5) a plate or plaque

Nominations must be written by an IAP member in good standing and should contain information on the nominees including the following points to be evaluated in order of decreasing importance:

Scientific merits	**Qualitative (importance of knowledge generated on Map-related issues)**
	Quantitative (number of papers produced, years working on paratuberculosis)
Responsibilities	**National (positions held, advisory committees, researcher training, services provided, meetings organized, etc.)**
	International (positions held, advisory committees, researcher training, services provided, meetings organized, etc.)
IAP involvement	**National representation, offices held, colloquia organization, newsletter contributions, etc.**
Other	**Other merits not specified above**

Nominations should be sent by e-mail to the Secretary-Treasurer of the IAP (rsweeney@vet.upenn.edu), and must include a letter containing all the information necessary for evaluation of the nominee as stated above. This document shall be an attached Word or Adobe pdf file blocked for changes. The IAP Member Support and Recognition Committee will evaluate the applications in the name of the IAP and its decisions are final.

Timetable:

Deadline for nominations: January 15, 2018

Announcement of awards: February 15, 2018

Richard Merkal Memorial Fellowship

The Association will provide funding for the participation of two graduate students to attend each Colloquium of the Association. Selection will be based on potential for future contributions to the field and scientific merit of a submitted abstract. Funding will include air fare, lodging, general registration and a per diem for meals. All applicants must be members of the Association or sponsored by a member of the Association. The fellowships will not be open to applicants having residence in the same country in which the Colloquium is being held.

Award contents:

Up to Two Fellowships will be granted.

Each fellowship will include:

1) free full registration for the 14 ICP

2) Reimbursement for travel and lodging expenses, and a *per diem* for meals. (Maximum reimbursement not to exceed US$3000.)

3) a certificate

4) a plate

Timetable:

Deadline for applications: January 15, 2018

Announcement of awards: February 15, 2018

Application for Richard Merkal Fellowship to attend the 14th International Colloquium on Paratuberculosis (14ICP) in Riviera Maya, Mexico, June 4-8 June, 2018

Name:

Date of Birth:

Educational Qualifications:

Current affiliation:

Institution:

Country:

Group leader:

Publications in Paratuberculosis Research:

Abstract of intended presentation:

STATEMENT OF PURPOSE AND IMPORTANCE OF RESULTS TO BE PRESENTED

Applications should be sent by e-mail addressed to the Secretary-Treasurer of the IAP (rsweeney@vet.upenn.edu), and must include the completed forms provided in the call for applications as an attached Word or Adobe pdf file blocked for changes. The IAP Member Support and Recognition Committee will evaluate the applications in the name of the IAP and its decisions are final.

Helping Hand Fellowships

The Association, based on the availability of funds and as determined by the Governing Board, will provide funding for up to 5 individuals from lower income countries to participate in each Colloquium of The Association. Selection of these individuals will be based on the economic status of the individual's country of origin, a written statement of interest in paratuberculosis, **potential for future contributions to the field, and scientific merit of a submitted abstract if one has been submitted (abstract submission is not required).**

Program specifications:

Up to 5 awards will be granted based on the number and quality of applicants and the available funds.

Each award will include:

1) **free full registration for the 14 ICP**
2) **free IAP membership for 2018 and 2019**
3) **US$1000 stipend for travel expenses (payable in cash on arrival at the 14 ICP)**
4) **a certificate**

Timetable:

Deadline for applications: January 15, 2018

Announcement of awards: February 15, 2018

Criteria (listed in order of decreasing importance):

1.- Country of origin: Strong preference will given to applicants currently residing in countries not considered "high income" based on the website of the World Bank (https://openknowledge.worldbank.org/handle/10986/23628). Applicants originally from countries not considered "high income" but currently residing in "high income" countries will be considered only in the case that there were not enough candidates from the first category.

2.- Statement of purpose: The applicant must provide a written statement (in English) explaining their interest and experience in paratuberculosis, what they know of the paratuberculosis situation in their country, and why they would like to attend the 14 ICP.

3.- 14 ICP abstract: An abstract for a presentation at the 14 ICP concerning any aspect of paratuberculosis is mandatory for applicants from countries that have already received two or

more HH awards during the last 5 year period. For applicants from other countries, an abstract would be positively considered but is not mandatory.

4.- Applicant status: Applicants may or not be members of the IAP. If they are not, they must be nominated by a member in good standing for the last 5 years.

5.- Young researchers are encouraged to apply and will be prioritized. Senior candidates will be considered only if there are not enough qualified junior applicants.

6.- Repeat awards: The number of times that the same person can receive an HH award is 3 in order to reach a broader range of researchers. In case of a tie, applicants that have already received an H&H award will have lower priority than those not having received any.

7.- Number of awards per country: No more than 2 awards will go to the same country while there are applicants from countries with fewer than that number of applications.

8.- Number of awards to the same group/institution: Priority will be given to members of different groups. No more than 2 awards will go to the members of the same research group while there are applicants from other groups.

9.- Up to two special HH awards could be granted for students from any country with an outstanding career and presenting a highly innovative abstract provided that there are not 5 or more successful applicants to the regular awards.

Application for Helping Hand Fellowship to attend 14th International Colloquium on Paratuberculosis (14ICP) in Riviera Maya, Mexico, June 4-8 June, 2018

Name:
Country of origin:
Date of Birth:
Educational Qualification:
Current affiliation:
Institution:
Country:
Group leader:
Ph.D Thesis Title (if applicable):
Area of Paratuberculosis Research:
Publications in Paratuberculosis Research:
STATEMENT OF PURPOSE
ABSTRACT (optional)

Applications should be sent by e-mail addressed to the Secretary-Treasurer of the IAP (rsweeney@vet.upenn.edu), and must include the filled in forms provided in the call as an attached Word or Adobe pdf file blocked for changes. The IAP Member Support and Recognition Committee will evaluate the applications in the name of the IAP and its decisions are final.

National Johne's Management Plan in the UK

Phase II

The National Action Group on Johne's **in the UK, a forum for dairy industry organisations** concerned with tackling Johne's disease, **initiated a management plan in 2015 to manage and control the disease on farms. Phase II of the plan has now commenced.**

The National Johne's Management **Plan (NJMP) was developed to guide the management and to reduce the incidence of** Johne's disease t**hrough implementing one of the six strategies. This includes approaches such as biosecurity protocols, strategic testing and vaccination. Further information can be found at** http://www.actionjohnesuk.org/ **As part of this initiative there are now over 650 vets** who are accredited advisors for Johne's **disease.**

Post comments on the IAP website

#Paratuberculosis or# Johnes

If you are a Twitter user which handle do you prefer? The *Journal of Dairy Science* tweets using both, do you?

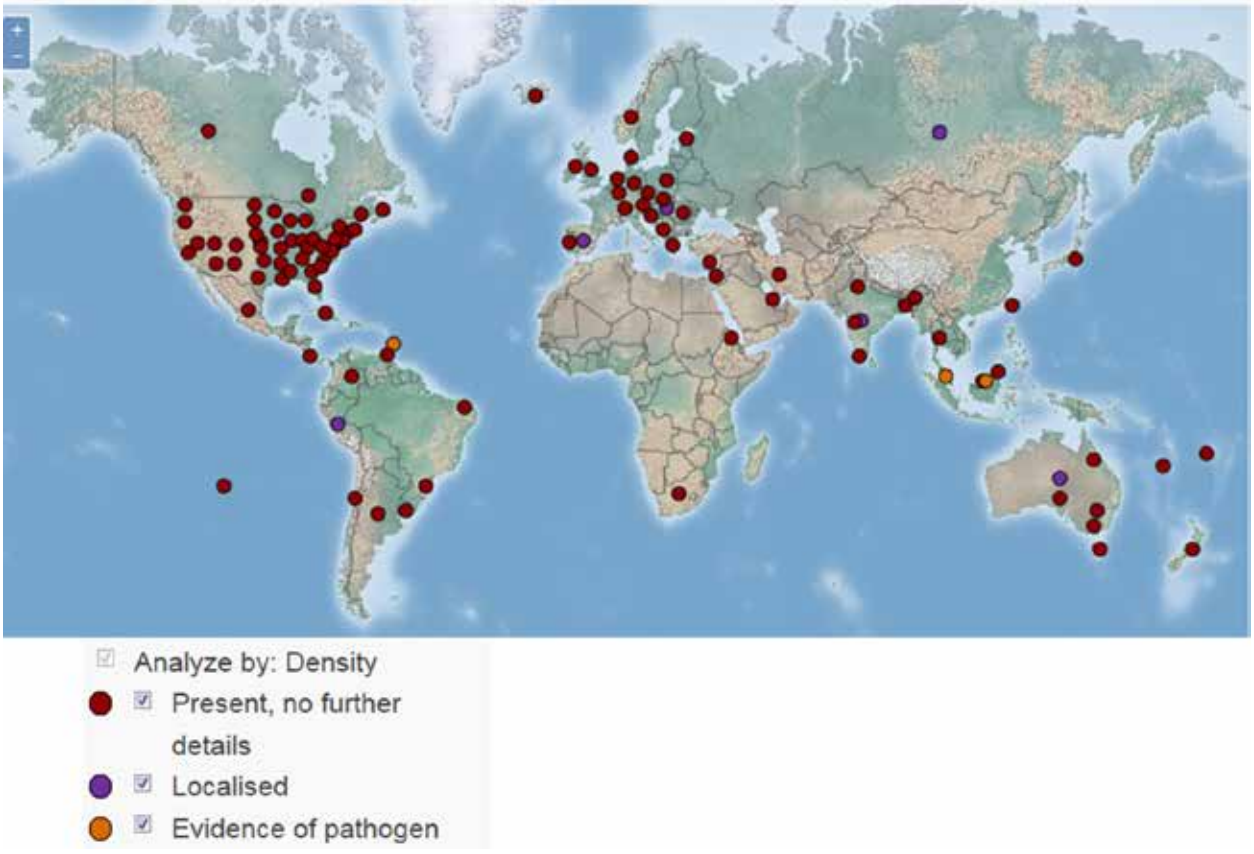
Post comments on the IAP website

Cover photo images

We are seeking images related to paratuberculosis for the cover of the Newsletter. Please submit suitable contributions to editor@paratuberculosis.net for consideration.

Paratuberculosis News

The Centre for Agriculture and Biosciences International (CABI) is an international not-for-profit organization that improves lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment. They have just updated the data sheet for paratuberculosis https://www.cabi.org/isc/datasheet/70813 It has a global disease distribution map (shown below) and a more comprehensive table detailing the presence or absence of disease.



Post comments on the IAP website

Upcoming events

- **The 14th ICP will be held in Cancun, Mexico from June 4-8 2018**

- **The 15th ICP will be held Dublin, Ireland in 2020**

- **The first African Society for Paratuberculosis meeting will be held at the Animal Reproduction Research Institute, Giza, Egypt, March 5-7, 2018**

This organization which was formed in February 2017 will serve as a platform for cooperation, to share and to knowledge, experiences, materials on Paratuberculosis among African Researchers and stakeholders on Paratuberculosis control.

- **The 30th World Buiatrics Congress will be held in Sapporo, Japan from 28 Aug – 1 Sept 2018. The Scientific program will cover issues on cattle health and reproduction. Topics will include a wide range of production diseases, major infectious diseases, calves and new-born diseases, tropical epidemiology, public health and food security and other animal health and management problems.**

- **The 6th European Veterinary Immunology Workshop (EVIW) will be held from 5-7 September 2018 in Utrecht, the Netherlands. Plenary and concurrent session topics include: Innate immunity, Adaptive immunity, Infection and immunity, Vaccination, Clinical immunology, Allergy, Mucosal immunology and the microbiome in relation to immune responses**

Are there any other events you are aware of that could be of interest to other members of the IAP? Click here to let us know.

Recent publications

Abraham A, Naicy T, Raghavan KC, Siju J, Aravindakshan T. 2017. Evaluation of the association of SLC11A1 gene polymorphism with incidence of paratuberculosis in goats. J Genet 96:641-646.

Al-Mamun MA, Smith RL, Schukken YH, Grohn YT. 2017. Use of an Individual-based Model to Control Transmission Pathways of Mycobacterium avium Subsp. paratuberculosis Infection in Cattle Herds. Sci Rep 7:11845.

Arango-Sabogal JC, Pare J, Labrecque O, Cote G, Roy JP, Buczinski S, Wellemans V, Fecteau G. 2017. Incidence of fecal excretion of Mycobacterium avium subsp. paratuberculosis in dairy cows before and after the enrolment in the Quebec voluntary program. Prev Vet Med 148:94-105.

Barbosa P, Leao C, Usie A, Amaro A, Botelho A, Pinto C, Inacio J, Stevenson K, Ramos AM. 2017. Draft Genome Sequence of a Rare Pigmented Mycobacterium avium subsp. paratuberculosis Type C Strain. Genome Announc 5.

Barkema HW, Orsel K, Nielsen SS, Koets AP, Rutten V, Bannantine JP, Keefe GP, Kelton DF, Wells SJ, Whittington RJ, Mackintosh CG, Manning EJ, Weber MF, Heuer C, Forde TL, Ritter C, Roche S, Corbett CS, Wolf R, Griebel PJ, Kastelic JP, De Buck J. 2017. Knowledge gaps that hamper prevention and control of Mycobacterium avium subspecies paratuberculosis infection. Transbound Emerg Dis doi:10.1111/tbed.12723.

Bauman CA, Jones-Bitton A, Ahlstrom C, Mutharia L, De Buck J, Jansen J, Kelton D, Menzies P. 2017. Identification of Mycobacterium avium subspecies paratuberculosis strains isolated from dairy goats and dairy sheep in Ontario, Canada. Can J Vet Res 81:304-307.

Beaunee G, Vergu E, Joly A, Ezanno P. 2017. Controlling bovine paratuberculosis at a regional scale: Towards a decision modelling tool. J Theor Biol 435:157-183.

Ben Romdhane R, Beaunee G, Camanes G, Guatteo R, Fourichon C, Ezanno P. 2017. Which phenotypic traits of resistance should be improved in cattle to control paratuberculosis dynamics in a dairy herd: a modelling approach. Vet Res 48:62.

Burgess TL, Witte CL, Rideout BA. 2017. Early-life exposures and Johne's disease risk in zoo ruminants. J Vet Diagn Invest doi:10.1177/1040638717735350:1040638717735350.

Chaubey KK, Singh SV, Gupta S, Singh M, Sohal JS, Kumar N, Singh MK, Bhatia AK, Dhama K. 2017. Mycobacterium avium subspecies paratuberculosis - an important food borne pathogen of high public health significance with special reference to India: an update. Vet Q doi:10.1080/01652176.2017.1397301:1-35.

Del Corvo M, Luini M, Stella A, Pagnacco G, Ajmone-Marsan P, Williams JL, Minozzi G. 2017. Identification of additional loci associated with antibody response to Mycobacterium avium ssp. Paratuberculosis in cattle by GSEA-SNP analysis. Mamm Genome 28:520-527.

Espeschit IF, Schwarz DGG, Faria ACS, Souza MCC, Paolicchi FA, Juste RA, Carvalho IA, Moreira MAS. 2017. Paratuberculosis in Latin America: a systematic review. Trop Anim Health Prod 49:1557-1576.

Espeschit IF, Souza MCC, Lima MC, Moreira MAS. 2017. First molecular typing of Mycobacterium avium subspecies paratuberculosis identified in animal and human drinking water from dairy goat farms in Brazil. Braz J Microbiol doi:10.1016/j.bjm.2017.06.005.

Frie MC, Sporer KRB, Kirkpatrick BW, Coussens PM. 2017. T and B cell activation profiles from cows with and without Johne's disease in response to in vitro stimulation with Mycobacterium avium subspecies paratuberculosis. Vet Immunol Immunopathol 193-194:50-56.

Galiero A, Turchi B, Pedonese F, Nuvoloni R, Cantile C, Colombani G, Forzan M, Cerri D, Bandecchi P, Fratini F. 2017. Serological, culture and molecular survey of Mycobacterium avium paratuberculosis in a goat flock in Tuscany. Folia Microbiologica 62:471-477.

Gautam M, Ridler A, Wilson PR, Heuer C. 2018. Control of clinical paratuberculosis in New Zealand pastoral livestock. N Z Vet J 66:1-8.

Grant IR, Foddai ACG, Tarrant JC, Kunkel B, Hartmann FA, McGuirk S, Hansen C, Talaat AM, Collins MT. 2017. Viable Mycobacterium avium ssp. paratuberculosis isolated from calf milk replacer. J Dairy Sci 100:9723-9735.

Kennedy AE, O'Mahony J, Byrne N, MacSharry J, Sayers RG. 2017. Is TB Testing Associated With Increased Blood Interferon-Gamma Levels? Front Vet Sci 4:176.

Kiser JN, Neupane M, White SN, Neibergs HL. 2017. Identification of genes associated with susceptibility to Mycobacterium avium ssp. paratuberculosis (Map) tissue infection in Holstein cattle using gene set enrichment analysis-SNP. Mamm Genome doi:10.1007/s00335-017-9725-4.

Kuenstner JT, Naser S, Chamberlin W, Borody T, Graham DY, McNees A, Hermon-Taylor J, Hermon-Taylor A, Dow CT, Thayer W, Biesecker J, Collins MT, Sechi LA, Singh SV, Zhang P, Shafran I, Weg S, Telega G, Rothstein R, Oken H, Schimpff S, Bach H, Bull T, Grant I, Ellingson J, Dahmen H, Lipton J, Gupta S, Chaubey K, Singh M, Agarwal P, Kumar A, Misri J, Sohal J, Dhama K, Hemati Z, Davis W, Hier M, Aitken J, Pierce E, Parrish N, Goldberg N, Kali M, Bendre S, Agrawal G, Baldassano R, Linn P, Sweeney RW, Fecteau M, Hofstaedter C, et al. 2017. The Consensus from the Mycobacterium avium ssp. paratuberculosis (MAP) Conference 2017. Front Public Health 5:208.

Li L, Bannantine JP, Campo JJ, Randall A, Grohn YT, Katani R, Schilling M, Radzio-Basu J, Kapur V. 2017. Identification of sero-reactive antigens for the early diagnosis of Johne's disease in cattle. PLoS One 12:e0184373.

Marino R, Capoferri R, Panelli S, Minozzi G, Strozzi F, Trevisi E, Snel GGM, Ajmone-Marsan P, Williams JL. 2017. Johne's disease in cattle: an in vitro model to study early response to infection of Mycobacterium avium subsp. paratuberculosis using RNA-seq. Mol Immunol 91:259-271.

McAloon CG, Doherty ML, Whyte P, More SJ, O'Grady L, Citer L, Green MJ. 2017. Relative importance of herd-level risk factors for probability of infection with paratuberculosis in Irish dairy herds. J Dairy Sci 100:9245-9257.

Rangel S, Arango-Sabogal JC, Labrecque O, Pare J, Fairbrother JH, Buczinski S, Roy JP, Cote G, Wellemans V, Fecteau G. 2017. Evaluation of a PCR assay on overgrown individual fecal samples cultured for Mycobacterium avium subsp paratuberculosis. Journal of Veterinary Diagnostic Investigation 29:912-915.

Rathnaiah G, Zinniel DK, Bannantine JP, Stabel JR, Grohn YT, Collins MT, Barletta RG. 2017. Pathogenesis, Molecular Genetics, and Genomics of Mycobacterium avium subsp. paratuberculosis, the Etiologic Agent of Johne's Disease. Front Vet Sci 4:187.

Serrano M, Elguezabal N, Sevilla IA, Geijo MV, Molina E, Juste RA, Garrido JM. 2017. Preliminary Results Indicate That Inactivated Vaccine against Paratuberculosis Could Modify the Course of Experimental Mycobacterium bovis Infection in Calves. Front Vet Sci 4:175.

Whittington RJ, Begg DJ, de Silva K, Purdie AC, Dhand NK, Plain KM. 2017. Case definition terminology for paratuberculosis (Johne's disease). BMC Vet Res 13:328.

Deadline for next issue: 15 February 2018

All contributions should be s8ent to editor@paratuberculosis.net

Board Members