



Editors

Tiffany Cunningham
(tac18@psu.edu)

Ian Gardner
(iagardner@ucdavis.edu)

Vivek Kapur
(vkapur@psu.edu)

Ken Olson
(keolson@prodigy.net)

JDIP News is published periodically to enhance intramural communications and ensure that JDIP participants and stakeholders are updated on news of relevance to our community.

Please direct any comments, contributions and suggestions via email to: Vivek Kapur, JDIP Program Director, at vkapur@psu.edu



National Institute of Food and Agriculture

Funding for JDIP is provided through competitive award number 2008-55620-18710 from the Animal Biosecurity Program of USDA-NIFA.

In This Issue:

	<u>Page</u>
Johne's at the United States Animal Health Association (USAHA) Annual Meeting	1
JDIP Year 6 Request for Applications	2
APHIS-JDIP Vaccine Project Update	3
A National Survey of Dairy Producers Concerning Participation in a Johne's Disease Control Program	4
The 10 th International Colloquium on Paratuberculosis and 2 nd New Horizons Workshop	7
Diagnostic Test Standard Project Moves into Top Gear	9
Upcoming Meetings and Events	10
Johne's Disease in Print	
o Producer Press	10
o Peer Review – Johne's Disease	10
o Peer Review – Crohn's Disease	13

Johne's at the United States Animal Health Association (USAHA) Annual Meeting

By: Ken Olson, Ph.D.

The annual meeting of the United States Animal Health Association will be held October 8 to 14, 2009 at the Town and Country Hotel in San Diego, California (<http://www.usaha.org/meetings/2009/index.shtml>). Two major Johne's meetings will be held as a part of the annual meeting. The National Johne's Working Group (NJWG) will meet from 8am until 5pm on Friday, October 9 in the California Room. The primary focus of the meeting will be the new Johne's Strategic Plan and the Program Standards, along with the Herd Classification proposal. It will include discussion of actions that are being taken and others that may be needed from the NJWG to maintain progress in the Johne's program.

The Johne's Disease Committee will meet on Sunday, October 11 from 12:30pm until 5:30pm in the Golden West Room. This meeting will include reports of responses to last year's recommendations, education and demonstration herd activities from the past year, and a report on the NJWG discussion. Action is planned on the herd classification proposal and the program standards. Other resolutions or recommendations may also move forward from the committee to USAHA.



JDIP Year 6 Request for Applications

By: Tiffany Cunningham, J.D. and Vivek Kapur, BVSc, Ph.D.

JDIP would like to remind you of its Year 6 Request for Applications ("RFA"). While some information is provided below, please visit www.jdip.org and click on the "Funding Opportunities" link in the left-hand column for more information on the application process. Please contact the project leader for your program area if you have any questions relating to the science. If you have needs for assistance with study design, please contact the JDIP bio-statistical consulting core.

Finally, for programmatic questions please send an email to help@jdip.org or call the JDIP Project Assistant, Tiffany Cunningham, at 814-867-0261, and we will be happy to help. Good luck with your proposal preparations and the submission process (in case you are submitting).

Dates: Applications must be received by 5:00 PM EDT on Monday, November 9, 2009.

Funding Description: Competitive awards for research, education and extension on Johne's disease. This is the third year of funding under JDIP Phase II program from the USDA- National Institute of Food and Agriculture program.

Total Amount to be Awarded: It is expected that a total of approximately \$1,000,000 will be available for this annual funding cycle. Of this, we anticipate that approximately \$400,000 will be used to fund projects related to diagnostics, and that at least \$100,000 of the total funding will be directed towards meritorious developmental projects from investigators who are not currently funded through the JDIP mechanism.

Range of Awards: \$0 to \$180,000

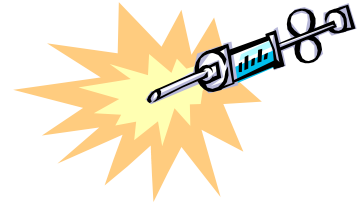
Eligibility: All applicants must be a current JDIP Investigator/Member, or request membership prior to receiving an award. To learn more about JDIP, including our current list of Investigators/ Members, please visit www.jdip.org . New member inquiries and requests should be directed to either the JDIP Administrator (help@jdip.org) or Vivek Kapur (vkapur@psu.edu). Outstanding applications from international investigators will be considered, and applicants are encouraged to actively solicit feedback from project leaders at JDIP regarding their proposals. For applicants from non-US institutions, demonstration of leveraging of funds through matching support and/or establishing collaborations with JDIP based investigators will be preferred, but is not required.

Application and Submission Process: Please visit the "Funding Opportunities" link at www.jdip.org for further information on the application and submission process.

Funding for JDIP is provided through competitive award number 2008-55620-18710 from the Animal Bio-security Program of USDA- National Institute of Food and Agriculture.

APHIS-JDIP Vaccine Project Update

By: Tiffany Cunningham, J.D. and Robab Katani, B.S.



After much discussion, coordination, and paper work, the Johne's Disease Integrated Program ("JDIP") has initiated the USDA-APHIS sponsored vaccine testing program and is accepting submissions for participation in the program.

For those who are unfamiliar with the program, there is interest among many veterinarians and producers alike in the application of vaccination as a tool in Johne's disease control programs; however, there is only one USDA approved vaccine available at the present time. That vaccine has limitations and is not approved for use in all states. JDIP scientists are working closely with USDA-APHIS-VS in an effort to identify viable vaccine candidates and evaluate those with the greatest potential for commercial development. The project is in the initial stages of a three-step process.

Currently, JDIP is in Phase I of the vaccine testing program and has added an additional participating institution, AgResearch Limited, to the program. JDIP is accepting applications for submission of live vaccine candidates and has received strains of live vaccine candidates and recombinant proteins from participating scientists. Dr. Vivek Kapur's laboratory at The Pennsylvania State University is in the process of coordinating the cultures and growing the strains that have been received. Once the strains are received, Dr. Vivek Kapur's laboratory will number, grow and distribute the strains to candidate vaccine testing centers at the laboratories of Dr. Adel Talaat at the University of Wisconsin and Dr. Srinand Sreevatsan at the University of Minnesota for blinded evaluation. Testing will be performed in batches of 5 isolates in each laboratory. Vaccine candidates may be re-tested as needed. The JDIP Epidemiology and Biostatistics Core at Cornell University will analyze the results of the testing in a blinded manner and identify the "Best Candidates." Once the analysis is complete and the blind is opened, all of the program participants will receive the data at the same time.

In Phase II, these "Best Candidates" will be evaluated through the use of a mouse model. It is anticipated that two laboratories will conduct the infection and protection studies in the mouse. In Phase III, the "Best Candidates" identified through the mouse studies will then be evaluated using a goat model. This will provide data similar to that from cattle, but the data will be available in a much shorter time frame and at a lower cost.

In summary, the coordinated three-stage evaluation will take approximately three years to complete. It is expected that this rigorous screening process will identify one or more viable candidates to move forward for commercial development. Additional information is available at www.jdip.org if you click on the "Research Resources" link in the left-hand column and then on the "Vaccine Project" sub-link.

A National Survey on Dairy Producers Concerning Participation in a Johne's Disease Control Program

By: Ernest Hoving, Ph. D. and Ken Olson, Ph.D.

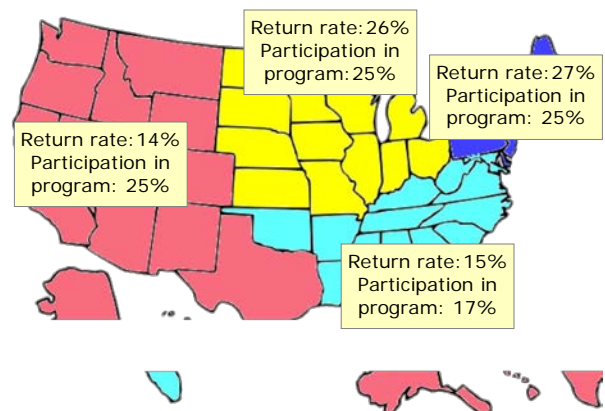
The USDA has encouraged and supported adoption of a nationally-standardized Voluntary Bovine Johne's Disease Control Program by dairy and beef cattle producers. One method used to stimulate participation in the program was by means of cooperative agreement funding to state governments. Initially, the number of herds enrolled in the program increased, but after a number of years enrollment appeared to reach a plateau.

The objectives of this project were to define the characteristics of dairy producers who did, or did not, participate in an 'official' Johne's Disease Control Program in the United States, and to determine reasons for participation or non-participation. This information was sought out in an attempt to develop programs and strategies for increasing the formal and informal adoption of Johne's Disease (JD) management and control programs.

A survey instrument designed to attain the objectives of the project was developed by a team of subject matter experts using an iterative consensus-building approach. The survey was beta-tested by dairy producers in 3 states, and minor revisions were made based on feedback from the beta-testers.

In the spring of 2008, the final version of the 4-page survey was mailed to 8,013 dairy producers who had previously reported having at least 25 mature cows, systematically, randomly selected from a database of approximately 48,000 mailing addresses. A minimum of 5 herds was selected from every state. The Pennsylvania State University Survey Research Center administered the survey, using a 3-mailing technique to increase the response rate. In addition, an on-line version of the survey was available to producers. By the end of the data collection period, a crude response rate of 33% was realized. A number of surveys were returned blank, or almost completely blank, many of them with indications that the addressee was no longer actively dairy farming. Most of these surveys did not have sufficient information to warrant inclusion in the database. A database consisting of 1902 usable surveys was assembled for analysis.

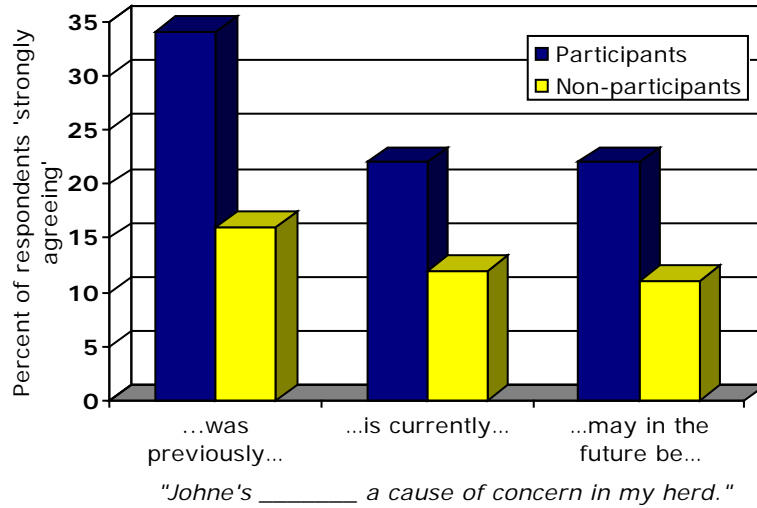
Dairy producers from across the country participated in the survey. The proportion of responders who indicated that they participated in their state's Johne's disease program was higher than USDA-APHIS-VS estimates (~10%), but similar to that of respondents to the USDA-NAHMS Dairy 2007 study. This indicates that program participants were somewhat more likely to respond than non-participants. Herd size distribution of the respondents closely matched national estimates from the USDA's National Agricultural Statistics Service, with a slightly lower percentage of small herds, reflecting the omission of herds with <25 cows from the study pool.



(continued on page 5)

(continued from page 4)

Survey recipients were asked to indicate their level of agreement with the following statements: "Johne's Disease was previously/ is currently / may in the future be a cause for concern in my herd." Program participants strongly agreed with each of these statements more frequently than the non-participating respondents ($p < .01$).



Program participants also indicated that if it was possible, and their herd was free of JD, they would be willing to spend almost 44% more per cow per month than their non-participating counterparts (\$2.02 vs. \$1.41, $p < .01$), in order to remain free of JD. They also showed a willingness to pay a higher premium (\$196 vs. \$156 per head, $p < .01$) for replacement animals that had a high probability of being free of JD.

Study participants were asked to choose from a list to indicate "Who encouraged you to participate in your state's Johne's Program?" Fifty-four (54) percent of non-participants indicated that no one had encouraged them to participate, whereas only 8% of the participants selected this response ($p < .001$).

This lack of 'external' encouragement or guidance was reinforced in responses to a subsequent question about reasons for not participating (see below). Here a frequent written-in response for "Other" was akin to "No one has asked me to," or "I haven't been told how to participate."

What is the primary reason you are NOT currently participating in your state's Johne's Program?	
<i>I'm already doing everything I can to manage Johne's in my herd.</i>	33%
<i>My veterinarian thinks the program is not worthwhile.</i>	6%
<i>I don't think I have Johne's, so there's no value to participating.</i>	36%
<i>I have Johne's, but I don't think it has a significant economic impact.</i>	8%
<i>Other (eg. "No one asked me too", "too expensive", "tests are not reliable")</i>	17%

(continued on page 6)

(continued from page 5)

It is interesting to note that 36% of the non-participants felt they did not have Johne's disease in their herd and therefore would not benefit from participating in a program. The USDA-NAHMS Dairy 2007 study demonstrated that at least 68% of herds in the USA are likely to be infected with the causative agent of Johne's disease (*Mycobacterium avium* ssp. *paratuberculosis*), so it seems very likely that many non-participating producers are unaware that they have MAP in their herds. Concerns about the cost of program implementation, and the cost and accuracy of testing (data not presented) were also frequently cited as reasons for non-participation.

Four questions were designed to determine the respondents' level of knowledge about Johne's disease. Program participants answered more of the questions correctly than did non-participants, with 90% selecting at least 50% of the correct answers. Only 68% of the non-participants achieved similar results ($P < .005$).

1. <i>Mature animals are more susceptible to becoming infected than youngstock</i>	True False
2. <i>Most new infections in an infected herd occur by animals "eating" Johne's organismS</i>	True False
3. <i>An intensive "test and cull" program, although expensive, is the best way to get rid of Johne's.</i>	True False
4. <i>A 22-month-old registered heifer at a sale has had a 'negative blood test" for Johne's. This means that she is almost guaranteed (>95%) not to be infected.</i>	True False

Conclusions

A coordinated 'marketing' and educational effort may succeed in getting more herds enrolled in a Johne's Disease Control Program, since a lack of motivation and encouragement appears to be a significant reason that herds are not participating in a Johne's Disease Control Program. Producers participating in a control program also sense a greater economic cost associated with Johne's disease than do non-participants.

A lack of awareness of their herd's true infection status may also be keeping some producers from participating in a Johne's disease program, although some non-participating herds feel that they are implementing Johne's disease control measures without being enrolled in a formal/official program.

Finally, participation in a program is associated with an increased level of knowledge about Johne's disease, although it cannot be determined from this survey if this enhanced knowledge came about as a result of participation in a program, or preceded program participation.

This study was supported by JDIP & USDA-APHIS-VS.

The 10th International Colloquium on Paratuberculosis and the 2nd New Horizons Workshop

By: Ken Olson, Ph.D.

The 10th International Colloquium on Paratuberculosis and the 2nd New Horizons in Johne's Disease Control workshop, held on the University of Minnesota campus in Minneapolis from August 9 to 14, 2009 were very well received. A total of 317 participants from 27 countries attended the meetings. A total of 219 abstracts were submitted for the ICP and 10 additional ones for the New Horizon's workshop.

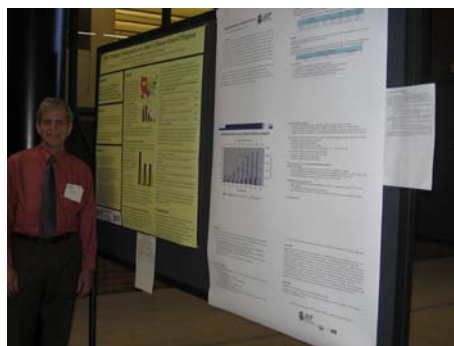
The opening session featured a lively discussion of the potential of MAP as a human health concern. Dr. Tim Bull led off with a presentation "Paratuberculosis and Crohn's Disease: Already beyond reasonable doubt." This was followed by Dr. Herb Van Kruiningen discussing, "Where are the Weapons of Mass Destruction --- the MPTB?" The discussion provided good food for thought as the meeting progressed.

The New Horizons workshop was targeted for practicing veterinarians, producers and industry staff. It was held as a concurrent session with the ICP's scientific presentations on "Diagnostics and Genotyping." The workshop focused on the field application of research to provide producers with tools to manage and reduce the impact of the disease in their herds. The session began with presentations focused on "Johne's – Why is it important to you?" It then moved to a discussion of current management strategies being used to address the disease. Colostrum feeding, milk management and housing (off-site vs. on-site) were covered in the section on youngstock. This was followed by management strategies for mature animals and discussion of vaccination and monensin sodium as tools to potentially reduce shedding. The closing presentation, "Summation and Motivation from Mike," reiterated practices that work and discussed how they have been applied in Wisconsin demonstration herds to help producers effectively deal with the disease. Presentations will soon be available on www.jdip.org.

The ICP featured oral presentation sessions of current work in the areas of:

- Diagnostics and Genotyping
- Host Response and Immunology
- Epidemiology
- MAP Control
- Pathogenomics and MAP Biology
- Johne's Disease Initiatives

Each of the first five sections began with a "Keynote presentation" followed by several research presentations and concluded with a "Perspective talk" on the area. In addition to the oral presentations, poster presentations in each of the areas were available throughout the meeting. Proceedings will be available from the International Association for Paratuberculosis later this year.



(pictured, Dr. Ken Olson)

(continued on page 8)

(continued from page 7)

During the meeting two JDIP members were recognized for their career achievements and their long-time support of the International Association for Paratuberculosis. Dr. Claus D. Buergelt, Professor in the College of Veterinary Medicine at the University of Florida, and Dr. Robert Whitlock, Associate Professor in the School of Veterinary Medicine at the University of Pennsylvania, received the IAP Emeritus Award.



(from left to right, Dr. Ramon Juste, Dr. Claus D. Buergelt, Dr. Robert Whitlock and Dr. Ray Sweeney)

JDIP utilized the ICP as the forum for research presentations rather than holding a separate annual conference. We were pleased to be a “Gold Level” sponsor of the ICP, and also that we could provide travel scholarship awards for 12 outstanding graduate and post-Doctoral presenters:

- Elena Castellano, (University of Madrid - Spain)
- Jenn-Wei Chen, (Cornell University - USA)
- Jaesung Cho, (Cornell University - USA)
- Antonio Foddai, (Queen’s University Belfast – Northern Ireland)
- Sajan George, (University of Minnesota - USA)
- Edward Kabara, (Michigan State University - USA)
- Elise Lamont, (University of Minnesota - USA)
- Clara Marce, (University of London - England)
- Brandon Plattner, (Iowa State University - USA)
- Abani Pradhan, (Cornell University - USA)
- Mark Robinson, (University of Otaga – New Zealand)
- Virginie Roupie, (Scientific Institute of Public Health – Belgium)



Congratulations to all of the recipients.

The 11th ICP will be held in Sydney, Australia from Sunday, February 5th to Friday, February 10th, 2012. The venue is the beautiful University of Sydney campus, which is centrally located between the harbor and the airport. Richard Whittington (richardw@camden.usyd.edu.au) is the local coordinator for the event.

Diagnostic Test Standards Project Moves into Top Gear

By: Ian Gardner, Ph.D.

“The 10th ICP meeting proved the ideal setting to catalyze activity on the JDIP Test Standards project”, said Ian Gardner, who is leading this joint activity of the Epidemiology and Diagnostic cores of JDIP. Several presentations at the meeting, including those of keynote speaker Dr. Richard Whittington, highlighted issues related to the use of culture as the ante-mortem reference standard for test evaluation. Another presentation raised the issue of lack of standards for reporting test evaluation studies in veterinary medicine and the consequences of inadequate test validation.

The goal of the project is to develop a set of consensus-based standards for reporting paratuberculosis test evaluation studies in peer-reviewed literature. The approach will be similar to that used in human medicine by the STARD (**Standards for Reporting of Diagnostic Accuracy**) initiative which has a 25-point check list (available at www.stard-statement.org/), endorsed by about 200 biomedical journals, allowing the transparent reporting of test accuracy studies.

STARD was initially developed for clinical cases of non-infectious diseases (e.g. cancer, heart disease) but its principles are readily adaptable to detection of subclinical infectious diseases. Important features of testing for animal diseases that are not well covered in STARD are the evaluation of herd-level and pooled tests, and the lack of “gold standard reference tests” which necessitate alternate statistical methods e.g. latent class analysis. In addition, STARD does not provide guidance for types of controls for assays. This can be an important consideration, especially for culture and PCR-based studies.

Additional benefits expected to accrue from this JDIP initiative related to the design and reporting of evaluation studies for paratuberculosis tests include:

- Avoiding tests of poor utility that do not improve management decisions by dairy producers or industry groups (or reduce potential public health risks)
- Adoption and use of lower cost tests that have comparable accuracy to current tests
- Design and analysis guidelines for authors and reviewers of relevant grant proposals or applications for test licensure
- More informed decisions about sample types to be included in repositories developed for use in the context of test validation and comparison studies

The initial focus of the team’s efforts are antibody-detection tests in milk and serum, and organism-detection tests in feces and tissues with broad application to paratuberculosis in farmed animals (cattle, sheep, goats and deer). Subsequent activities will focus on cell mediated immunity tests and organism-detection tests in milk, depending on how well the team’s recommendations are received by the paratuberculosis community, including relevant stakeholders.

The team which currently includes Drs. Beth Harris, Mike Collins, Srinand Sreevatsan, Douwe Bakker, Soren Nielsen, and Richard Whittington is drafting documents following the STARD checklist and adding new items for potential inclusion. A face-to-face meeting of the team and an additional group of about 10 paratuberculosis experts is planned in early 2010 to finalize the document and prepare a manuscript for publication.

Recommendations from the group will be coordinated with activities of an ad-hoc working group of the World Organization for Animal Health (OIE) which is drafting a new chapter “Principles and methods for validation of diagnostic assays for infectious diseases” with associated annexes for the Manual of Standards for Diagnostic Tests. This chapter is broadly applicable to all infectious diseases with trade implications, including paratuberculosis.

Upcoming Meetings and Events

September 29 – October 3, 2009

World Dairy Expo

Madison, Wisconsin. USA

<http://www.world-dairy-expo.com>

October 8 – 14, 2009

113th Annual Meeting of the United States Animal Health Association (USAHA)

Includes meeting of the National Johne's Work Group October 9 and Johne's Committee October 11

Town and Country Hotel

San Diego, California. USA

<http://www.usaha.org/meetings/>

November 10 – 12, 2009

National Milk Producers Federation (NMPF), National Dairy Promotion and Research Board (NDB), and

United Dairy Industry Association Joint Annual Meeting (UDIA)

Grapevine, Texas. USA

http://www.nmpf.org/annual_meeting

January 27 – 30, 2010

Cattle Industry Annual Convention and NCBA Trade Show

San Antonio, Texas. USA

<http://www.beefusa.org/convcattleindustryannualconventionandncbatradeshow.aspx>

JD In Print – Producer Press

- **Merlo, C.**, Compare Your Dairy to USDA's 2007 NAHMS Survey Findings. www.agweb.com . September 4, 2009.
- **Perry, A.**, Coordinated pushback could help contain bovine bacterial diseases. Agribusiness Dairyman. July 2009, p.19.
- **Hill, K.M.**, 11 biosecurity protocol tips for consultants visiting dairies, Progressive Dairyman. April 2009.

JD In Print – Peer Review Johne's Disease Related Publications

- **Alinovi CA, Ward MP, Lin TL, Wu CC.** Sample handling substantially affects Johne's ELISA. Prev Vet Med. 2009 Aug 1; 90(3-4):278-83. Epub 2009 May 28. PMID: 19477542.
- **Alonso-Hearn M, Eckstein TM, Sommer S, Bermudez LE.** A Mycobacterium avium subsp. paratuberculosis LuxR regulates cell envelope and virulence. Innate Immun. 2009 Aug 2. PMID: 19710090.
- **Aly SS, Anderson RJ, Whitlock RH, Fyock TL, McAdams S, Adaska JM, Jiang J, Gardner IA.** Reliability of environmental sampling to quantify Mycobacterium avium subspecies paratuberculosis on California free-stall dairies. J Dairy Sci. 2009 Aug; 92(8):3634-42. PMID: 19620644.
- **Badi FA, Haroon AI, Alluwaimi AM.** The gammadelta cells as marker of non-seroconverted cattle naturally infected with Mycobacterium avium subspecies paratuberculosis. Res Vet Sci. 2009 Jul 7. PMID: 19589549.
- **Benjamin LA, Fosgate GT, Ward MP, Roussel AJ, Feagin RA, Schwartz AL.** Benefits of obtaining test-negative Level 4 classification for beef producers in the Voluntary Bovine Johne's Disease Control Program. Prev Vet Med. 2009 Oct 1;91(2-4):280-4. Epub 2009 Jul 21. PMID: 19625094.

- **Bezoz J, de Juan L, Romero B, Alvarez J, Mazzucchelli F, Mateos A, Domínguez L, Aranaz A.** Experimental infection with *Mycobacterium caprae* in goats and evaluation of immunological status in tuberculosis and paratuberculosis co-infected animals. *Vet Immunol Immunopathol.* 2009 Aug 7. PMID: 19716181.
- **Cook KL, Britt JS, Bolster CH.** Survival of *Mycobacterium avium* subsp. paratuberculosis in biofilms on livestock watering trough materials. *Vet Microbiol.* 2009 Aug 8. PMID: 19717251.
- **Dhand NK, Toribio JA, Whittington RJ.** Adsorption of *Mycobacterium avium* subsp. paratuberculosis to soil particles. *Appl Environ Microbiol.* 2009 Sep; 75(17):5581-5. Epub 2009 Jun 26. PMID: 19561187.
- **Dimareli-Malli Z, Stevenson K, Sarris K, Sossidou K.** Study of microbiological and molecular typing aspects of paratuberculosis in sheep and goats in Northern Greece. *Transbound Emerg Dis.* 2009 Aug; 56(6-7):285-90. Epub 2009 Apr 23. PMID: 19413882.
- **Donaghy J, Keyser M, Johnston J, Cilliers FP, Gouws PA, Rowe MT.** Inactivation of *Mycobacterium avium* ssp. paratuberculosis in milk by UV treatment. *Lett Appl Microbiol.* 2009 Aug; 49(2):217-21. Epub 2009 May 22. PMID: 19486288.
- **El-Sayed A, Hassan AA, Natour S, Abdulmawjood A, Bülte M, Wolter W, Zschöck M.** Evaluation of three molecular methods of repetitive element loci for differentiation of *Mycobacterium avium* subsp. paratuberculosis (MAP). *J Microbiol.* 2009 Jun; 47(3):253-9. Epub 2009 Jun 26. PMID: 19557341.
- **Elzo MA, Rae DO, Lanhart SE, Hembry FG, Wasdin JG, Driver JD.** Association between cow reproduction and calf growth traits and ELISA scores for paratuberculosis in a multibreed herd of beef cattle. *Trop Anim Health Prod.* 2009 Aug; 41(6):851-8. Epub 2008 Nov 8. PMID: 18998232.
- **Fosgate GT, Osterstock JB, Benjamin LA, Dobek GL, Rousel AJ.** Preliminary investigation of a humoral and cell-mediated immunity ratio for diagnosis of paratuberculosis in beef cattle. *Prev Vet Med.* 2009 Oct 1; 91(2-4):226-33. Epub 2009 Jul 4. PMID: 19577813.
- **Gioffré A, Echeverría-Valencia G, Arese A, Morsella C, Garbaccio S, Delgado F, Zumárraga M, Paolicchi F, Cataldi A, Romano MI.** Characterization of the Apa antigen from *M. avium* subsp. paratuberculosis: A conserved *Mycobacterium* antigen that elicits a strong humoral response in cattle. *Vet Immunol Immunopathol.* 2009 Jun 24. PMID: 19616313.
- **Green LR, Jones CC, Sherwood AL, Garkavi IV, Cangelosi GA, Thacker TC, Palmer MV, Waters WR, Rathe CV.** Single-antigen serological testing for bovine tuberculosis. *Clin Vaccine Immunol.* 2009 Sep; 16(9):1309-13. Epub 2009 Jul 15. PMID: 19605596.
- **Greenstein RJ, Su L, Brown ST.** On the effect of thalidomide on *Mycobacterium avium* subspecies paratuberculosis in culture. *Int J Infect Dis.* 2009 Sep; 13(5):e254-63. Epub 2009 Mar 20. PMID: 19303801.
- **Janagama HK, Senthilkumar TA, Bannantine JP, Rodriguez GM, Smith I, Paustian M, McGarvey J, Sreevatsan S.** Identification and Functional Characterization of the Iron Dependent Regulator (IdeR) of *Mycobacterium avium* subspecies paratuberculosis. *Microbiology.* 2009 Aug 14. PMID: 19684064.
- **Johansen TB, Agdestein A, Olsen I, Nilsen SF, Holstad G, Dønne B.** Biofilm formation by *Mycobacterium avium* isolates originating from humans, swine and birds. *BMC Microbiol.* 2009 Aug 6; 9:159. PMID: 19660141.
- **Khalifeh MS, Al-Majali AM, Stabel JR.** Role of nitric oxide production in dairy cows naturally infected with *Mycobacterium avium* subsp. paratuberculosis. *Vet Immunol Immunopathol.* 2009 Sep 15; 131(1-2):97-104. Epub 2009 Apr 7. PMID: 19409621.
- **Khare S, Nunes JS, Figueiredo JF, Lawhon SD, Rossetti CA, Gull T, Rice-Ficht AC, Adams LG.** Early phase morphological lesions and transcriptional responses of bovine ileum infected with *Mycobacterium avium* subsp. paratuberculosis. *Vet Pathol.* 2009 Jul;46(4):717-28. Epub 2009 Mar 9. PMID: 19276052.
- **Krishnan MY, Manning EJ, Collins MT.** Comparison of three methods for susceptibility testing of *Mycobacterium avium* subsp. paratuberculosis to 11 antimicrobial drugs. *J Antimicrob Chemother.* 2009 Aug; 64(2):310-6. Epub 2009 May 20. PMID: 19457932.
- **Kudahl AB, Nielsen SS.** Effect of paratuberculosis on slaughter weight and slaughter value of dairy cows. *J Dairy Sci.* 2009 Sep; 92(9):4340-6. PMID: 19700693.

- **Lee J, Moon C, Kim J, Jung C, Lee KH, Joo HG, Ahn M, Shin T.** Immunohistochemical localization of galectin-3 in the granulomatous lesions of paratuberculosis-infected bovine intestine. *J Vet Sci.* 2009 Sep; 10(3):177-80. PMID: 19687616.
- **Lee JS, Shin SJ, Collins MT, Jung ID, Jeong YI, Lee CM, Shin YK, Kim D, Park YM.** Mycobacterium avium subsp. paratuberculosis fibronectin attachment protein activates dendritic cells and induces a Th1 polarization. *Infect Immun.* 2009 Jul;77(7):2979-88. Epub 2009 Apr 27. PMID: 19398539.
- **Liandris E, Gazouli M, Andreadou M, Comor M, Abazovic N, Sechi LA, Ikonomopoulos J.** Direct detection of unamplified DNA from pathogenic mycobacteria using DNA-derivatized gold nanoparticles. *J Microbiol Methods.* 2009 Sep;78(3):260-4. Epub 2009 Jun 17. PMID: 19539667.
- **Lybeck KR, Storset AK, Olsen I.** Neutralization of interleukin-10 from CD14(+) monocytes enhances gamma interferon production in peripheral blood mononuclear cells from Mycobacterium avium subsp. paratuberculosis-infected goats. *Clin Vaccine Immunol.* 2009 Jul; 16(7):1003-11. Epub 2009 May 6. PMID: 19420185.
- **Marassi CD, McNair J, Pollock J, Ristow P, Fonseca LS, Oelemann WM, Lilenbaum W.** The use of MPB70 and MPB83 to distinguish between bovine tuberculosis and paratuberculosis. *Comp Immunol Microbiol Infect Dis.* 2009 Sep 5. PMID: 19735941.
- **Miranda A, Pires MA, Pinto ML, Sousa L, Sargo R, Rodrigues J, Coelho AC, Matos M, Coelho AM.** Mycobacterium avium subspecies paratuberculosis in a diamond sparrow. *Vet Rec.* 2009 Aug 8; 165(6):184. PMID: 19666920.
- **Möbius P, Fritsch I, Luyven G, Hotzel H, Köhler H.** Unique genotypes of Mycobacterium avium subsp. paratuberculosis strains of Type III. *Vet Microbiol.* 2009 Jun 21. PMID: 19647378.
- **Pillars RB, Grooms DL, Wolf CA, Kaneene JB.** Economic evaluation of Johne's disease control programs implemented on six Michigan dairy farms. *Prev Vet Med.* 2009 Aug 1; 90(3-4):223-32. Epub 2009 May 23. PMID: 19464741.
- **Pinedo PJ, Buergelt CD, Donovan GA, Melendez P, Morel L, Wu R, Langae TY, Rae DO.** Candidate gene polymorphisms (BoIFNG, TLR4, SLC11A1) as risk factors for paratuberculosis infection in cattle. *Prev Vet Med.* 2009 Oct 1; 91(2-4):189-96. Epub 2009 Jun 13. PMID: 19525022.
- **Pott J, Basler T, Duerr CU, Rohde M, Goethe R, Hornef MW.** Internalization-dependent recognition of Mycobacterium avium ssp. paratuberculosis by intestinal epithelial cells. *Cell Microbiol.* 2009 Aug 13. PMID: 19681906.
- **Pradenas M, Jara MC, Hernández N, Zambrano A, Collins MT, Kruze J.** Antibody recognition to secreted proteins of Mycobacterium avium subsp. paratuberculosis in sera from infected ruminants. *Vet Microbiol.* 2009 Sep 18; 138(3-4):378-83. Epub 2009 Apr 10. PMID: 19406591.
- **Romano M, Huygen K.** DNA vaccines against mycobacterial diseases. *Expert Rev Vaccines.* 2009 Sep; 8(9):1237-50. PMID: 19722896.
- **Saini V, Raghuvanshi S, Talwar GP, Ahmed N, Khurana JP, Hasnain SE, Tyagi AK, Tyagi AK.** Polyphasic taxonomic analysis establishes Mycobacterium indicus pranii as a distinct species. *PLoS One.* 2009 Jul 16;4(7):e6263. PMID: 19606228.
- **Senturk S, Mecitoglu Z, Ulgen M, Onat K.** Effect of levamisole on faecal levels of acid-fast organisms in cows with paratuberculosis. *Vet Rec.* 2009 Jul 25; 165(4):118-9. PMID: 19633326.
- **Shankar H, Singh SV, Singh PK, Singh AV, Sohal JS, Greenstein RJ.** Presence, characterization, and genotype profiles of Mycobacterium avium subspecies paratuberculosis from unpasteurized individual and pooled milk, commercial pasteurized milk, and milk products in India by culture, PCR, and PCR-REA methods. *Int J Infect Dis.* 2009 Jul 1. PMID: 19576834.
- **Singh SV, Sohal JS, Singh PK, Singh AV.** Genotype profiles of Mycobacterium avium subspecies paratuberculosis isolates recovered from animals, commercial milk, and human beings in North India. *Int J Infect Dis.* 2009 Sep; 13(5):e221-7. Epub 2009 Feb 23. PMID: 19233699.
- **Toft N, Nielsen SS.** Summary receiver operating characteristics (SROC) and hierarchical SROC models for analysis of diagnostic test evaluations of antibody ELISAs for paratuberculosis. *Prev Vet Med.* 2009 Sep 9. PMID: 19747743.

- **Van Rhijn I, Kim Anh Nguyen T, Michel A, Cooper D, Govaerts M, Cheng TY, van Eden W, Branch Moody D, Coetzer JA, Rutten V, Koets AP.** Low cross-reactivity of T cell responses against lipids from *Mycobacterium bovis* and *M. avium* paratuberculosis during natural infection. *Eur J Immunol.* 2009 Aug 17. PMID: 19688747.
- **Wells JE, Bosilevac JM, Kalchayanand N, Arthur TM, Shackelford SD, Wheeler TL, Koohmaraie M.** Prevalence of *Mycobacterium avium* subsp. paratuberculosis in ileocecal lymph nodes and on hides and carcasses from cull cows and fed cattle at commercial beef processing plants in the United States. *J Food Prot.* 2009 Jul;72(7):1457-62. PMID: 19681269.
- **Zhong L, Di Fiore L, Taylor D, Begg D, de Silva K, Whittington RJ.** Identification of differentially expressed genes in ileum, intestinal lymph node and peripheral blood mononuclear cells of sheep infected with *Mycobacterium avium* subsp. paratuberculosis using differential display polymerase chain reaction. *Vet Immunol Immunopathol.* 2009 Oct 15; 131(3-4):177-89. Epub 2009 Apr 19. PMID: 19439365.

JD In Print – Peer Review Crohn's Disease Related Publications

- **Chiappini E, de Martino M, Mangiantini F, Lionetti P.** Crohn Disease and Mycobacterial Infection in Children: An Intriguing Relationship. *J Pediatr Gastroenterol Nutr.* 2009 Aug 11. PMID: 19680150.
- **Hermon-Taylor J.** *Mycobacterium avium* subspecies paratuberculosis, Crohn's disease and the Doomsday scenario. *Gut Pathog.* 2009 Jul 14; 1(1):15. PMID: 19602288.