



New Members

ACT

David Gordon
Gordon McGurk
Sandra Parsons
Heather Tolley
Jennifer Hartley
Tania Henderson
Sankar Mancella

NSW

Maryanne Talese
Isabella Cahill
Jonathan Natoli
Allison Steele
Quach Truong
Min Jun
Yee Min Khor
Grace Heather
Naomi Maple
Kok On Ho

Kathryn Obray
Diane Bennett
Avelina Santiago
Joanne Clissold
Jia Pien Lim
Gary Yip
Valerie Nguyen

QLD

Susan Weber
Lauren Sheriff
Renee Carr
Vikram Vaska
Mohammad Ahmed
Jayde Gawthorne
Sarina Gloeckl
Yiling Koh
Raquel Lo
James Rae
Elizabeth Randall

Leisha Richardson
Belinda Coldebella
Tegan Harris
Shreema Merchant
Erin Anderson
Kenneth Wasmund

SA

Lisa Shephard
Daisy Lai
S Anastasia Potiris
Melissa Young

TAS

Richard Jackson

VIC

Andrea Prendergast
Andrea Zafiropoulos
Jane Ryan
Alexander Aguirre

Marzieh Hosseinezhad
Kylie McLean
Melissa Ruberto
Christopher Vindurampulle
Cody Allison

WA

Tony MacIntyre
Alicia Robinson
Melissa Ferraro
Steven Webb

Overseas

New Zealand
Nicola Beamish

UK

Prysor Williams

USA

Christiane Hennessee

Call for Expressions of Interest for the position of Editor of *Recent Advances in Microbiology*

Recent Advances in Microbiology (RAM) contains reviews of a wide range of topics of interest to our members. The reviews are written by specialists in their fields and have an emphasis on Australian content and issues which are not dealt with elsewhere. The most recent copy of RAM, Volume 9, was such a success it was a sellout.

The Society is looking to start work on Volume 10 and requires an editor to coordinate and oversee the project. The person chosen will receive a \$1,000 honorarium for giving up their time.

To express an interest, please e-mail the ASM General Manager, Chris Daly chris@theasm.com.au by Friday 29 September.

Our news is first
published @

www.biomerieux.com.au

Add us to your favourites!

- The latest news, products & services
- Up to date technical notes & information
- **Free call 1800 333 421**

from diagnosis,
the seeds of better health





Vik Skerman prizewinning essay

Free-living protozoa: the Trojan horse of legionnaires' disease

Introduction

Legionnaires' disease is a severe form of acute infectious pneumonia accounting for 2-15% of community acquired pneumonia that requires hospitalisation¹. Serious infection is generally associated with the elderly and immunocompromised and is therefore often life threatening. Mortality rates of patients who receive appropriate antibiotic treatment range from 5-10%².

Legionellosis is not spread person to person but rather through the inhalation of contaminated water aerosols¹. Many forms of water reservoirs have been implicated in legionellosis outbreaks, these include water cooling towers, evaporative condensers, dental unit waters, spa baths, ice machines, grocery misters, shower heads, water distribution systems and potable water sources³⁻⁷.

Following a large outbreak of legionellosis among attendants at an American Legion convention in Philadelphia 1976, the bacterium *Legionella pneumophila* was identified as the causative agent⁸. Since then, many species within the Legionella genus have been identified and associated with disease. but *L. pneumophila*

Hayley Newton

Australian Bacterial
Pathogenesis Program,
Monash University,
Department of Microbiology

serogroup 1 is responsible for 80-90% of legionnaires' disease worldwide⁹. The recent outbreak in the northern suburbs of Melbourne, in March 2006, demonstrates that *L. pneumophila* continues to be a serious cause of community acquired pneumonia in Australia.

Amoeba as an environmental reservoir of *L. pneumophila*

Early studies demonstrated that Legionella are ubiquitous organisms within freshwater environments¹⁰. *L. pneumophila* has been recovered from potable water, ponds, rivers, lakes, biofilms, thermal waters and many types of man-made water habitats^{7, 10, 11}. This widespread environmental presence of *L. pneumophila* is in contrast to observations that *L. pneumophila* is not

able to replicate in distilled and tap water samples¹². Furthermore, laboratory growth of Legionella requires significant nutrient supplementation. Both of these observations led researchers to the hypothesis that *L. pneumophila* is not a free-living aquatic bacterium¹¹.

In 1980, Rowbotham established a relationship between *L. pneumophila* and free-living freshwater and soil amoebae, demonstrating that *L. pneumophila* infects and replicates intracellularly in Acanthamoeba and Naegleria species. To date, Legionella have been shown to multiply in at least 14 species of amoeba, including Acanthamoeba, Naegleria, Echinamoeba, Hartmannella, Saccamoeba and Vahlkampfia, two species of ciliated protozoa and the slime mould Dictyostelium¹³⁻¹⁷. No environmental extracellular growth of *L. pneumophila* has been documented, providing a strong indication that this relationship between free-living protozoa and Legionella as essential to the environmental dissemination and persistence of this pathogen.

Amoebae and *L. pneumophila* persistence

Amoebae are capable of growth over a wide range of temperatures and provide an intracellular pH conducive to Legionella growth¹³. While providing the niche for Legionella replication, amoebae also act to protect Legionella from harsh environmental conditions. Persistence of Legionella in amoebic cysts protects the bacteria from adverse environmental conditions, and studies have demonstrated that amoebae allow Legionella to survive chlorine treatment^{13, 18, 19}. Replication within protozoa also increases resistance of *L. pneumophila* to biocides, antibiotics, acid, hydrogen peroxide, osmotic and thermal stress²⁰⁻²³.



In man-made water systems, *Legionella* are almost exclusively found within complex biofilms²⁴. The characterisation of *Legionella* within such ecosystems is difficult; however, model biofilm systems have been used to demonstrate that the replication of *L. pneumophila* within a biofilm is dependent on a protozoan host²⁵. Murga *et al.* demonstrated that, within their biofilm model, *L. pneumophila* is able to persist but not multiply in the absence of amoebae. However, since this model comprised only five organisms, it does not represent the much more diverse natural biofilm communities that may provide the nutritional requirements conducive to extracellular replication of *Legionella*.

While it is clear that amoebic hosts provide a protective niche enabling the environmental persistence of *L. pneumophila*, amoebae may also play a crucial role in human legionellosis. *Acanthamoeba* spp. have been shown to expel biocide resistant vesicles containing high numbers of *L. pneumophila*²⁶. These vesicles may become airborne agents, increasing the potential transmission of *Legionella*.

Furthermore, several studies report that replication within free-living amoeba promote the expression of virulence traits^{22, 23}. *L. pneumophila* grown within *Acanthamoeba castellanii* are more than 100-fold more invasive for epithelial cells and 10-fold more invasive for macrophages than *L. pneumophila* grown on agar²².

Amoebae as a tool to study *L. pneumophila* pathogenesis

Researchers have taken advantage of these naturally occurring single cell organisms to investigate the intracellular lifecycle and pathogenesis of *Legionella*. The most commonly employed host organisms are *A. castellanii* and *H. vermiformis* which both support an infection process similar to that observed within mammalian macrophages^{27, 28}.

During human infection, aerosolised *L. pneumophila* are internalised by alveolar

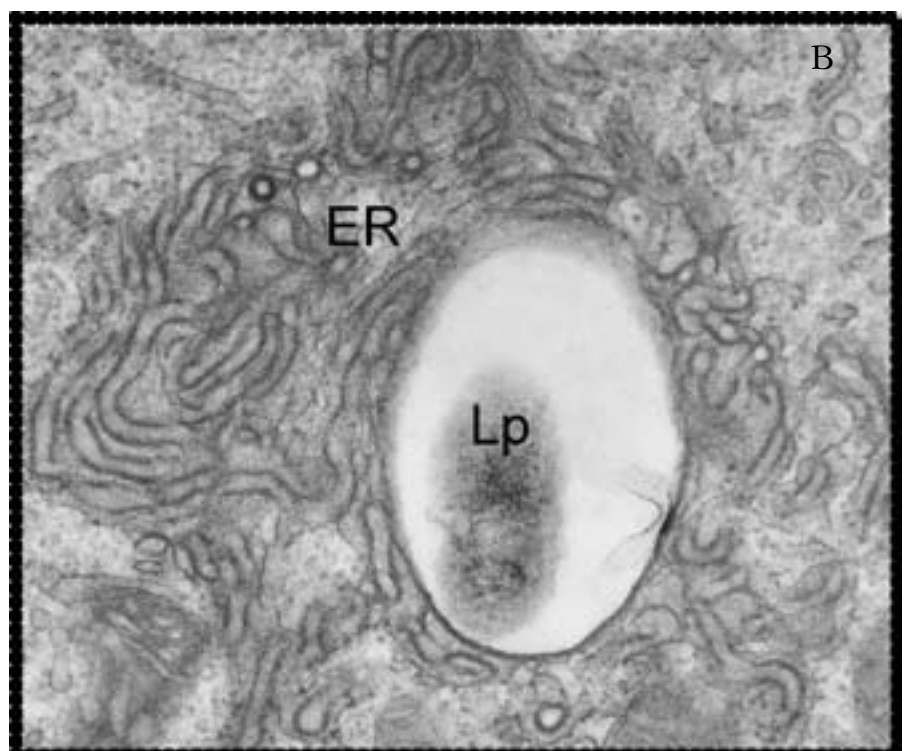
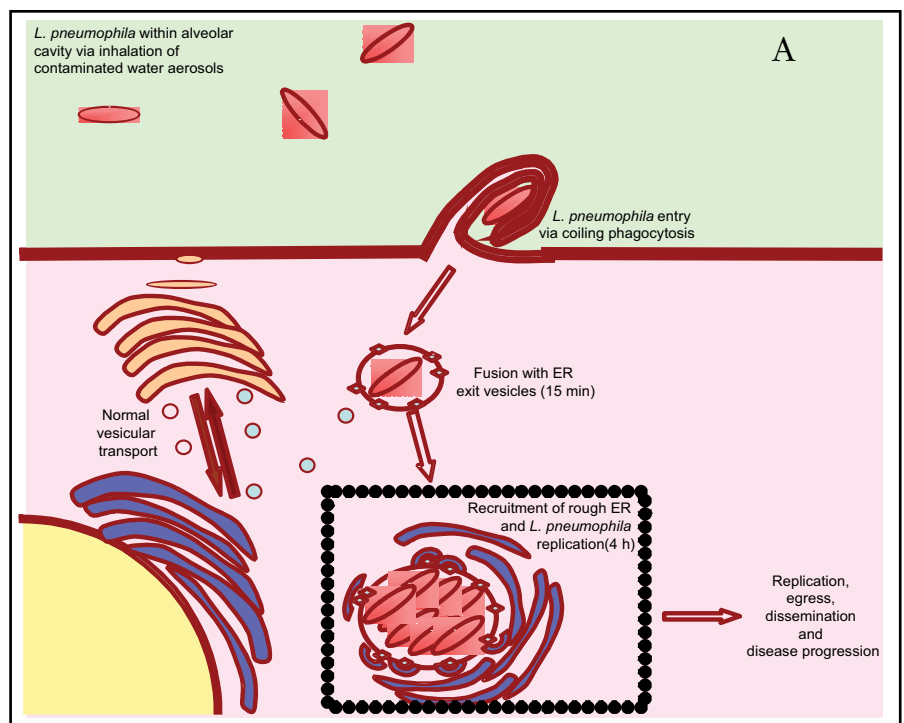


Figure 1. Intracellular lifestyle of *L. pneumophila*.

Schematic representation of the ability of *L. pneumophila* to subvert normal phagolysosome fusion, intercept exit vesicles from the ER and create a unique replicative organelle within macrophage host cells (A)

Electron microscopy of the *L. pneumophila* (Lp) containing vacuole following infection of THP-1, human macrophage like cells, for 5 hours (B).

Magnification $\times 45,000$.



macrophages where they replicate within a unique intracellular vacuole. Figure 1 illustrates that *L. pneumophila* containing vacuole avoids the typical phagosome degradation pathway and phagolysosome fusion, and instead recruits host proteins and vesicles to establish a replicative vacuole surrounded by rough endoplasmic reticulum (ER)^{29,30}.

Several studies have demonstrated that *L. pneumophila* establishes an equivalent replicative vacuole within protozoa, highlighting the common mechanisms utilised for both hosts^{31, 32}. In *H. vermiformis*, *L. pneumophila* is found within a ribosome-studded multilayer membrane, with abundant recruitment of the ER specific protein BiP after just 5 hours of infection³¹.

While some host specific virulence determinants have been identified, it is clear that similar mechanisms are used by *L. pneumophila* to replicate within these two evolutionarily distinct phagocytic host cells. Within both macrophage cell lines and protozoan hosts, the establishment of this unique replicative vacuole is entirely dependent on a type IV secretion system, termed the Dot/Icm system. Mutations within this system render *L. pneumophila* incapable of replication within macrophages and protozoa³³⁻³⁵. Many more genes involved in the interaction between macrophages and *L. pneumophila* have also been shown to be important in protozoa infections.

Hence, it is hypothesised that the ability of *L. pneumophila* to cause human disease is an accidental consequence of a long coevolution process between the bacteria and amoebae³⁶. This provides ample reason to study the interactions between *L. pneumophila* and protozoan host cells as a mechanism for investigating pathogenesis and virulence related genes.

MICRO-FACT

The smallest bacteria have diameters of around 0.2 microns.

Several research groups have begun using the soil amoeba *Dictyostelium discoideum* as a model for Legionella infection^{16, 37}. A great advantage of this model is that it is amenable to genetic analysis unlike the other protozoan hosts available³⁸. *D. discoideum* has a haploid genome and can be genetically altered through ectopic expression of plasmid encoded genes and disruption of genes through homologous recombination³⁸.

Several recent studies demonstrate the value of this protozoan model to study host genes involved in infection. A range of *D. discoideum* proteins have been linked to intracellular replication of *L. pneumophila*^{37, 39, 40}. For example, RtoA, a protein involved in vesicle fusion within *D. discoideum*, has been implicated in the development of the *L. pneumophila* containing vacuolar membrane⁴⁰.

D. discoideum therefore provides a unique opportunity to study protozoan genes involved in *L. pneumophila* pathogenesis. However, the primary disadvantage of this *in vitro* model is the requirement for infection to occur at temperatures below 27°C to maintain *D. discoideum* viability. This may influence any findings based on this model, given that many human pathogens specifically express virulence related genes at 37°C³⁸.

Amoebae and other human pathogens

Understanding the ecological relationship between amoebae and Legionella has led to the discovery of Legionella-like amoebal pathogens (LLAPs)¹⁸. These organisms are unable to be grown on bacteriological agar and are classified obligate intracellular bacterial parasites of free living amoeba.

LLAPs have infrequently been associated with community acquired pneumonia, commonly as a co-pathogen⁴¹. However, given that approximately 50% of community acquired pneumonia in the United States of America is of unknown cause, it is assumed that LLAPs may be involved in at least some of these cases⁴².

The parasitic relationship between Legionella, LLAPs and protozoa is not unique, even though protozoa more commonly phagocytose bacteria, utilising them as a source of nutrients. Two other intracellular pathogens, *Chlamydia pneumoniae* and *Mycobacterium avium*, are able to multiply to some extent within Acanthamoeba species, yet prolific replication within protozoa appears to be an exclusive characteristic of Legionella^{43, 44}. Similar to *L. pneumophila*, *M. avium* grown within *A. polyphaga* is more virulent and exhibits enhanced invasiveness than bacteria grown on broth media⁴⁵.

There are also other endosymbionts of free-living amoeba which remain poorly characterised or uncharacterised, including a range of Rickettsia like microbes, and a range of known pathogens that show *in vitro* resistance to destruction by free-living amoeba. It is predicted that many endosymbionts of free-living amoeba have pathogenic potential and that these amoebic hosts can act as an evolutionary stepping stone for bacterial pathogens³⁶.

Conclusion

Free-living amoeba act as an invaluable tool for the study of *L. pneumophila*. Not only can this model be manipulated to examine the role of virulence genes and the involvement of host proteins during infection, but it can also help to develop our understanding of the environmental persistence of *L. pneumophila*. Such research is essential not only for the development of new therapeutics and diagnostics, but also for the environmental management of *L. pneumophila* and subsequent prevention of serious outbreaks of legionnaires' disease.

Acknowledgements

I would like to thank Vicki Bennet-Wood for her work on the electron microscopy presented in this article. I am indebted to my PhD supervisor, Dr Liz Hartland, for her advice during the preparation of this article and to Dr Fiona Sansom for helpful observations.



References

1. Stout J & Yu VL. Legionellosis. *New Eng J Med* 1997; 337:682-687.
2. Bartlett CLR, Macrae AD & Macfarlane JT. Management of *Legionella pneumoniae*. In: *Legionella Infections*. London: Edward Arnold, 1986, p.56-66.
3. Atlas RM, Williams JF & Huntington MK. Legionella contamination of dental-unit waters. *Appl Environ Microbiol* 1995; 61:1208-1213.
4. Den Boer JW *et al.* A large outbreak of legionnaires' disease at a flower show, the Netherlands, 1999. *Emerg Infect Dis* 2002; 8:37-43.
5. Graman PS, Quinlan GA & Rank JA. Nosocomial legionellosis traced to a contaminated ice machine. *Infect Cont Hosp Epidemiol* 1997; 18:637-640.
6. Joseph CA, Watson JM, Harrison TG & Bartlett CLR. Nosocomial legionnaires' disease in England and Wales 1980-1992. *Epidemiol Infect* 1994; 112:329-345.
7. Morris GK *et al.* Isolation of the legionnaires' disease bacterium from environmental samples. *Ann Intern Med* 1979; 90:664-666.
8. McDade JE, Shepard CC, Fraser DW, Tsai TR, Redus MA & Dowdle WR. Legionnaires' disease: isolation of a bacterium and demonstration of its role in other respiratory disease. *New Eng J Med* 1977; 297:1197-1203.
9. Benson RF & Fields BS. Classification of the genus *Legionella*. *Semin Respir Infect* 1998; 13:90-99.
10. Fliermans CB, Cherry WB, Orrison LH, Smith SJ, Tison DL & Pope DH. Ecological distribution of *Legionella pneumophila*. *Appl Environ Microbiol* 1981; 41:9-16.
11. Rowbotham TJ. Preliminary report on the pathogenicity of *Legionella pneumophila* for freshwater and soil amoebae. *J Clin Pathol* 1980; 33:1179-1183.
12. Skaliy P & McEachern HV. 1979. Survival of the legionnaires' disease bacterium in water. *Annal Intern Med* 1979; 90:662-663.
13. Anand CM, Skinner AR, Malic A & Kurtz JB. Interaction of *L. pneumophila* and a free living amoeba (*Acanthamoeba palestinensis*). *J Hyg (Cambridge)* 1983; 91:167-178.
14. Barbaree JM, Fields BS, Feeley JC, Gorman GW & Martin WT. Isolation of protozoa from water associated with a legionellosis outbreak and demonstration of intracellular multiplication of *Legionella pneumophila*. *Appl Environ Microbiol* 1986; 51:422-424.
15. Fields BS, Shotts EB Jr, Feeley JC, Gorman GW & Martin WT. Proliferation of *Legionella pneumophila* as an intracellular parasite of the ciliated protozoan *Tetrahymena pyriformis*. *Appl Environ Microbiol* 1984; 47:467-471.
16. Hagele S, Kohler R, Merkert H, Schleicher M, Hacker J & Steinert M. *Dictyostelium discoideum*: a new host model system for intracellular pathogenesis of the genus *Legionella*. *Cell Microbiol* 2000; 2:165-171.
17. Newsome AL, Baker RL, Miller RD & Arnold RR. Interactions between *Naegleria fowleri* and *Legionella pneumophila*. *Infect Immun* 1985; 50:449-452.
18. Adeleke A, Pruckler J, Benson RF, Rowbotham TJ, Halablab M, Fields B. Legionella-like amoeba pathogens: phylogenetic status and possible role in respiratory disease. *Emerg Infect Dis* 1996; 2:225-230.
19. King CH, Shotts Jr. EB, Wooley RE & Porter KG. Survival of coliforms and bacterial pathogens within protozoa during chlorination. *Appl Environ Microbiol* 1988; 54:3023-3033.
20. Barker JM, Brown W, Collier PJ, Farrell I & Gilbert P. Relationship between *Legionella pneumophila* and *Acanthamoeba polyphaga*: physiological status and susceptibility to chemical inactivation. *Appl Environ Microbiol* 1992; 58:2420-2425.
21. Cirillo JD, Cirillo SL, Yan L, Bermudez LE, Falkow S & Tompkins LS. Intracellular growth in *Acanthamoeba castellanii* affects monocyte entry mechanisms and enhances virulence of *Legionella pneumophila*. *Infect Immun* 1999; 67:4427-4434.
22. Cirillo JD, Falkow S & Tompkins LS. Growth of *Legionella pneumophila* in *Acanthamoeba castellanii* enhances invasion. *Infect Immun* 1994; 62:3254-3261.
23. Rowbotham TJ. Current views on the relationship between amoeba, legionellae and man. *Israel J Med Sci* 1986; 22:678-689.
24. Rogers J, Dowsett AB, Dennis PJ, Lee JV & Keevil CW. Influence of temperature and plumbing material selection on biofilm formation and growth of *Legionella pneumophila* in a model potable water system containing complex microbial flora. *Appl Environ Microbiol* 1994; 60:1585-1592.
25. Murga R, Forster TS, Brown E, Pruckler JM, Fields BS & Donlan RM. Role of biofilms in the survival of *Legionella pneumophila* in a model potable-water system. *Microbiol* 2001; 147:3121-3126.
26. Berk SG, Ting RS, Turner GW & Ashburn RJ. Production of respirable vesicles containing live *Legionella pneumophila* cells by two *Acanthamoeba* spp. *Appl Environ Microbiol* 1998; 64:279-286.
27. Fields BS, Fields SR, Loy JN, White EH, Steffens WL & Shotts EB. Attachment and entry of *Legionella pneumophila* in *Hartmannella vermiformis*. *J Infect Dis* 1993; 167:1146-1150.
28. Moffat JF & Tompkins LS. A quantitative model of intracellular growth of *Legionella pneumophila* in *Acanthamoeba castellanii*. *Infect Immun* 1992; 60:296-301.
29. Horwitz MA. Formation of a novel phagosome by the legionnaires' disease bacterium (*Legionella pneumophila*) in human monocytes. *J Exp Med* 1983; 158:1319-1331.
30. Kagan JC, Stein MP, Pypaert M & Roy CR. Legionella subvert the functions of Rab1 and Sec22b to create a replicative organelle. *J Exp Med* 2004; 199:1201-1211.
31. Abu Kwaik Y. The phagosome containing *Legionella pneumophila* within the protozoan *Hartmannella vermiformis* is surrounded by the rough endoplasmic reticulum. *Appl Environ Microbiol* 1996; 62:2022-2028.
32. Cianciotto NP & Fields B. *Legionella pneumophila* mip gene potentiates intracellular infection of protozoa and human macrophages. *Proc Natl Acad Sci USA* 1992; 89:5188-5191.
33. Berger KH & Isberg RR. Two distinct defects in intracellular growth complemented by a single genetic locus in *Legionella pneumophila*. *Mol Microbiol* 1993; 7:7-19.
34. Gao IY, Harb OS & Abu Kwaik Y. Utilization of similar mechanisms by *Legionella pneumophila* to parasitize two evolutionary distant hosts, mammalian and protozoan cells. *Infect Immun* 1997; 65:4738-4746.
35. Segal G, Purcell M & Shuman HA. Host cell killing and bacterial conjugation require overlapping sets of genes within a 22-kb region of the *Legionella pneumophila* genome. *Proc Natl Acad Sci USA* 1998; 95:1669-1674.
36. Greub G & Raoult D. Microorganisms resistant to free-living amoebae. *Clin Microbiol Rev* 2004; 17:413-433.
37. Solomon JM, Rupper A, Cardelli JA & Isberg RR. Intracellular growth of *Legionella pneumophila* in *Dictyostelium discoideum*, a system for genetic analysis of host-pathogen interactions. *Infect Immun* 2000; 68:2939-2947.
38. Solomon JM & Isberg RR. Growth of *Legionella pneumophila* in *Dictyostelium discoideum*: a novel system for genetic analysis of host-pathogen interactions. *Trends Microbiol* 2000; 8:478-480.
39. Fajardo M *et al.* Calnexin, calreticulin and cytoskeleton-associated proteins modulate uptake and growth of *Legionella pneumophila* in *Dictyostelium discoideum*. *Microbiol* 2004; 150:2825-2835.
40. Li Z, Solomon JM & Isberg RR. *Dictyostelium discoideum* strains lacking the RtoA protein are defective for maturation of the *Legionella pneumophila* replication vacuole. *Cell Microbiol* 2005; 7:431-442.
41. Marrie TJ, Raoult D, La Scola B, Birtles RJ & de Carolis E. Legionella-like and other amoebal pathogens as agents of community-acquired pneumonia. *Emerg Infect Dis* 2001; 7:1026-1029.
42. Abu Kwaik Y, Gao IY, Stone BJ, Venkataraman C & Harb OS. Invasion of protozoa by *Legionella pneumophila* and its role in bacterial ecology and pathogenesis. *Appl Environ Microbiol* 1998; 64:3127-3133.
43. Essig A, Heinemann M, Sinnacher U & Marre R. Infection of *Acanthamoeba castellanii* by *Chlamydia pneumoniae*. *Appl Environ Microbiol* 1997; 63:1396-1399.
44. Steinert M, Birkness K, White E, Fields B & Quinn F. *Mycobacterium avium* bacilli grow saprophytically in coculture with *Acanthamoeba polyphaga* and survive within cyst walls. *Appl Environ Microbiol* 1998; 64:2256-2261.
45. Cirillo JD, Falkow S, Tompkins LS & Bermudez LE. Interaction of *Mycobacterium avium* with environmental amoebae enhances virulence. *Infect Immun* 1997; 65:3759-3767.

MICRO-FACT

The human body is composed of 10^{13} human cells plus 10^{14} bacterial cells in the gut.



ASM2006: Gold Coast, 2-6 July 2006

Organising Committee conference report

That venerable Queensland marketing slogan “beautiful one day, perfect the next” proved absolutely accurate between 2-6 July this year. ASM2006 on the Gold Coast scored the rare and happy trifecta of great weather, great venue and great science. The cloudless skies, mild weather, beach, myriad excellent accommodation and dining options, together with a nearly brand new convention centre, made a combination irresistible to 850 happy conference delegates.

The science is the reason it all happens. The National Scientific Advisory Committee (NSAC) and the Scientific Program Committee assembled a superb programme of invited speakers and symposia. The invited speakers were all of the highest international reputation. Their expertise spanned the breadth of microbiology, and they all delivered informative and engaging presentations.

Selecting the most ‘outstanding’ talks for special mention is a perilous enterprise but, from my completely subjective point of view, the presentations by John Mattick on the central role of small RNA molecules in the regulation of development, Rick Cavicchioli on the application of genomics to Antarctic microbiology (the Fenner Lecture), Sandy Gruss on respiration by lactic acid bacteria, Bala Swaminathan on Pulsenet, Ruth Hall on integrons (the Rubbo Oration) and, of course, Australian of the Year Ian Frazer on cervical cancer vaccines, were of very high impact. The symposia and plenary lectures were complemented by a very strong programme of posters and proffered papers. A new category of ‘case studies’ elicited considerable interest.

Thanks are due to the Scientific Program Committee chaired by Ala Lew, and the NSAC, which is chaired by Hatch Stokes

Phil Giffard

Local Organising Committee Chair
ASM2006

and included the divisional chairs for ASM2006 – Johnson Mak, Robyn Wood, Jan Tennant and Stephen Kidd.

Not all the science is organised by NSAC and the Scientific Program Committee. There is now a long tradition of an extensive programme of specialist workshops being run before, during and after ASM Annual Scientific Meetings. ASM2006 was no exception, with well attended workshops being held on subjects including the communication of science to the public, interacting with the laboratory management, the detection of antibiotic resistance and the teaching of microbiology to medical students.

This year we were especially fortunate to have Barbara Hyde, the Director of Communications for the American Society for Microbiology, as a workshop and conference participant. Thanks to workshop convenors Jeanette Williamson and Tony Jennings, the workshop organisers and presenters, and to Bond University and QUT (in particular Mark O’Brien) for assistance with facilities and equipment.

There is also more to science than science. The ASM2006 social programme was as lively and memorable as regular attendees at ASM Annual Scientific Meetings have come to expect. From the *Leis and life savers* at the welcome mixer, to the five star class of the Rubbo supper, to the recreation (disinterment?) of the best and worst of the ‘decade that style forgot (i.e. the 1970s)’ at the Roche sponsored conference dinner at Jupiter’s Casino,

the social programme hit just the right notes. It was a credit to Social Program Convenor Sandra Hall and her team.

The trade display is an integral part of ASM Annual Scientific Meetings. ASM2006 was particularly well supported by sponsors and exhibitors – they are all listed on page 6 of the ASM2006 abstract book so have a look! Delegates were encouraged to circulate around the exhibition with a ‘passport’ competition which was won by Joanne Patterson. This process also revealed that the delegates considered that Laboratory Diagnostics merited the ‘most bodacious booth’ award.

In addition, BD, bioMérieux, Merck Sharp & Dohme, Oxoid, Pfizer Australia and Roche have continued to generously sponsor a range of prestigious awards for scientific achievement, while CSL continues to sponsor the Bazeley Oration.

The ASM National Office was central to the conference organisation process. The ASM maintains its own professional conference organiser facility. This team, lead by Janette Sofronidis, are in large part responsible for the superb logistics and value for money experienced by the delegates, and the Organising Committee are deeply grateful for their experience and diligence. In addition, the ASM Executive, chaired by (then) ASM President Julian Rood, provided wise guidance precisely when needed.

Finally, I must thank my Organising Committee colleagues – Mark O’Brien, Helen Smith, Jeanette Williamson, Ala Lew, Jennifer Riley, Sandra Hall and Tony Jennings for all their efforts. I also must not forget to thank Sullivan and Nicolaides for the use of their boardroom for all those committee meetings!



ASM2006: Gold Coast, 2-6 July 2006

ASM prizewinners and Rubbo Oration

2005 Frank Fenner Research Award

Rick Cavicchioli



The David White Excellence in Teaching Award

Elizabeth Fagan

*Dept of Microbiology & Immunology
University of Melbourne*

Elizabeth is a tutor/demonstrator in microbiology for medical, dental and science students, and in the medical education unit as a PBL tutor. She has been associated with these departments for 10 and 6 years respectively. Her background experience is in clinical microbiology, having worked for a number of years in hospital and private pathology laboratories in Melbourne.

Elizabeth's main interest is in small group teaching. She is presently researching the value of oral presentations from an undergraduate perspective for her final subject in the Graduate Certificate of University Teaching, a postgraduate course at the University of Melbourne.



2006 BioMérieux Identifying Resistance Award

Sydney Bell

Director, Area Microbiology, South East Area Laboratory Services & Professor, Faculty Medicine, UNSW

Syd Bell has worked in diagnostic microbiology for over 40 years. His principal research interest has been the study of antimicrobial resistance to antibiotics and its application to clinical medicine. He has published, as the principal author, original research relating to the resistance of *Staphylococcus aureus* to cephaloridine, the resistance of *Pseudomonas aeruginosa* to carbenicillin, mechanisms of ampicillin resistance in *Haemophilus influenzae*, mutation of *P. aeruginosa* to resistance to piperacillin and the resistance to β -lactamases in *Streptococcus pneumoniae*. He has also made a major contribution to published studies on the β -lactamases of *Yersinia enterocolitica* and the carbapenem-hydrolysing β -lactamases of *Klebsiella pneumoniae*.

Syd's major contribution to the field of the use of antimicrobials in clinical practice has been the publication of the CDS Susceptibility Test in 1969 and the continuing development of the method up to the present time. The CDS now occupies a unique status in susceptibility testing in Australia. It is the most up to date method in use in this country and consistently outperforms other techniques in quality assurance programmes.



2006 Rubbo Oration

Prof Ruth Hall

*NHMRC Senior Principal Research Scientist, School of Molecular and Microbial Biosciences
University of Sydney*

The premier scientific event of ASM 2006 was the prestigious Rubbo Oration. This year's oration was delivered by Prof. Ruth Hall, whose presentation was on *Antibiotic resistance: genes on the move*.

Prof. Hall is one of the few Australian researchers who have been responsible for the development of an entire research field. Integrons and their associated gene cassettes are critical mechanisms by which bacteria acquire antibiotic resistance determinants, a process that is of major importance to public health. The entire integron field was developed from her landmark paper that defined these important mobile genetic elements. Prof. Hall developed a theory to explain their genetic diversity and adaptability and then went on and obtained the experimental evidence that verified her hypothesis.

Ruth is pictured at the Trade Mixer with ASM colleagues.





Microbiologists at work...





Photos courtesy of Mark O'Brien.



ASM2006: Gold Coast, 2-6 July 2006

BD Student Awards 2006

The annual competition for the BD Awards showcases the work being done by young Australian microbiologists. One award is given in each State to the best student presentation of their research work. It covers the cost of attendance at the ASM annual conference. Each winner presented their work at the BD plenary session at the conference. This year's winners are shown with session convener, Cheryl Power.

New South Wales

Leigh Monaban
University of Technology, Sydney

Bacterial cell division: trapping a helical intermediate in the assembly of the Z ring.

Queensland

Erin Price
Queensland University of Technology

High resolution fingerprinting of *Campylobacter jejuni* using a small number of binary gene targets derived from comparative genome hybridisation studies.

South Australia

Francesca Bell
University of Adelaide

Genetic analysis of copper transport and associated genes in *Listeria monocytogenes*.

Victoria

Emily Hart
University of Melbourne

Identification of a novel putative transcriptional regulator and colonisation factor of *Citrobacter rodentium*.

Western Australia

Chelsea Papadopoulos
University of Western Australia

The outer membrane core lipopolysaccharide of *Pseudomonas aeruginosa* is associated with tolerance to tea tree oil and components.

Tasmania

Donglai Zhang
University of Tasmania

Is temperature the prime factor governing inactivation in all bacteria?



BD winners from left to right, Leigh Monaban, Emily Hart, Erin Price, Chelsea Papadopoulos, Francesca Bell, DongLai Zhang.



Meetings

Contributions listing relevant meetings are welcome. Please send to: <editor@theasm.com.au>

2006

10 October 2006

University of Queensland, St. Lucia

Food Microbiology Seminar Series – P Desmarchelier (FSA)

A world class event, presented solely by authors of AIFST's coveted 'Green Book'. The authors will present scientific status summaries of foodborne microorganisms of public health significance (Green Book), adding emphasis via case studies from their own work. The fee structure incorporates discounts for ASM and AIFST members, as well as students and student members.

The evening seminar series is targeted to microbiologists and technical staff from industry, government, academia and consulting laboratories, food manufacturing QA staff, university/TAFE students and potential or current NATA food microbiology signatories.

Presented by ASM Food Microbiology SIG and AIFST

E-mail: sofroni@eml.org.au

E-mail: aifst@aifst.asn.au

15-18 October

Amsterdam, Netherlands

6th International Conference of the Hospital Infection Society

Contact: Congress Secretariat

HIS 2006, Concorde Services Ltd

4B/50 Spiers Wharf, Glasgow G4 9TB

Tel: (44) 141 331 0123

Fax: (44) 141 331 0234

E-mail: info@his2006.com

Web: www.his2006.com

16-19 October

Hilton on the Park, Melbourne

23rd NRL Workshop on Serology

E-mail: rosanna@nrl.gov.au

Web: www.nrl.gov.au

29 October – 1 November

Crown Promenade Hotel, Melbourne

VTEC 2006: The 6th International Symposium on Shiga Toxin (Verocytotoxin) producing *Escherichia coli* infections

Chair: Elizabeth Hartland

Conference Manager: Janette Sofronidis

Australian Society for Microbiology

E-mail: janette@theasm.com.au

17-18 November 2006

Grand Chancellor Hotel, Hobart

Victoria & Tasmania Bi-State Conference: "Food: Medical Microbiology"

Victorian State Branch

Australian Society for Microbiology

Tel: (03) 9811 9012

E-mail: Sue Cornish – scornish@mayfield.edu.au

Web: <http://asmvic.scienceinpublic.com/hobart/index.html>

Victorian State branch website:

www.asmvic.org

12 December 2006

University of Queensland, St. Lucia

Food Microbiology Seminar Series – Narelle Fegan (FSA)

For details see announcement at 10 October 2006

2007

22-24th February

Rydges, Melbourne

Antimicrobials 2007

Australian Society for Antimicrobials Annual Scientific Meeting

Important Dates:

Abstract Submission Deadline:

Friday 15th December 2006

Early Bird Registration Deadline:

Friday 15th December 2006

Website: www.icms.com.au/asa2007

1-6 July

Melbourne Exhibition & Convention Centre

23rd International Conference on Yeast Genetics and Molecular Biology

This is the first time this meeting has been held in Australia and the Australian yeast group is keen to make this a spectacular programme.

Confirmed speakers include Sir Paul Nurse (Nobel Laureate), Gerry Fink and Steve Oliver.

Chair: Ian Macreadie

Conference Manager: The Meeting Planners

Tel: (03) 9417 8888

E-mail: yeast2007@meetingplanners.com.au

Web: www.yeast2007.org

9-13 July

Adelaide Convention & Exhibition Centre

ASM 2007, Adelaide

Chair: Andrew Lawrence

Conference Manager: Janette Sofronidis

Australian Society for Microbiology

Tel: (03) 9867 8699

E-mail: janette@theasm.com.au

1-4 November

Hamilton Island, Great Barrier Reef, Qld

3rd Medical Mycology MasterClass 2007

Exclusive 2 day advanced class in medical mycology designed for specialists and trainees in infectious diseases, microbiology, haematology and intensive care medicine and for laboratory scientists/specialists specialising in medical mycology.

Chair: David Ellis

E-mail: david.h.ellis@adelaide.edu.au

Conference Manager: Janette Sofronidis

E-mail: janette@theasm.com.au

Australian Society for Microbiology,

Conference Management

Tel: (03) 9867 8699

Web: to be established – stay tuned!

<http://www.2005mycologymasterclass.org/> is the website of the most recently held MasterClass.

The 3rd Medical Mycology MasterClass 2007 is supported by an unrestricted educational grant from Pfizer.



Australian Society for Microbiology Incorporated

NATIONAL COUNCIL EXECUTIVE

President

Associate Prof Keryn Christiansen

Past President

Julian Rood

Vice President, Scientific Affairs

Dr Hatch Stokes

Vice President, Corporate Affairs

Adj Assoc Prof Silvano Palladino

BRANCH DELEGATES

ACT Dr Nick Medveczky

NSW Assoc Prof Elizabeth Harry

Qld Dr Mark O'Brien

SA Dr Eveline Bartowsky

Tas Ms Kathleen Shaw

Vic Ms Sue Cornish

WA Ms Suellen Blackaby

NT (sub branch) Mr Kevin Freeman

Chair, National Scientific Advisory Committee

Dr Hatch Stokes

Chair, National Examinations Board

Prof Peter Coloe

Chair, National Qualifications Cttee

Dr Ruth Foxwell

Convenor, Visiting Speakers' Program

Dr Mary Barton

Editor, Microbiology Australia

Prof Ian Macreadie/Mrs Jo Macreadie

Registrar, National Examinations Board

Prof Peter Timms

Public Officer of the Society

Dr Ray Akhurst

General Manager

Mr Chris Daly

Conference Manager

Ms Janette Sofronidis

Administration & Events Officer

Ms Meg Lukies

Part-time Personal Administration

Ms Lina Raco

BRANCH SECRETARIES

ACT

Dr Nicholas Medveczky

TGAL Immunology

PO Box 100

Woden ACT 2606

Tel: (02) 6232 8491

E-mail: nicholas.medveczky@health.gov.au

NSW

Helen Ziochos

Liverpool Hospital

Department of Microbiology

PO Box 103, Liverpool NSW 2170

Tel: (02) 9828 5144

E-mail: helen.ziochos@swsahs.nsw.gov.au

Qld

Dr Patrick Blackall

Animal Research Institute

Locked Mail Bag 4

Moorooka QLD 4105

Tel: (07) 3362 9498

E-mail: blackap@dpi.qld.gov.au

SA

Dr Eveline Bartowsky

Research Microbiologist

The Australian Wine Research Institute

PO Box 197, Glen Osmond SA 5064

Tel: (08) 8303 6600

E-mail: Eveline.Bartowsky@awri.com.au

Tas

Ms Sarah Foster

LGH, Cnr Franklin and Charles Streets

Launceston TAS 7250

Tel: (03) 6348 7670

E-mail: sarah_anne_74@hotmail.com

Vic

Dr Enzo Palombo

Senior Lecturer

Swinburne University of Technology

School of Engineering & Science

PO Box 318, Hawthorn VIC 3122

Tel: (03) 9214 8571

E-mail: epalombo@swin.edu.au

WA

Miss Nicola Barrett

Microbiology Dept, Royal Perth Hospital

Wellington Street, Perth WA 6000

Tel: (08) 9224 2444

E-mail: nicola.barrett@health.wa.gov.au

NT (sub branch)

Mr Kevin Freeman

12 Beacon Court, Palmerston NT 0830

Tel: (08) 8922 8685

E-mail: kevin.freeman@nt.gov.au

CONVENORS OF ASM STANDING COMMITTEES

ASM Foundation

Dr Ray Akhurst

CSIRO, Division of Entomology

GPO Box 1700, Canberra ACT 2601

Tel: (02) 6246 4123

E-mail: ray.akhurst@ento.csiro.au

BioSafety

Mr Lee Smythe, Supervising Scientist

WHO/FAO/OIE Collaborating Centre

for Reference & Research on Leptospirosis

Queensland Health Scientific Services

39 Kessels Rd, Coopers Plains QLD 4108

Tel: (07) 3274 9064

Fax: (07) 3274 9175

E-mail: Lee_Smythe@health.qld.gov.au

Clinical Microbiology

Dr Stephen Graves

Director of Microbiology

Hunter Area Pathology Service (HAPS)

John Hunter Hospital,

Newcastle NSW 2300

Tel: (02) 4921 4420

Mobile: 0407 506 380

Fax: (02) 4921 4440

E-mail: stephen.graves@hne

health.nsw.gov.au

Ethics Committee

Emeritus Prof Nancy Millis

University of Melbourne

School of Microbiology, Parkville VIC 3052

Tel: (03) 9344 5707

E-mail: jmjohn@unimelb.edu.au

National Scientific Advisory Committee

Dr Hatch Stokes

Dept of Biological Sciences

Macquarie University NSW 2109

Tel: (02) 9850 8164

E-mail: hstokes@ma.bio.mq.edu.au

Publications/Editorial Board

Dr Ailsa Hocking

CSIRO, Div Food Science & Technology

PO Box 52, North Ryde NSW 2113

Tel: (02) 9490 8520

E-mail: ailsa.hocking@csiro.au

Research Trust Advisory & Development Committee

Assoc Prof Elizabeth Dax

National Serology Reference Laboratory

4 Fl, Healy Building

41 Victoria Parade, Fitzroy VIC 3065

Tel: (03) 9418 1111

E-mail: liz@nrl.gov.au

CONVENORS OF ASM SPECIAL INTEREST GROUPS

Division 1

Antimicrobials

John Merlino

Concord Repatriation General Hospital

Microbiology and Infectious Diseases

Hospital Road, Concord NSW 2173

Tel: (02) 9767 6658

E-mail: merlinoj@email.cs.nsw.gov.au

Mycobacteria

Dr Janet Fyfe

Mycobacterium Reference Laboratory

Victorian Infectious Diseases

Reference Laboratory, 10 Wreckyn Street

North Melbourne VIC 3051

Tel: (03) 9342 2617 Fax: (03) 9342 2666

E-mail: Janet.Fyfe@mh.org.au

Mycology

Dr Weiland Meyer, Westmead Hospital

ICPMR CIDMLS Microbiology

Level 2, Room 3114A

Darcy Road, Westmead NSW 2145

Tel: (02) 8344 5701

E-mail: w.meyer@usyd.edu.au

Mycoplasmatales

Dr Steven Djordjevic

Elizabeth Macarthur Agricultural Institute

Private Mail Bag 8, Camden NSW 2570

Tel: (02) 4640 6426

E-mail: steve.djordjevic@agric.nsw.gov.au

Ocular Microbiology

Dr Mark Willcox

University of New South Wales

Rupert Myers Building, Sydney NSW 2052

Tel: (02) 9385 7524

E-mail: m.willcox@unsw.edu.au

Parasitology and Tropical Medicine

Dr Andrew Butcher

Senior Medical Scientist

Adjunct Senior Lecturer

University of South Australia

Institute of Medical & Veterinary Science

The Queen Elizabeth Hospital

Department of Clinical Microbiology &

Infectious Diseases

28 Woodville Road, Woodville SA 5011

Tel: (08) 8222 6728

Fax: (08) 8222 6032

E-mail: andrew.butcher@imvs.sa.gov.au

Public Health Microbiology

Dr Geoffrey Hogg

University of Melbourne

Microbiological Diagnostic Unit

Parkville VIC 3052

Tel: (03) 8344 5713

E-mail: g.hogg@mdu.unimelb.edu.au

Clinical Serology & Molecular

David Dickeson

Serology Manager, Centre for Infectious

Diseases & Microbiology Lab Services

Level 3, ICPMR, Westmead Hospital

Westmead NSW 2145

Tel: (02) 9845 6861 Fax: (02) 9633 5314

E-mail: davidd@icpmr.wsaahs.nsw.gov.au

Veterinary Microbiology

Dr Glenn Browning

The University of Melbourne

Vet Preclinic Centre

Gratton Street, Parkville VIC 3052

Tel: (03) 8344 7342

E-mail: glenfb@unimelb.edu.au

Women's and Children's Microbiology

Convenor:

Dr Suzanne Garland

Royal Children's Hospital

Microbiology, 132 Grattan Street

Melbourne VIC 3000

Tel: (03) 9344 2476

E-mail: Suzanne.garland@rwh.org.au

Secretary:

Mr Andrew Lawrence

Women's & Children's Hospital

Microbiology & Infectious Diseases Dept

72 King William Rd, Nth Adelaide SA 5006

Tel: (08) 8161 6376

Fax: (08) 8161 6051

E-mail: andrew.lawrence@cywhs.sa.gov.au

Division 2

Virology

Division 3

AquaSIG – Water Microbiology

Mr Simon Rockliff

ACT Health

ACT Government Analytical Laboratories

Micro Section, Locked Bag 5,

Western Creek ACT 2611

Tel: (02) 6205 8701 Fax: (02) 6205 8703

E-mail: simon.rockliff@act.gov.au

Computers

Mr Paul Hakendorf

Flinders Medical Centre

Clinical Epidemiology & Health Outcomes

Unit, Bedford Park SA 5042

Tel: (08) 8204 3950 Ext 4451

E-mail: paul.hakendorf@fmc.sa.gov.au

Cosmetics and Pharmaceuticals

Dr Paul Priscott

AMS Laboratories, 118 Hattersley Street

Rockdale NSW 2216

Tel: (02) 9567 8544

E-mail: applied@tig.com.au

Culture Media

Mr Peter Traynor

Oxoid Australia Pty Limited

20 Dalgleish Street

Thebarton SA 5031

Tel: 1800 33 11 63

E-mail: peter.traynor@oxoid.com.au

Education

Ms Cheryl Power

University of Melbourne

Dept Microbiology

Parkville VIC 3052

Tel: (03) 8344 0332

E-mail: cherylpj@unimelb.edu.au

Food Microbiology

Sofroni Eglezos

Technical Manager

EML Consulting Services Qld Pty Ltd

1/148 Tennyson Memorial Avenue

Tennyson QLD 4105

Tel: (07) 3848 3622

Fax: (07) 3392 8495

Mobile: 0410 664 530

E-mail: sofroni@eml.com.au

Web: www.eml.com.au

Laboratory Management

Captain Dennis Mok, MASM

2nd Division, Randwick Barracks

Randwick NSW 2031 or

18 Downwind St, Birkdale QLD 4159

Tel: 0433 288 441

E-mail: dennis.mok1@gmail.com

convenorSIG@gmail.com

Microbial Ecology

Dr John Bowman

University of Tasmania Antarctica CRC