AUSTRALIAN ATHEROSCLEROSIS SOCIETY Inc.

Dear Member,

Welcome to an info-packed e news this month, with an update on the fantastic ASM in Fremantle this year, as well as numerous other interesting titbits and meeting announcements.
If you have still to renew your membership, (the deadline was March 31) then I urge you to do so as soon as possible, in order to benefit from your membership when you register for the ASM.
When renewing, please take a moment to update your details, such as student / non student etc. as these will be used to determine your eligibility for discounts, and award applications.

Included in this e-News

• Annual Scientific Meeting – Call for Abstracts and Registration now open
• SCOLAR 2015 will be held on October 16th 2015 in Sydney
• Membership report
• AAS Trust Fund Travel Awards: Reports from Vyoma Patel and Liming Hou
• Feature article entitled: 'Modelling plaque development mathematically' by Mary R Myerscough and Alexander D Chalmers, School of Mathematics and Statistics
• ICLA Meeting – September 11- 12, 2015 in Korea

Look forward to seeing you all in Fremantle,

Fatiha Tabet, Editor

AAS Scientific Meeting 2015 – Call for Abstracts

Meeting Date: 21-23 October 2015
Location: Maritime Museum Fremantle
Abstract Deadline: 4 September 2015

With prizes for Young Investigators and Students, both oral and poster presentations, there is something for everyone to aim for at this year's meeting, along with a terrific line up of invited speakers including Guest International Speakers; Professor Bart Staels, from the Pasteur Institute in Lille, France, Bhama Ramkhelawon (USA), Jean-Sébastien Silvestre (France) and Katrina Binger

(Germany).

Our national expert speakers this year are: Leon Adams (WA) Alex Bobik (VIC),Gerald Watts (WA), Len Kritharides (NSW) and Karlheinz Peter (VIC) and the program committee would like to thank all of them for their involvement and participation.

Abstract Submissions are now open, and you can find all the information on the meeting, register your place and submit your abstract at the secretariat website www.yoursecretariat.com.au or simply click here to submit your abstract.

Please note financial student members may apply for a travel grant to assist in attending the meeting, for more details or to apply simply to go www.yoursecretariat.com.au and LOGIN as a member, then click on the travel grants application tab.

Click here to download the final invitation brochure detailing the program.

SCOLAR 2015

Date: 16th October 2015
Location: Sydney – The Heart Research Institute

This year we have recruited students and ECRs to form a SCOLAR Committee. Members include: Dr Bronwyn Brown, Dr Siân Cartland, Mr Pradeep Cholan, Dr Jessica Macer-Wright, Ms Dhanya Ravindran, Ms Anisyah Ridiandries. Organised by the student and ECR Committee members, the SCOLAR Program will showcase themes relevant to the AAS Annual Scientific Meeting. This year it will be held in **Sydney at the Heart Research Institute**. A webinar will be available live from the venue.

For SCOLAR Program information please contact Dr Mary M Kavurma: Mary.Kavurma@hri.org.au

Membership Renewals

There are a number of members who have yet to renew their membership. Thank you for those who are ahead of the game. Technically your membership lapsed on March 31st, so be sure to visit the secretariat site www.yoursecretariat.com.au to renew your membership if you have not already done so, and even if you have – update your details ahead of registration to the ASM.
Contact admin@yoursecretariat.com.au or call 02 4356 0007 if you have any troubles, the team are ready and waiting to help you.

PLEASE ENSURE YOU ADD admin@yoursecretariat.com.au TO YOUR CONTACTS AND SAVE THE LINK TO YOUR FAVOURITES. If you have any issues at all please e mail admin@yoursecretariat.com.au directly – thank you.

AAS Trust Fund - Member reports

The AAS Trust Fund is available to our young investigator members to attend a scientific meeting, upon confirmation of your abstract acceptance to the conference you may apply via www.yoursecretariat.com.au

Two successful applicants in 2015 share their experiences in the reports below:

Vyoma Patel: IAS, Amsterdam, May 2015

Through the generous support of AAS, I received a Student Travel Grant to attend the 17th triennial congress of the International Atherosclerosis Society May 2015 in Amsterdam, Netherlands, for which I am most grateful. The meeting had a fascinating scientific program bringing together numerous cardiovascular experts from around the world for a stimulating exchange of scientific information and ideas relating to impacts of atherosclerosis on human health. By attending this meeting, I managed to appeal to my specific interests as well as the broader field of cardiovascular disease.

I presented a poster titled “Expression profile of adhesion and chemokine markers on monocyte subsets and their association with atherosclerosis”. Presenting at this meeting not only gave me an opportunity to disseminate my research to an international audience but, also, through discussion, gave me great ideas for future work on my project.

Attending several symposiums and scientific sessions at the conference broadened my understanding of the concepts involved in the dyslipidemia, pathogenesis, epidemiology and prevention of atherosclerosis, all of which form an integral part of my project. I really enjoyed attending the ‘PCSK9’ sessions, which provided a tremendous amount of information. From this, I now have a greater understanding of new strategies to reduce the risk of heart disease relating to LDL/PCSK9 axis. The entire experience at the conference was very educational and will greatly facilitate my work in future.

Overall, attending this conference as a great way to keep abreast of emerging themes and technology in the field. The whole experience built not only my confidence in my academic abilities but also my self-confidence, which came from meeting informally with other researchers in the field. I would like to thank AAS immensely for giving me the opportunity to attend this meeting, and I look forward to many such conferences in the future.

Vyoma Patel, PhD Student, Westmead Hospital, University of Sydney

Liming Hou

2015 Arteriosclerosis, Thrombosis and Vascular Biology / Peripheral Vascular Disease Scientific Sessions (ATBV |PVD)
Dates: 7th – 9th May, 2015
Location: San Francisco, California, USA

ATVB|PVD 2015 is one of the best conferences in my field which focuses on lipid metabolism, obesity and metabolism disorders. Indeed, the scientific program is outstanding and has been presented by renowned international researchers such as Prof. Janet Sparks and Prof. Jay Horton.
This meeting brought together experts that presented their newest results and discoveries in the field of cardiovascular research, endocrinology, genetics and molecular biology.
Attending the ATVB 2015 impacted my research in a very significant way. I presented my current research on how ABCA1 and ABCG1 regulate the gene expression on pancreatic beta cell and I got great feedbacks with the opportunity of collaboration. This conference also allowed me to expand my

knowledge in my field of research, discussed future directions for my PhD project and solved my methodological questions with experts in the field. Most importantly, I met with international researchers and developed new collaborations

If you have any questions regarding the AAS Trust Fund, please contact the secretariat admin@yoursecretariat.com.au

Feature article: Modelling plaque development mathematically

Modelling plaque development mathematically

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Mary R Myerscough
At first sight mathematics and medical science seem an unlikely combination. Statistics and bioinformatics are, of course, crucial for extracting reliable information from data but at first sight it is less clear how mathematical modelling can contribute to atherosclerosis research.

A mathematical model takes scientific ideas that are known or hypothesized from experimental or observational research and encapsulates them as a set of equations or as an individual-oriented simulation of in silico cells. These models can be solved and analysed, usually computationally, to produce hypotheses, to make predictions or to explore ideas in a way that is difficult to do experimentally. Often, the process of constructing the model—considering and discussing what are the important players, processes and interactions that should be included and how—is just as scientifically revealing as the model results.

Cancer science and medicine has a long history of engagement with mathematical models [1,2] which is now bearing fruit in the use of mathematical models in an integrated approach to personalized cancer treatment [3]. Other areas, such as wound healing [4] and bone regeneration [5] have reaped benefits from the insight that mathematical modelling gives.

Most mathematical and computational work on atherosclerosis to date has been in analyzing and modelling blood flow in arteries [6] or the reaction of the artery wall to stents or other interventions [7]. This has been very important in understanding the role of low shear stress in the localization of plaques. There has been comparatively little work on modelling the immunological events that occur inside the artery wall during plaque initiation and development. These are the models that our group works on.

Mathematical models are particularly suitable for exploring the effect of flows, fluxes and interactions and their outcome over time. For example, the monocyte immigration rate into the artery wall, the rate of macrophage proliferation or the rate of lipid export from foam cells by HDL and other processes in plaque formation can be represented as a set of equations which can be solved to find how particular combinations of these influence plaque growth in the model. Generally these processes are interdependent and each may be controlled by several different factors. For example, the entry of monocytes into the intima through the endothelium is affected, not only by the number of monocytes in the blood flow, but also by endothelial expression of adhesion molecules and the presence of chemoattractants such as MCP-1 and other cytokines which may have been produced in response to macrophage ingestion of modLDL inside the intima.

We can describe these sort of complicated interactions mathematically using techniques that consider the density of cells and concentration of cytokines and lipoproteins averaged across the intima (ordinary differential equations) [8,9] or methods that look at spatial patterns inside the intima and take account of the active role of the vascular endothelium (partial differential equations) [10].

Many of the interactions between cells and lipoproteins or cytokines are nonlinear; that is, the rate of the interaction does not increase at a rate proportional to the density or concentration of the inputs. For example, there is an upper limit to the rate that a single macrophage can ingest modified LDL particles. This is determined, fundamentally, by the surface area of the macrophage and the number of receptors that it carries. When the concentration of modLDL particles is low, a macrophage may, indeed consume modLDL at a rate proportional to the amount of modLDL present, but when modLDL is more abundant, the macrophage's rate of consumption may be affected by the cell's limited capacity to ingest modLDL.

Our models predict that these nonlinear interactions can lead to sudden switches and qualitative changes in behaviour [10]. Figure 1 is an example of this type of behaviour. It shows the rate of accumulation of foam cells over time (which is an output of the model) when the rate of monocyte influx is increased and then decreased. This is done for two different plaques; one which experiences a high rate of LDL influx (upper plot) and the other a low LDL influx (lower plot). Before the monocyte influx is increased, the rate of foam cell accumulation in these plaques is similar. Increasing monocyte influx when LDL influx is low makes little change to the rate of foam cell accumulation and the plaque returns to the previous accumulation rate when the monocyte influx decreases again. When LDL influx is high, however, the rate of foam cell accumulation spikes when blood monocyte levels increase and then does not return to its previous level when the monocyte influx is reduced to its former rate but remains about four times higher than before.

This suggests that a temporary increase in blood monocyte count may have the capacity to permanently switch a plaque from slow growth to rapid growth, particularly if blood LDL levels are high. Technically, this is due to a fold bifurcation, a mathematical structure than can be tracked and predicted [10]. This result is purely due to the nature of interactions between the cells and cytokines in the model; other than the LDL influx into the plaque, the inputs for these two model results are exactly the same.

At present, our models are qualitative only; they are not yet quantitatively predictive. Each model has several parameters that represent cell movement, or cell-lipid interactions rates or cytokine rates for example. Most of these have not been measured even indirectly and because of the in vivo nature of atherosclerosis experiments, these measurements are inherently difficult. Even in in vitro systems, measuring model parameters is not necessarily straightforward [11]. However, almost any information about cell and cytokine movements and interactions will be valuable in making our models more quantitatively accurate.

The field of mathematical modelling of plaque formation and development is currently wide open—ours is one of only a handful groups in the world working with biologically realistic models for the immunological and cellular processes in plaque formation. Australia has an outstanding and active research community in atherosclerosis and vascular disease which provides a wonderful stimulus to the development of biologically sound and useful modelling. We are very excited about the possibilities.

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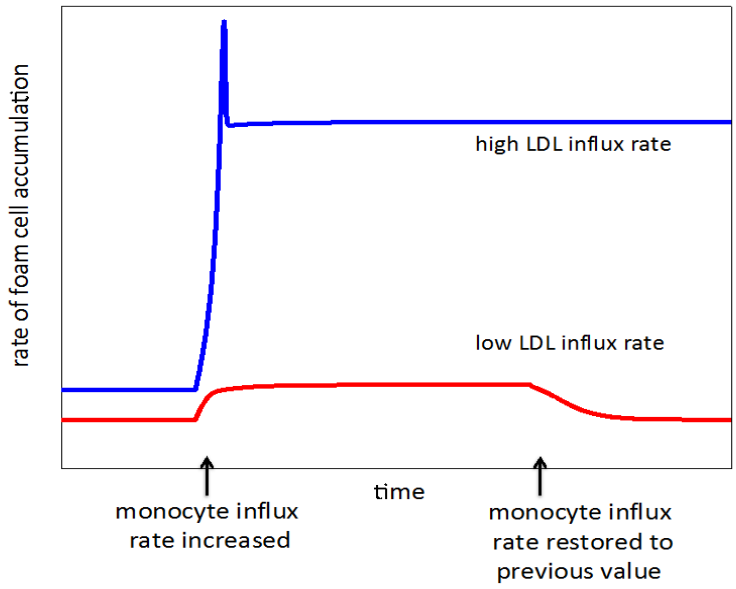
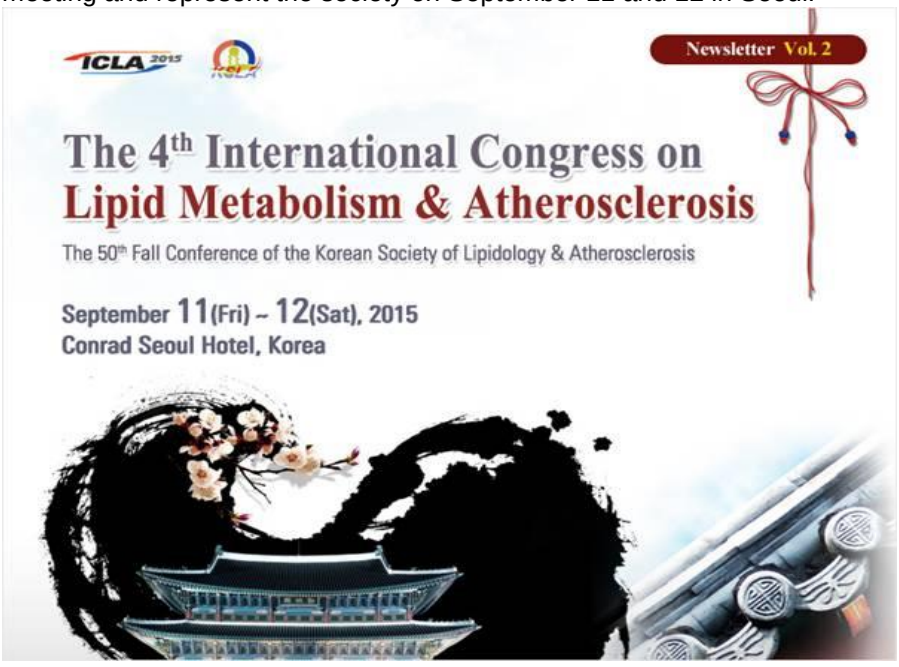


Figure 1. Plot showing the results of the model as the rate of foam cell accumulation as a function of time. (Both quantities are in arbitrary units from a non-dimensionalised model and so units are not included.) At the first arrow, monocyte influx into the model plaque is increased by 50% and then returned to its original value at the second arrow. The lower curve is the result from a model plaque with a low rate of LDL influx. The upper curve is the result from a plaque whose LDL influx rate is 2.67 times that of the other plaque.

Meetings and other items of interest:

The ICLA meeting will be held in Korea in September this year, and the organising committee have kindly invited three of our young investigator members to attend, and to present at the meeting. Fatiha Tabet, Elyse Di Marco and Dragana Dragoljevic are the three nominated speakers who will attend the meeting and represent the society on September 11 and 12 in Seoul.



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