

SMBE (SA/NT) AGM

The 2013 SMBE (SA/NT) AGM was again held at Waverly house, St Andrews Hospital, South Terrace, Adelaide on the 6th of August. The evening was again well attended proved to be memorable.

SMBE (SA/NT) was fortunate to reserve the availability of MapTek™ founder and Chairman Dr K. Robert Johnson as our 2013 AGM guest speaker. Bob has pioneered and commercialised technology that has significantly benefited the mining, engineering and surveying industries. MapTek™ product technology focuses on analysing and modelling data from disparate sources to solve the problems that engineers, geologists and miners face everyday. They are the leading provider of innovative software, hardware and services for the global mining industry, with more than 30 years of commitment to mine technology research and development.

Bob's presentation focused on MapTek's critical role during the miraculous Chilean mine disaster rescue event at the San José copper-gold mine beginning March 2011. By chance, the date of our AGM represented three years to the day that the 33 trapped miners were rescued.

Before the evening, anticipation from the SMBE (SA/NT) committee members alone was very high after learning how well Bob's previous presentations have been received. He delivered.

Bob shared a fascinating insight to the technical and personal challenges that his colleagues faced. It was impossible to separate the emotional context from the engineering feats, which alone can be regarded as genuinely remarkable. From overcoming gradients in respect and facing constant political and media exposure, the MapTek™ team proved invaluable to the eventual successful rescue effort and they are the undeniable heroes of such a significant event in mining history. To put things into perspective, the mine originally opened in 1989 and grew to be the largest copper mine in the world. It was so large that it would take miners an hour to reach their destination from the surface, and in economic terms, it delivered 60% of the total Gross Domestic Product of Chilli.

On the 5th August 2011, 33 miners became trapped some 800m underground after the only entry / exit completely collapsed when the under-engineered spiralled mineshaft lost structural integrity. Fortunately, with provisions as well as kilometres of tunnel, there was

enough air and rations for the trapped miners to survive for some time. However, surprisingly, the Chilean Government gave up on the rescue after four days. On day 6, a MapTek™ draftsman arrived, and without sleep, by day 8 had produced a valid 3D model of the entire mine from original surveyor markings. With this information, three significant holes were drilled. The first, Esperanza Hole meaning 'hope hole', was a painstakingly calculated drill to pinpoint a significant

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area of the mine, which held hope of survival. Approximately 150m was being drilled per day. Due to the rotational impact drilling means of the rig, the hole needed to be checked every 100 meters to ensure it remained on-path, and any undesirable curvature was compensated for when detected. This process required complete removal and shelving of the drilling rods. On day 22, the Esperanza Hole eventually struck the mine. Upon retrieval of the drill, Bob presented a photograph that showed the drill had been marked with paint and a note was attached by the trapped

miners. The note detailed their circumstance underground. The second Palomas 'Pigeon' Hole was drilled to send provisions and communications, and the third La mano de Dios 'The Hand of God' Hole was eventually bored to slide the rescue capsule. During these drills, the trapped miners were given tasks of their own to keep them active and positive about the prospects of a successful rescue. The last person to be retrieved from the mine was Luis Urzua, who happened to be a supervisor and the original surveyor of the mine. Luis is regarded as being the person responsible for maintaining positive moral in the other miners. Fittingly, all activity at the mine has ceased following the rescue.

Following the presentation, several members validated my thoughts after commenting about how inspirational and significant Bob's story was. His presentation was world class and deserved the resounding appreciation and respect from all present.

Lachlan Eberhard

Thank You

The committee's gratitude and thanks go to our 2013 AGM guest presenter, Dr K. Robert Johnson of MapTek™. Special mention to committee member Adrian Richards for his hand in organising the availability of Bob. Also, thanks to committee members who helped on the evening, especially Maged Shenouda for organising the facility and Vera Townsend with Daniel Fletcher for organising the catering for the evening. This is the third consecutive AGM that SMBE (SA/NT) has held at Waverly House. Comments received about the grand venue and catering remain overwhelming. Most of all, big thanks to all members and guests who attended the evening. It is pleasing and encouraging to receive your continued support and we look forward to seeing everyone gather again at our next spread of events in October.

SMBE (SA/NT) on facebook

SMBE SA has just launched its own facebook page. Search for "SMBE SA/NT". Become aware of happenings including out technical program calendar events and awards as they are developed. Be sure to like the page and spread the word!



SMBE (SA/NT) Presidents Report

1. Membership

Membership levels were maintained. Refer to Treasurer's Report for details. Membership queries to be directed to Hatice Kalkan, SMBE (SA/NT) Membership Officer via Secretary@smbe.asn.au.

2. 2012/2013 Technical Program:

AUG 2012: SMBE AGM.

Forensic Pathology – reverse engineering? Presented by Associate Professor Neil Langlois; Forensic Pathologist, Forensic Science SA, Adelaide, Monday 13th August, 2012.

AUG 2012: Australian Biomedical Engineering Conference (ABEC).

17-19th September 2012, South Brisbane, Queensland, Australia.

OCT 2012: Annual Workshop.

AS/NZS 3003:2011, Electrical Installations – Patient Care. Hosted by Biomedical Colleague, Engineers Australia, Tuesday 30th October 2012, Engineers Australia, Level 11, 108 King William St, Adelaide, SA.

Nov 2012: 2012 Biomedical Engineering Student Paper Night.

A public speaking competition for university students (honours level and above) presenting their Biomedical Engineering projects. Jointly hosted by Biomedical Colleague, Engineers Australia, and SMBE (SA/NT), Wednesday 28th November, Flinders University, Bedford Park, SA.

Nov 2012: Christmas Dinner.

Thanks to Dan Fletcher & Vera Townsend for organising this event at The Queens Head Hotel, North Adelaide, Thursday 29th November. A very successful evening, well attended.

FEB 2013: Technical Talk.

Game on! Accessible Gaming for Children with Disabilities. Presented by David Hobbs; School of Computer Science, Engineering and Mathematics, Tuesday 26th February, Flinders University, Bedford Park, SA.

FEB 2013: Technical Workshop.

Welcome to a new manufacturing future; 3D printing. Hosted by Manufacturing Focus and eBizActivators.

Tuesday 26th February, St Francis Winery, Old Reynella.

Wednesday 27th February, Polaris Centre, Innovation House East, Park Way, Mawson Lakes.

Thursday 28th February, Regional Development Australia Office, Whyalla Norrie.

MAY 2013: Site Visit.

Operating Theatre Technology – Stryker i-Suite. Presented by Mr Richard Denton; SA BME, Thursday 9th May, Flinders Medical Centre, Bedford Park, SA.

JUN 2013: Annual Workshop.

AS/NZS 3551:2012, Management Programs for Medical Devices. Presented by Mike Flood; Lotus Consulting. Hosted by Biomedical Colleague, Engineers Australia. Wednesday 12th June 2013, Engineers Australia, Level 11, 108 King William St, Adelaide, SA.

SMBE (SA/NT) will be gratefully acknowledging future technical presentations and workshops organised or advertised through the Medical Device Partnering Program (MDPP) at Flinders University www.mdpp.org.au.

3. SMBE Australia Website & Social Media

The website continues to be the main source of information for SMBE members across Australia. Robin Woolford, SMBE (SA/NT) Council Member and Webmaster, has continued to maintain and update the site as required. This year, we released a survey, of which feedback suggests the website is being underutilised by members. It is the renewed focus of the committee to draw attention to the website through newsletters, events and social media to promote the information and services provided by SMBE (SA/NT). As always, the website is complemented by emails, which are being distributed to advertise events and awards to financial members.

The year 2012/13 has seen the development of the SMBE (SA/NT) facebook page thanks to Vera Townsend, SMBE (SA/NT) Secretary. The committee is encouraging members and potential members, who have facebook accounts, to 'like' the society's page. The intention of the page is to advertise events and create discussions amongst members and non-members alike. It is also an important tool to help connect SMBE members nationally.

4. Newsletters

The SMBE (SA/NT) committee has published three newsletters last financial year to advertise events, awards and news. My gratitude and thanks go to the committee, and our award winners, for suggesting and creating newsletter articles. Survey feedback offered good support and suggestions for the newsletter. As such, the committee has taken this news very positively, and will continue to improve newsletter content and presentation with renewed enthusiasm. Work has already started by improving the SMBE logo and settling on a standard colour, which is represented on our banner, event invitations and facebook background. Special thanks to Olivia Lockwood, SMBE (SA/NT) Immediate Past President, for her continued support by editing articles and formatting the newsletter.

5. Awards

The **SMBE (SA/NT) ABEC Travel Grant** was continued this year. The conference is being held in Sydney, 13th to 16th October 2013. This award provides an opportunity for a single successful applicant to be reimbursed up to \$1500 for travel, accommodation and conference registration fees. Preference is offered to SMBE (SA/NT) members who were accepted to present at the conference. The award applications closed 2nd August. Two applications have been received and the winner will be notified by mid-August 2013.

The **SMBE (SA/NT) Biomedical Engineering Scholarship Award** remains on offer for a member of at least 3 years to be reimbursed up to \$1000 to attend and present at a conference of their choice. It was not awarded in the 2012/13 financial year. Two applications were received. However, the applicants did not match the selection criteria.

The **SMBE (SA/NT) Biomedical Engineering Encouragement Award** for 2012/13 was withheld due to no nominations. An application for 2013 has already been received and the committee will be renewing the call for nominations near the end of the year, at which time a sponsor of the award will be determined if required.

The **SMBE (SA/NT) Outstanding Honours Project Award** is awarded to a Flinders University Biomedical Engineering student for their superior work towards their final year honours project. The award is based on practicality of the design, project development and outcomes, as well as an explanation of their work at the Flinders University Honours Project Presentation Day. In 2011, the university changed the format of the day, and a renewed understanding between the university and SMBE (SA/NT) committee has been established. The award is in the form of a \$500 cash prize, a certificate, and 12 months free Student membership to the SMBE (SA/NT).

The 2012 award was presented to Laura Diment for her project and thesis titled "Assessing the Kinect Virtual Art Program's ability to physically engage severely impaired children". The committee acknowledges runner up Bryant Roberts. Thanks to Greg Smith, SMBE (SA/NT) Council Member, and Olivia Lockwood for their time and involvement on the day.

The **Student Presentation Night**, jointly hosted by College of Biomedical Engineers, Engineers Australia and SMBE (SA/NT), was held 28th November 2012 at Flinders University. The Australasian College of Physical Sciences and Engineers in Medicine (ACPSEM) hosted a separate evening due to improved numbers. First prize of \$400 was awarded to Lynne Burrow of Flinders University for her presentation "A clinical educational tool for training medical students in abdominal palpation". Runner up was received by Ryan Quarrington from the University of Adelaide. He was awarded \$150 for his presentation titled "Mechanical properties of bone in the lamb after intrauterine growth restriction".

6. Member Survey

Adrian Richards, SMBE (SA/NT) Council Member, compiled a membership survey consisting of 20 mixed multiple choice and written response questions. The intent of the survey was to determine member's satisfaction with the performance and direction of the current SMBE (SA/NT) committee. Survey results were summarised in the July 2013 newsletter. Thanks to the membership who contributed and to Adrian for managing the survey.

7. Recognitions

Finally, I would like to once again thank the SMBE (SA/NT) committee for their support during my second term as President. Thanks also to our members and sponsors for helping us to host events and maintain our technical program, which we are proud of. A special thanks for the contribution and efforts of our departing Vice President Tony Carlisle who has a combined 10 years' experience on the committee. Tony has decided to stand down from the Vice President position this year as he pursues his PhD studies at Flinders

University. On behalf of the committee, we wish Tony all the best in his endeavours and we look forward to seeing him at future events.

SMBE (SA/NT) Committee Election

This year, the role of Vice President, Treasurer, and two (2) council positions were up for 2013/15 nominations. Incumbent Treasurer Daniel Fletcher, and Council members Greg Smith and Hatice Kalkan accepted to stand for re-election. The committee appealed for Tony Carlisle's replacement due to announcing that he will be standing down from his position as Vice President and being unavailable for re-election.

After placing the call to all SMBE (SA/NT) members, nominations were received for the following committee positions;

- Vice President; Greg Smith
- Treasurer; Daniel Fletcher
- Council; Hatice Kalkan, Trevor Riessen, Tom Allen

Greg accepted to be nominated for Vice President, and once again Daniel thankfully decided to stand as Treasurer. Both Greg and Dan have shared similar roles during their involvement on the committee and we are grateful to retain their experience and support. Hatice Kalkan, who back-filled Vera Townsend's promotion to Secretary last year, has been supported by the committee, this time for a full council term. We are thankful for the willingness and enthusiasm Hatice has brought to the council over the last 12 months.

The committee received two further nominations for the vacant council position. The successful nominee was eventually resolved by vote from members who were present. Unfortunately neither Trevor nor Tom could attend the evening. However, they were discussed and represented by committee members who knew of them. Trevor is the Managing Director of Medical Equipment Management in Darwin and Tom is an employee of Helicon Technologies in Adelaide. Both have been SMBE (SA/NT) members for some time and they have shown support for the society and its principles.

Vice President, Treasurer and Hatice's council position were elected unopposed. Members favoured Trevor by a majority vote. Regretfully, the committee could not accommodate Tom's interest this year. On behalf of the committee, I wish to thank Tom for his nomination, and especially thank and congratulate all 2013-15 office bearers.

Lachlan Eberhard

Biomedical Engineering at The University of Adelaide

The Electrical Energy Society of Australia, through Engineers Australia, invite SMBE members to attend an evening to introduce and showcase Biomedical Engineering at the University of Adelaide.

The evening will consist of three esteemed guest speakers from the University of Adelaide; Professor Derek Abbot, Dr Said Al-Sarawi and Dr Mathia Baumert

Thursday 10th October 2013

Sir Robert Chapman Theatre, Engineers Australia,

Level 11, 108 King William St, Adelaide SA

Refreshments from 5:15pm

Presentation from 6pm

Registration is essential. Please email martyn.k.pearce@gmail.com. This is a great opportunity for SMBE members to gain appreciation and show your support for Biomedical Engineering research in Adelaide.

For further information, please contact Martyn Pearce (EESA SA Chapter Chair)

T: 0450 692 901

E: martyn.k.pearce@gmail.com

www.smbe.asn.au

2013 ABEC Key Note Speaker in Adelaide

SMBE (SA/NT) through the Engineers Australia's College of Biomedical Engineers is grateful to promote an evening with Professor Poul Nielsen to present in Adelaide prior to ABEC in Sydney.



Professor Poul Nielsen
University of Auckland

Integrative Biomedical Instrumentation, Experimentation and Model Development at the Auckland Bioengineering Institute

Thursday 11th October 2013, 2-3pm

Flinders University,

Rm 5, Science Innovation Learning Centre (SILC) [map](#) reference 52 car park 9

RSVP to debbie.cocks@flinders.edu.au by 10th Oct

Professor Nielsen's research focuses on using novel instrumentation, detailed computational models, and quantitative descriptions of physical processes to gain a better understanding of human physiology. Many of his projects couple mathematical modeling with innovative instrumentation to improve our ability to understand and interpret measurements of complex biological systems, subject to the constraints of well-understood physical conservation and balance laws.

Prof Nielsen will be attending the Australian Biomedical Engineering Conference in Sydney (13th -15th October 2013).

Prof Nielsen's research projects include:

- Physiome, an integrated multi-centric program to design, develop, implement, test and document, archive and disseminate quantitative information and integrative models of the functional behaviour of organelles, cells, tissues, organs, and organisms.;
- CellML, an open standard to store and exchange computer-based mathematical models;
- FieldML, a declarative language for representing the dynamic geometry and solution fields of computational models;
- Breast mechanics, computational biomechanical models to improve the detection of breast cancer using information obtained from a variety of imaging modalities;
- Muscle microcalorimetry, to identify the dynamic stiffness of isolated rat trabeculae while simultaneously recording muscle heat production;
- Soft tissue mechanics, coupling large deformation theory, structurally-based constitutive relations, and nonlinear identification techniques to understand the mechanics of soft tissues;
- Pelvic floor mechanics, modeling the second stage of labour and pelvic floor prolapse;
- Modeling shaken baby syndrome, gaining an understanding of the relationships between shaking insults and soft tissue injury in infants;
- Bioinstrumentation and medical devices, novel instrumentation for biological measurements.

Registration and Training of Biomedical Engineers and Associates in the UK - A Review

SMBE (SA/NT) in joint association with the Engineers Australia's College of Biomedical Engineers are promoting a FREE evening with 2013 ABEC international speaker Mike Green, Director of The Medical Room in the UK with guest Dani Forster of Melbourne (www.themedicalroom.com).

Mike has been in technical recruitment for 30 years, and specifically in the recruitment and training of Biomedical Engineers and Associates in the UK for 13 years. He identified a need for an Associates Training Programme in the UK, and has implemented a competency-based training programme, which now runs in several cities in the UK.

Mike and Dani propose to speak about the registration and training of biomedical technicians in the UK and compare this to the situation in Australia, using the information The Medical Room have gathered from a recent research tour looking at training, registration, and career pathways for Biomedical Engineers and Associates in Australia.

Thursday 23rd October 2013

Refreshments 5.45pm, Presentation 6pm

Waverly House Board Room, St Andrew Hospital, 360 South Terrace

RSVP Lachlan.Eberhard@health.sa.gov.au by 21st Oct

SMBE (SA/NT) Awards

The SMBE (SA/NT) committee is pleased to support three students who have successfully gained recognition by the committee by filling the requirements of our recent 2013 ABEC Travel Grant and Conference Scholarship award.

SMBE (SA/NT) 2013 ABEC Travel Grant

Due to the quality of applicants this year, recognition of the 2013 ABEC Travel Grant has been shared between joint winners Muhammad Hasan from the University of Adelaide and Sam de Goren of Flinders University.

Congratulations Muhammad and Sam! They will receive up to \$1500 each in 2013 ABEC travel, registration and accommodation arrangements. As a requirement of the award, they will be contributing a newsletter article about their conference experience.

Muhammad joined the SMBE (SA/NT) last year and the committee has learnt that he is an enthusiastic engineer who has contributed a lot to his field of research. He has been accepted by the 2013 ABEC committee to present his research on;

DYNAMIC REPOLARIZATION VARIABILITY IN PATIENTS WITH MYOCARDIAL INFARCTION

M.A. Hasan^{1,2,3}, D. Abbott^{1,3}, M. Baumert^{1,2,3} ¹School of Electrical & Electronic Engineering, The University of Adelaide, Adelaide, Australia ²Centre for Heart Rhythm Disorders, The University of Adelaide, Adelaide, Australia ³Centre for Biomedical Engineering (CBME), The University of Adelaide, Adelaide, Australia

Keyword(s): Medical Technology Education and Research, The Biomedical Engineering Workforce, Biomedical Engineering leading Health

Abstract

Increased beat-to-beat QT interval variability (QTV) has been associated with cardiac morbidity and mortality, but little is known about the cause of beat-to-beat QTV instability in cardiac patients, more specifically in patients with myocardial infarction (MI). The purpose of this study was to investigate the underlying mechanism of unstable beat-to-beat QTV in the MI patients

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compared to the healthy subjects. Standard resting 12-lead ECGs of 79 MI patients and 69 healthy subjects were investigated. Beat- to-beat QT intervals were computed separately for each lead using an updated ECG-pre- processing template matching algorithm [1] which was originally proposed by Berger et al [2]. In addition, we extracted the beat-to-beat T-wave amplitude in each lead by following same approach described by our previous article [3]. We computed the standard deviation of beat-to- beat QT intervals as a marker of QTV for both healthy subjects and MI patients. Significant QTV differences have been observed between the 12 ECG leads, as well as between the groups of healthy subjects and MI patients. Beat- to-beat QTV was significantly higher in most of the leads for MI patients than for healthy subjects. Further, significant T-wave amplitude differences across leads and in MI patients compared to healthy subjects were observed. A significant inverse relation between beat-to-beat QTV and T-wave amplitude was found. The group differences in QTV remained significant after co-varying for the T-wave amplitude. In conclusion, the heterogeneity of beat-to-beat QTV in patients with MI is partly due to the lower T-wave amplitude as well as lower SNR in the surface of ECGs, but need further research to investigate the currently unknown reason of higher QTV in MI patients.

References

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- [2] Berger, R. D. *et al.*, "Beat-to-beat QT interval variability - Novel evidence for repolarization lability in ischemic and nonischemic dilated cardiomyopathy," *Circulation*, vol. 96, pp. 1557-1565, 1997.
- [3] Hasan, M. A. *et al.*, "Relation between beat- to-beat QT interval variability and T-wave amplitude in healthy subjects," *Annals of Noninvasive Electrocardiology*, vol. 17, pp. 195-203, 2012.

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Phone: +61430978798 Email: muhammad.hasan@adelaide.edu.au

Sam De Groen applied for membership this year. He has been accepted by the 2013 ABEC conference committee to present his research on;

EXAMINING REGIONAL CHANGES IN MICRO-ARCHITECTURE OF SUBCHONDRAL BONE IN HUMAN KNEE OSTEOARTHRITIS USING 3D MICRO-CT

S. de Groen¹, B. Roberts¹, K.J. Reynolds¹, E. Perilli¹

¹Flinders University, Medical Device Research Institute, Adelaide, Australia

Keyword(s): Medical Technology Education and Research, Biomechanics of Impact Injury

Background

Osteoarthritis (OA) is a painful, disabling disease associated with cartilage breakdown and altered subchondral bone micro-architecture [1].

Recent micro-CT systems enable structural characterisation of large excised bone segments, at high resolution in 3D. This allows investigation into diverse regions of interest (ROI) without damaging the bone, as occurs with biopsies [2].

Aim: To develop a method to measure, for the first time, the subchondral bone micro-architecture on entire human tibial plateaus in OA in four different anatomical regions within the same high-resolution micro-CT scan.

Materials and Methods

One human tibial plateau retrieved from surgery was scanned by micro-CT (17.4 $\mu\text{m}/\text{pixel}$ resolution; Skyscan model 1076, Skyscan, Kontich, Belgium), and analysed using CTAnalyser software (Skyscan).

In the micro-CT images, an irregular-shaped and a circular (18mm diameter) ROI type, both 3mm-thick, were selected, in four anatomical regions (anterior-medial, anterior-lateral, posterior-medial, posterior-lateral) (Fig. 1). These were further divided into 1mm-thick subregions (inferior, central, superior). In all subregions, 3D-morphometric parameters were calculated; bone volume fraction (BV/TV), trabecular thickness (Tb.Th), number (Tb.N), separation (Tb.Sp), structure model index (SMI), degree of anisotropy (DA).

Results

Independent of ROI type, the anterior-medial region exhibited highest BV/TV and Tb.N, and lower SMI, followed by the posterior-medial region (Fig.2); whereas, Tb.Th, Tb.Sp, and DA showed low regional variations.

Differences were more marked in the circular ROIs, as opposed to the irregular shaped ones (Fig. 2). The differences among regions were consistent also in the 1mm-high subregions.

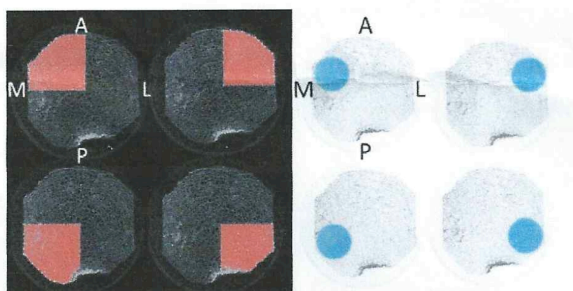


Fig. 1: Micro-CT cross-sections of tibial plateau with irregular shaped ROIs (left); and circular ROIs (18mm diameter, right).

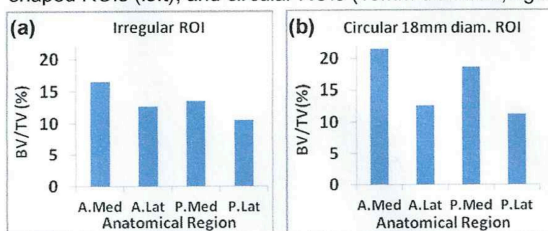


Fig. 2: BV/TV from irregular (a) and 18mm diameter ROIs (b)

Conclusion

This is the first micro-CT study that qualifies regional micro-architectural changes associated with OA, on the entire human tibial plateau. This protocol will be used to study patients undergoing total knee arthroplasty in OA.

Acknowledgements

Study supported by Arthritis Australia, donor Zimmer Australia (Grant in Aid 2013, Perilli E.)

References

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- [2] Perilli E, Parkinson IH, Reynolds KJ, *Ann Ist Super Sanita*, 48, 75-82, 2012

SMBE (SA/NT) \$1000 Conference Scholarship Award

Active member and newsletter contributor Michael Smith, from Flinders University, has won favour with the SMBE (SA/NT) committee to support him present his accepted abstract at 2013 ABEC. Michael will receive up to \$1000 in travel, registration and accommodation arrangements. He will be contributing a newsletter article about his conference experience and presenting his research to the society at an opportune time.

Congratulations Michael! The committee wishes you all the best and looks forward to learning more about your research and conference experience.

Michael will be presenting his research on:

THEORETICAL LIMITATIONS FOR FORWARD-OSMOSIS DIALYSATE PRODUCTION USING STANDARD REVERSE- OSMOSIS MEMBRANE ELEMENTS

Michael C. Smith¹, K. Reynolds¹ ¹Medical Device Research Institute, School of Computer Science, Engineering & Mathematics, Flinders University, South Australia

Keyword(s): Clinical Engineering, Medical Technology Development

Abstract

Background: While the principle of dialysate production by forward-osmosis (F.O.) has been described previously [1,2], its practical feasibility has not yet been established.

Aim: To estimate the theoretical limits of practical dialysate production for treatment using ordinary, inexpensive, spiral-wound reverse- osmosis elements in F.O. orientation.

Method: Analytic and stochastic models were developed to describe the performance of both ideal and practical systems, using published membrane and concentrate specifications and target dialysate output values. Some values were estimated from experimental data.

Results: By analysing the behaviour of an ideal membrane element, lengthwise distributions of salt concentration and flow were approximated, and then used to estimate the minimum element length needed for useful dialysate production. It was found that trans-membrane salt-leak causes significant efficiency losses in practical elements and is best compensated for by over-priming the draw-side with excess salt, while minimising the net trans-membrane concentration gradient by re-distributing the salt in the draw-side solution. This process also helps stabilise the system, making it easier to control output flow and conductivity to match target values. The limiting time for useful dialysate production was able to be described as a function of target output by using stochastic modeling to estimate the limiting, draw-side salt distribution. A reversed, F.O. backflushing phase is proposed as a novel way of removing feed-side salt from a saturated membrane.

Conclusion: Based on this modeling, it would appear that a pair of alternating, parallel, 4.0 x 40 inch, spiral-wound, polyamide membrane elements would be capable of continuously producing enough dialysate for a typical dialysis treatment.

References

[1] Talaat, K. M. Forward osmosis process for dialysis fluid regeneration. *Artificial Organs* 33(12), 1133-1135, 2009.

[2] Talaat,K.M.Dialysisfluidregenerationby forward osmosis: A feasible option for ambulatory dialysis systems. *Saudi Journal of Kidney Diseases and Transplantation*, 21(4), 748, 2010.

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SMBE (SA/NT) Encouragement Award

Do you know someone who deserves to be recognised for their endeavour and enthusiasm within the field of Biomedical Engineering?

If you know of a worthy recipient who would benefit from the recognition, or if you think you are that person, we encourage you, or a peer, to submit a SMBE SA Encouragement Award nomination form. They are available on line at www.smbe.asn.au. The award is open to all Biomedical Engineering practitioners and incorporates one year free membership to SMBE (SA/NT) as well as a funded visit to the SMBE (NSW) Biomedical Engineering conference.

Applications are open and will be reviewed early in the new year.

Membership Fees

Do you know if your SMBE (SA /NT) membership is current?

Would you like to confirm your membership?

For all related questions, please contact the SMBE (SA/NT) treasurer: Treasurer@smbe.asn.au

A membership renewal form is available through our website; <http://www.smbe.asn.au>

Membership Certificates

Are you a SMBE (SA/NT) member without a Membership certificate?

Would you like to update your email or contact details?

If so please contact the SMBE (SA/NT) secretary: Secretary@smbe.asn.au

A membership certificate will be made for you and formally presented at our next technical meeting.

Newsletter Articles

Would you like to leave feedback or comments about the SMBE (SA/NT) newsletter?

Maybe you have an interesting article to share?

If so, please contact the SMBE (SA/NT) secretary Secretary@smbe.asn.au

We look forward to hearing from you!

SMBE (SA/NT) Committee

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Vice President	Greg Smith
Immediate Past President	Olivia Lockwood (Newsletter Editor)
Treasurer	Daniel Fletcher
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Council	Adrian Richards
	Maged Shenouda
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Would you like to like to know more about the committee? Please visit our website www.smbe.asn.au