Transforming leadership:
breaking boundaries & tackling emerging challenges

IUSS President:
meet Professor Faith Osier

Vitamin D & immunity:
BSI journal research

Mentorship:
supporting career & personal growth
As the experts in providing solutions against Cell Culture Contamination, InvivoGen introduces MycoStrip™, a new way to detect mycoplasma in your cell culture.

Detection of cell culture contaminating mycoplasma by MycoStrip™ is based on isothermal PCR. Simply prepare your sample and add our proprietary Reaction Mix to target and amplify the 16S rRNA gene for the most commonly found mycoplasma species in cell culture. Results are clearly visualized on an immunochromatographic strip within 5 minutes.

- **Simple** - No special lab equipment required
- **Rapid** - Performed in 1 hour, less than 15 min of hands-on time
- **Clear** - One band: negative, Two bands: positive for Mycoplasma
- **Specific** - Designed to detect Mycoplasma and Acholeplasma
- **Sensitive** - Able to detect as low as 10^-10² CFU/ml

In case of contamination, in your cell culture, use Plamocin™ treatment to effectively cure mycoplasma contamination within 2 weeks.

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A new era of almost-too-easy.

www.mabtech.com
Welcome to the summer issue of Immunology News. At the BSI, we continue to work relentlessly to support you – our members – and to put immunology centre stage. We know that the pandemic has impacted you greatly and we are committed to responding to emerging challenges. With this in mind, we surveyed our membership about our work, current hurdles and new opportunities arising in the field of immunology. In this issue, we share the results of the survey as well as provide an overview of some of our recent activities advancing our mission, such as our ambitious policy and public affairs programme and the different ways in which we’re championing public engagement.

We also proudly present the new BSI committee members, highlight recent achievements of the BSI Forum and hear from some of our wonderful members. In particular, Hannah Bialic shares her journey as an early career researcher and Professor Mark Travis, our BSI Groups Secretary, introduces himself and his plans to further develop our Regional and Affinity Groups.

As for our feature articles, you will find an inspirational interview with the President of IUIS, Professor Faith Osier, cutting-edge immunotherapy research from BSI Trustee, Dr Emma Chambers, and an opinion piece on mentoring from Professor Ann Ager and Professor Anne Cooke. I hope you enjoy this issue!

Teresa Prados
t.prados@immunology.org

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New BSI Groups Secretary
Welcome to another issue of *Immunology News*! We hope that you are all staying safe and well in the world of immunology. As always, we continue to be busy in the office and across the membership, with lots of exciting activities happening.

First, I would like to say a huge thank you to those who are stepping down from their committee roles at the end of their term and a huge welcome to those newly elected and selected committee members who will be starting with us! Details can be found on pages 6–7 but suffice to say that our committees are crucial to the success of the BSI and we are indebted to those who choose to give their time and energy to work closely with us across our activities. Thank you. We look forward to working with you all in the coming months and years!

On a similar note do turn to page 29 to hear more from our new Groups Secretary, Professor Mark Travis, on his vision for the BSI’s Regional and Affinity Groups. These Groups really are the jewel in the crown of the BSI, providing leadership and scientific insight into topics relevant to immunology. Through them we have a huge reach across the community, as well as the nation, and we are very grateful for all the members that make this possible by organising symposia, seminars, webinars and many other types of events. If you are not currently engaged with one of these Groups, please do check out our website to explore which one(s) are of interest and get in touch!

We also have an inspiring interview with Professor Faith Osier, President of the International Union of Immunological Societies (IUIS) on pages 20–22. She tells us about her research, her role at IUIS and how our Societies can collaborate further, and her thoughts on tackling inequality in immunology and key global challenges. Well worth a read!

And on the theme of global challenges, our Connect on Coronavirus initiative continues to make an impact in a range of activities, for example, by playing a key role in building public confidence in COVID-19 vaccines. Erika Aquino, our Public Engagement Manager, explains more on page 11.

And finally, I wanted to acknowledge that we realise that times do remain tough for many of our members. I can assure you that we will continue to listen and develop our support for you all as much as we can. But, as always, do not hesitate to get in touch with any ideas you have. Take care.

Doug Brown
Chief Executive,
British Society for Immunology
Email: d.brown@immunology.org

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**Save the date!**

**BSI Virtual Summer School**

**14 – 15 July 2021**

A BSI event designed for PhD students: present your research, hear from top immunologists & build your skills

[www.immunology.org/BSI-virtual-summer-school-2021](http://www.immunology.org/BSI-virtual-summer-school-2021)
BSI Forum: here to represent you

The BSI Forum is the place where the voice of our membership is fed into our activities. Chaired by Ann Ager, the 18 elected members act as our ‘think tank’ on issues relating to education and careers, public engagement, policy and public affairs, as well as communications. Forum aims to help the Society in implementing its strategic plan by providing a mechanism by which the voice of the membership can be fed into activities.

At the most recent meeting in April, Forum focused on three main areas. First, the new BSI strategy was presented for review ahead of its launch later this year. This additional round of consultation resulted in useful feedback from Forum members being incorporated into the strategy, together with insight from our Board of Trustees, various committees and the responses from our dedicated membership survey.

Next, the BSI’s Marketing & Communications Manager, Teresa Prados, gave an overview the Society’s communications strategy, which included a productive discussion around different channels used, content of interest to members and successful initiatives such as our ‘Black in Immuno week’ campaign.

Thirdly, there was a big focus on early career support, and Forum members shared their experiences and the effects of the pandemic. In particular, they discussed ways in which we can better support our early career members going forward, looking into our webinar series about careers in immunology and potential new offerings such as financial support for training.

Finally, Forum took an overview of all the external affairs and outreach activities that the BSI has undertaken over the past few months to communicate the voice of our immunology community to the wider world.

The BSI Forum and its members are here to represent you. If you would like to raise any issues for Forum to discuss at an upcoming meeting, please contact your relevant Forum member – you can find a list of your representatives on our website at www.immunology.org/forum. Alternatively, you can email our Director of External Affairs, Jennie Evans, at j.evans@immunology.org, who can pass on the message.

Experiences of an ECR on Forum

During my time ‘on Forum’ I’ve had the pleasure of working alongside two CEOs (Jo Revill & Doug Brown), two Presidents (Prof. Openshaw & Prof. Akbar) and two Forum Chairs (Prof. Cooke & Prof. Ager), and a continually changing group of passionate, enthusiastic, and vocal (!) immunologists from different geographical locations and sectors. We have discussed and developed policies and initiatives on a huge range of topics including childhood vaccines, bullying in STEM, scientific fraud, the impact of the COVID-19 pandemic/Brexit on UK STEM, equality, diversity and inclusion in STEM, and even the use of animals and caesium irradiators in immunological research!

Looking back on my time on Forum, I’ve made some great friends and connections, and have learnt that through active and frank discussion almost any issue can be thrashed out and solutions found. I even managed to reconnect with a childhood friend from school – immunology really is a small world! But most importantly, because I can, I’d just like to extend a quick word of thanks to my Forum colleagues past and present, the whole BSI team (I should say family really!) and to share with you two particularly stand-out memories that are 100% attributable to my position on Forum.

1 – Lunch in the Palace of Westminster!
This arose due to an invitation to attend one of the biggest parliamentary engagement events celebrating the relationship between Science and Parliament – Parliamentary Links Day. During this event the topics ‘People and Talent’ and ‘Funding and Skills’ were front and centre, and the lunch in question was hosted by the Speaker of the House of Commons in the State Apartments in the Speaker’s House. Here I had the incredible opportunity to mix with a broad range of Parliamentarians and other invited stakeholders.

2 – Attending an APPG roundtable event.
In this case I was honoured to represent the BSI at a virtual roundtable hosted by the All-Party Parliamentary Group on Diversity and Inclusion. Some of the key questions that we discussed were: ‘What are the success stories for the retention and recruitment of under-represented groups in the UK STEM workforce?’ and ‘What would be your ideal ‘shopping list’ of policies to implement to solve problems in recruitment and retention of under-represented groups in UK STEM?’

If you ever get the chance to stand for election to be part of the BSI Forum, make sure you do. You will not regret it!

Dr Laura J. Pallett
Senior Research Fellow,
University College London
SOCIETY NEWS

New BSI committee members

Following our recent nominations call for positions on the BSI Board of Trustees, Forum and Congress Committee, we are pleased to announce the following appointments. The turnout for these elections was over 12% of the BSI membership, with all except one of the posts contested by more than one candidate. We would also like to announce new Congress Committee members recently appointed by Congress Secretary Dr Gary Entrican and our CEO Dr Doug Brown. We would like to pass on our huge thanks to all the other BSI members who stood for election.

Board of Trustees

**FIONA CULLEY**
BSI Treasurer (re-elected)
Senior Lecturer, Imperial College London
Fiona will continue as BSI Treasurer, commencing a new term in July 2021.

Forum

**SIMONE CUFF**
BSI Forum Wales Representative
Research Associate, Cardiff University
Simone will join our Forum from July 2021.

**EDOARDO PREDILETTO**
BSI Forum Early Career Representative
Postdoctoral Researcher, Queen Mary University of London
Edoardo will join our Forum from July 2021.

Congress Committee

**HELEN MCGETTRICK**
BSI Congress Committee member
Senior Lecturer, University of Birmingham
Helen will join our Congress Committee from December 2021.

**HENRY MCSORLEY**
BSI Congress Committee member
Principal Investigator, University of Dundee
Henry will join our Congress Committee from December 2021.

**DANIEL O’CONNOR**
BSI Congress Committee Early Career Representative
Senior Bioinformatician, University of Oxford
Daniel will join our Congress Committee from December 2021.
SOCIETY NEWS

Congress Committee (cont.)

LAURA RIVINO
BSI Congress Committee member
Senior Lecturer, University of Bristol
Laura will join our Congress Committee from December 2021.

JAMES THAVENTHIRAN
BSI Congress Committee Clinical Representative
MRC Investigator/Honorary Consultant Immunologist, University of Cambridge
James will join our Congress Committee from December 2021.

You can read the full candidate statement from each person in the members’ section of our website at www.immunology.org/new-bsi-committee-members-2021. We welcome them all to the BSI and look forward to working with them to provide a strong voice for immunology.

The British Society for Immunology is here to represent all immunologists working in science, healthcare and industry. Our committees are vital in leading our work, making numerous decisions about how the Society is run, what activities we focus on and what support we provide to members. Find out more about our committees here: www.immunology.org/about-us/our-people/governance.
Safer handling of infectious material

Reduced exposure to infectious material with automation

Minimizing exposure to potentially contaminated samples is critical for scientists’ safety, and fully automated workflows allow precious time in the lab to be spent on other tasks.

Get the whole picture at or website (see below).

You may want to pick up a hobby.

With the CytoFLEX SRT in your lab, you’re going to find yourself with a lot of spare time. Set up is automated, and unlike other sorters, it doesn’t require supervision or a dedicated operator. You can walk in, sort, and walk out, freeing you up to handle other routine tasks. Best of all, it’s accessible anytime you need it.

Start saving time at Beckman. com/cytoflexSRT.

For research use only. Not intended for use in diagnostic purposes.

You may want to pick up a hobby.

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Start saving time at Beckman. com/cytoflexSRT.

For research use only. Not intended for use in diagnostic purposes.
BSI membership survey – the results

At the end of March, we carried out a membership survey to gain your insights on how the pandemic has affected you and the wider immunology community, and how you value the work of the Society. This is a particularly important time for us to hear your views as we are developing our new five-year strategic plan to be implemented later this year. In this article, we report on the responses to the survey. Many thanks to all of you who took the time to send us feedback – your input is invaluable.

Response rates
373 responses were received, and the survey was completed by 77% of people.

Who we heard from
Gender:
- 51% Female
- 47% Male
- 2% Other/Prefer not to say

Location:
- UK 77%
- Rest of the world 23%

Category:
- Full member 48%
- Early career 10%
- Postgrad 15%
- Concessionary 5%
- Undergraduate 12%
- Don’t know/Other 10%

Overall satisfaction
It is positive to hear that our members continue to be pleased with what the BSI offers as part of our membership. Similarly, the Society’s activities are greatly valued, with the BSI Congress and our virtual conference ranked highly alongside the opportunity to be part of our community with a strong voice to represent immunology to the highest levels. There is a notable appreciation for our topic-specific reports which examine immunology and the issues facing the discipline in depth. Of course, we are also aware that we need to respond to our members’ evolving needs and we recognise careers as a particular area that our respondents indicated they would like more support in. We have lots of plans for how to achieve this moving forward!

To what extent overall are you satisfied with what the BSI offers you?

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very satisfied</td>
<td>43%</td>
</tr>
<tr>
<td>Somewhat satisfied</td>
<td>38%</td>
</tr>
<tr>
<td>Neither satisfied nor dissatisfied</td>
<td>12%</td>
</tr>
<tr>
<td>Somewhat dissatisfied</td>
<td>5%</td>
</tr>
<tr>
<td>Very dissatisfied</td>
<td>2%</td>
</tr>
</tbody>
</table>

Challenges and opportunities for our members
We wanted to find out the key challenges that our members are experiencing particularly in light of the COVID-19 pandemic, as well as the future challenges you anticipate in your careers. The responses indicate that currently gaining new funding and productivity are prominent challenges. Looking towards the future, funding remains the dominant barrier and there is a growing concern around career progression.

Top three current and future challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Current</th>
<th>In the next two years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure funding</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Productivity</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Networking opportunities</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Job security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Career progression</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although this remains a difficult time for many, understanding the opportunities that have arisen for our members during the pandemic and those predicted for the future will help us support you in making the most of them. The benefits of virtual events and new working practices are highlighted in this part of the survey. The most prevalent potential opportunities at this current time do not change as members consider the future, with an appetite for virtual events predicted to remain strong.

Top three current and future opportunities

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Current</th>
<th>In the next two years</th>
</tr>
</thead>
<tbody>
<tr>
<td>More virtual conferences</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Better work-life balance</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Increased career opportunities as public interest in immunology grows</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

How we use your feedback
The Board of Trustees and our staff have been carefully considering the findings of this survey, in conjunction with the development of our new five-year strategic plan. Over the next couple of months, we will bring you more news on our future plans. Thank you for your continued support.
The essential guide
Multiomic single cell immunology

Learn more

Recombinant Antibodies
Sequencing | Engineering | Expression | Catalog

Your favourite research tools, improved with recombinant antibody technology.

absoluteantibody.com

Questions about COVID-19 vaccines?
Download this free, easy-to-read guide

Scan this QR code
Or go to: bit.ly/covidvaccineguide

A guide to vaccinations for COVID-19
Reliable, evidence-based information from the British Society for Immunology
Championing your public engagement ventures

With COVID-19 and vaccines in the spotlight, we have an ideal chance to represent the voice of immunologists and capture public attention and curiosity in immunology. Public engagement is the perfect opportunity to increase awareness of the significant contribution of immunology to our communities and society as a whole. In this article, our Public Engagement Manager, Erika Aquino, explains the different ways the BSI is here to guide and support our members with their public engagement endeavours, big or small.

Empowering the public

I’m often asked why public engagement is important. Increasing public knowledge, and the confidence to use that knowledge, can empower and inspire people. I’m passionate about authentic two-way conversations about science that can provide mutual benefit to both researchers and the public. Crucially, by providing space for the public to feel genuinely listened to, we can build public trust and confidence in science and research funding, while enabling everyone to make informed decisions about their health. Through engaging with the public, researchers can gain fresh perspectives and new insights into their work, discovering what matters to patient and public groups. Understanding the implications of research can lead to greater impact. It also enables new partnerships and collaborations as well as contributing to the development of transferable skills such as project management, communication and leadership. Plus it can be fun and motivational!

Many ways to share your passion

There are two main ways in which we engage with the public as an organisation. One is directly by attending science festivals and events, creating informative materials accessible to a wide audience and working with our partners. The other way is assisting our members by providing training and resources to facilitate your public engagement activities. At the BSI, we champion public engagement, and we’re keen to share our passion for immunology. Whether you call it science communication, patient involvement, outreach, widening participation or policy engagement, we promote and encourage all forms of public engagement.

As part of the External Affairs team, I work closely with our members to develop new materials. Your input is incredibly valuable to make sure the science is accurate and to have the immunologist’s perspective on complex concepts. A recent proud achievement for me was launching our guide to vaccinations for COVID-19 (bit.ly/covidvaccineguide), which provides reliable, evidence-based information on vaccines and immunity to everyone who needs or wants it. Lots of members gave us their time and expertise to fact check, copy edit and work on this brilliant resource – thank you. And a huge thank you to all our members who have been engaging with the public around COVID-19 vaccines, we’re very proud and grateful.

The first step

If you haven’t begun your public engagement journey, where do you start? Sometimes this can be the most daunting point for researchers, but we can help. We have countless free resources and ideas to ease you into taking the first step. Informative infographics, animations, detailed Q&A videos, practical activities and educational materials – there’s something for everyone to discover and share. Take a look at the ‘find out more’ box. Another place to start might be to find inspiration and training on public engagement. We are running a ‘Vaccine engagement starts at home’ campaign to empower you to engage with the public around COVID-19 vaccinations, from friends and family to local communities, networks and the wider public. It includes webinars to help you build your skills and become a positive vaccine ambassador. Importantly, our Communicating Immunology grant scheme offers members up to £1,000 to spark interest, discussion and understanding of immunology. I’m interested and excited to hear about your ideas for applications and I’m very happy to provide feedback on proposals and discuss details.

Here to support you

I’m here to support you, as is your Society. My role as a public engagement professional is to enable engagement to flourish by motivating our members, supporting the development of new initiatives and facilitating high quality engagement. I can also equip you to evaluate engagement work, which is vital for reflecting and learning from experience. If you have any queries, or would like to update us on what you’ve been doing to communicate with the public, please get in touch. I always enjoy learning about what our members have been up to!

Erika Aquino
BSI Public Engagement Manager
Email: e.aquino@immunology.org

Find out more:

• ‘Vaccine engagement starts at home’ campaign: www.immunology.org/coronavirus/vaccine-engagement-starts-home
• Connect on Coronavirus resources: www.immunology.org/coronavirus/connect-coronavirus-public-engagement-resources
• Celebrate Vaccines campaign and resources: www.immunology.org/celebrate-vaccines/public-engagement
• Immunology-related activities on a wide range of topics: www.immunology.org/public-information/immunology-related-activities-and-resources
Vaccine engagement case studies from BSI members

Our 'Vaccine engagement starts...' series showcases examples of how BSI members are COVID-19 vaccine ambassadors. Our hope is that, through highlighting a range of the wonderful and impactful activities our members have been carrying out, others will be inspired to begin engaging with the public on vaccines. In this article, you can find inspiration with a sneak peek of our case studies. To read the full series, head to: www.immunology.org/vaccine-engagement-starts-with-BSI-members. The more people involved, the bigger an impact we can make. Join our mission to increase public understanding of the importance of vaccination!

**Vaccine engagement starts...**

**...as part of a BSI Regional Group**

BSI member, Dr Brian Ferguson is a Lecturer in Innate Immunity at the University of Cambridge. He has vast experience engaging with the public around immunology and has been working to increase understanding of COVID-19 vaccines. Brian shares his thoughts on the change to public engagement over the past 12 months, how to maximise positive interactions online and the benefits of working as part of a team.

"Whichever way you choose, the data around combating vaccine hesitancy is very clear – listening to individuals, making them feel heard, providing information, answering their questions – that’s the most effective way."

Dr Brian Ferguson

**...with learning from your loved ones**

BSI member, Dr Dammy Pinheiro is a Postdoctoral Research Associate at Imperial College London. She has been talking to friends and family and engaging with ethnic minority communities and healthcare workers about COVID-19 vaccination. Dammy talks about how she helps others make informed choices by focusing on specific concerns and the importance of continuing to have constructive vaccine conversations.

"I will carry on connecting with people and sharing my experience to help them make informed choices, and I strongly feel that as immunologists, we must all do so relentlessly."

Dr Dammy Pinheiro

**...with knowing your role as an immunologist**

BSI member, Professor Neil Mabbott is a Personal Chair of Immunopathology at Edinburgh University’s Roslin Institute. He has been answering questions from the public about how COVID-19 vaccines work, while providing reassurance about their safety. Neil recommends different strategies for effective communications and draws attention to the role and value of immunologists in vaccine conversations.

"If you’re apprehensive about public engagement, remember that your role as an immunologist is to explain, not to defend something. You’re there to provide information and explain complex immunological matters."

Professor Neil Mabbott

**...by shifting your perspective**

BSI member, Professor Danny Altmann is a Professor of Immunology at Imperial College London. He has been providing scientific evidence about COVID-19 vaccines to different audiences, including policymakers to feed into their decisions, journalists to ensure news stories are accurate and healthcare workers to increase their confidence. Here, Danny speaks about how he has been learning the ropes and focusing on understanding concerns, and emphasises the vital role of immunologists in the pandemic.

"Immunologists, this is the job that you love and that you’ve trained for all your life. This is the time to use all our knowledge in the war against the virus and to help others feel confident about COVID-19 vaccination."

Professor Danny Altmann

**...with working with the media**

BSI member, Dr Zania Stamataki is a Senior Lecturer at the University of Birmingham. She has been working closely with journalists to inform the public about the immune response to SARS-CoV-2 and the importance of vaccination. Here, Zania highlights her positive experience so far, how she approaches different types of communication and how public engagement has opened a lot of doors for her career.

"Now is the time for immunologists to make the most of the opportunity to communicate our knowledge to the public and build the systems and trust needed for global vaccination in the future."

Dr Zania Stamataki

**...from personal experience and self-confidence**

BSI member, Professor Ann Ager is a Professor of Cellular Immunity and Immunotherapy at Cardiff University and the Chair of the BSI Forum. She has been playing her part in addressing some of the myths around COVID-19 vaccines by informing healthcare workers and the public. Here, Ann considers why she wants to share her immunology knowledge, goes through detailed strategies to prepare your
own presentation, and emphasises the importance of feeling confident.

"I feel that these conversations are extremely important. My message to other BSI members would be to make sure that you feel confident. Start by thinking about what you have to offer and then, give it a go with a rehearsal."

Professor Ann Ager

...by engaging with your local community

BSI member, Dr Donald Palmer is an Associate Professor of Immunology at the Royal Veterinary College, University of London and the BSI Education & Careers Secretary. He has been speaking to diverse communities about how the immune system works and why we need vaccinations. Here, Donald shares his thoughts on the importance of community engagement, how to go about it and why every immunologist’s voice matters.

"We all communicate differently, we have different accents and different personalities, and this will help us reach a variety of people around the UK. By continually having this conversation, the message is more likely to get through to people who have questions."

Dr Donald Palmer

...as an undergraduate student

BSI member, Lois Mason is an undergraduate immunology student at the University of Glasgow. She has created video explainers to help people understand why they are being advised to be vaccinated as part of her final year project. Here, Lois talks about her experience so far, highlights how it’s possible to make a difference as a student and shares her advice for others looking to learn about science communication.

"As an undergraduate student, you can feel that you don’t have a voice, and this can hold you back in some ways. But actually, there’s no reason why you shouldn’t speak out!"

Lois Mason

...with volunteering with St John Ambulance

BSI member, Dr Louise Topping is a Postdoctoral Research Assistant at the University of Oxford and an Early Career Representative on the BSI Forum. She has just completed the training needed to be a Volunteer Patient Advocate with St John Ambulance, which focuses on the welfare of patients pre and post COVID-19 vaccine. Here, Louise shares her thoughts on the positive impact of the role and how her immunology background has been an advantage.

"Delivering a message on the safety and efficacy of vaccines to as many people as possible is essential. The more people you can have actively spreading accurate information, the better the outcome."

Dr Louise Topping

...on TikTok

BSI member, Dr Faith Uwadiae is a Postdoctoral Training Fellow at the Francis Crick Institute and an Early Career Representative on the BSI Forum. She recently created a TikTok account and started sharing facts about COVID-19 vaccines through 60-second videos. Here, Faith discusses her science communication journey and learnings, and how small conversations can have a big impact in people’s lives.

"We should never underestimate what we can do with our background and knowledge – a small conversation can have such a big impact in people’s lives."

Dr Faith Uwadiae

...in your university networks

BSI member, Dr Natalie Riddell is a Lecturer in Immunology and Ageing at the University of Surrey. She has been working with her local networks and the alumni community to build vaccine confidence by addressing concerns about COVID-19 vaccines in informative online sessions. Here, Natalie talks about the role of immunologists in public engagement, how you can use your networks to reach different audiences and other useful advice.

"You don’t have to reach a huge number of people, but you can share your knowledge with friends, family and colleagues. At least it’s a start!"

Dr Natalie Riddell

...with a science communication blog

BSI member, Dr Daniel Patten is a Postdoctoral Research Fellow at the University of Birmingham. Recently, he has started engaging with the general public around COVID-19 vaccines. From writing a comprehensive blog sorting fact from fiction and a letter to the BMJ on the use of social media, to appearing in the local news, he has been using his expert skills as a researcher to make science accessible. Here, Daniel shares what he learned from these experiences and encourages other researchers to embark upon public engagement.

"Team up with other people around you to add more weight to what you’re trying to say. It is quite scary to raise your head above the parapet and have the spotlight on you, but it’s less daunting with someone else."

Dr Daniel Patten

...at the Swansea Science Festival

BSI South Wales Immunology Group members, Dr Becky Aicheler and Dr Simone Cuff, ran a virtual #CelebrateVaccines session at the Swansea Science Festival. Here they give their perspective on the event and public engagement with immunology.

"I think it can be easy to take for granted the expertise we have as a scientist and I believe it’s important that we communicate our understanding to the general public."

Dr Becky Aicheler

“The people involved in science engagement tend to genuinely like helping others. These are people that are nice to know and work with.”

Dr Simone Cuff

Find out more:

Are you a BSI member involved in public engagement around COVID-19 vaccines? We’d love to hear from you! Please get in touch with our Marketing & Communications Manager, Teresa Prados, to share your experience.

Email: t.prados@immunology.org
Virtual ECI 2021 is opening doors to scientists around the world

The 6th European Congress of Immunology, which was planned to take place in Belgrade, Serbia from September 1–4, 2021, will be held virtually on the same dates.

The program covers the full spectrum of immunological-related research with a slate of exceptional keynote and plenary sessions featuring two Nobel Laureates and a line-up of internationally renowned scientists. Participants will enjoy 30 main and regular symposia sessions within the 4-track program. The latest developments regarding COVID-19 will expectedly feature prominently in several sessions throughout the Congress.

Workshops and poster sessions will continue to be an exciting part of the Congress. To recognize the most notable and exciting works from the abstracts submitted, workshops, including ‘Bright Sparks’ workshops that focus on younger investigators, and ‘Best Poster’ sessions will feature in this year’s virtual experience.

ECI 2021 will implement a state-of-the-art virtual platform to provide our participants, speakers and industrial partners access to the scientifically stimulating program, valuable discussions and networking opportunities through various chat functions and video chat rooms. The organisers are hard at work to make the Virtual ECI 2021 the premier event for the European immunology community, “opening doors to the world of immunology” and inviting colleagues from around the world to join. We encourage you to register for ECI 2021 at eci2021.org and follow on social media: twitter.com/2021ECI.

Keynote and plenary speakers

Sir Peter Ratcliffe United Kingdom
How cells sense and respond to oxygen depletion

Jules Hoffmann France
Story of how innate immune cells sense danger and respond to it

Brigitta Stockinger United Kingdom
Environmental influences on intestinal immune responses and epithelial cell homeostasis

Cezmi Akdis Switzerland
Epithelial barrier hypothesis for the origins of allergic and autoimmune diseases

Federica Sallusto Switzerland
Human T cells in health and disease

Joachim Schultze Germany
Single-cell omics and a pandemic: did we learn something that helps us for other diseases as well?

Janko Nikolich-Zugich USA
Damage, defense and adaptation – how the immune system ages

Edit Buzas Hungary
Extracellular vesicles in the immune system

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**Vitamin D & immunity: could vitamin D supplementation enhance antigen-specific immunity in older adults?**

Researchers from Queen Mary, University of London, University College London, University of Edinburgh and Royal Free Hospital in London are studying how the immune system changes with age to identify therapeutic interventions that could be utilised to improve immunity in older adults. In this article, BSI member, Dr Emma Chambers, discusses their recent findings published in our Open Access journal *Immunotherapy Advances*, which show that vitamin D replacement enhances antigen-specific immunity in older adults.

**Immunity and aging**

An aging population is a global trend – unfortunately increasing lifespan does not coincide with increasing health-span. Older adults (≥65 years) live with chronic inflammatory diseases, increased incidence and severity of new infections, re-activation of latent infections such as varicella zoster virus (VZV; which causes shingles) and reduced vaccine efficacy. The aim of our research is to understand how and why the immune system changes with age and to identify therapeutic interventions that could be utilised to improve immunity in older adults.

Our work focuses on skin-specific immunity. Using our *in vivo* human antigen challenge model,1 antigen is injected intradermally in the skin and the memory recall responses is assessed 48–72 hours post-injection (Figure 1). A clinical score (range 0–10) is generated based upon three measurements of the injection site: induration, palpability and the change in erythema from baseline. We have observed that older people have a significantly lower clinical score in response to antigen challenge (VZV, candida or tuberculin skin test) as compared with young (<40 years), demonstrating that older people have worse memory recall responses in the skin. This reduced memory recall response is due to reduced T cell and dendritic cell accumulation at the site of antigen challenge.2

Inflammaging, a process of chronic low grade systemic inflammation often observed with increasing age,2 is a strong predictor for frailty and mortality in older adults3,4,5 and is proposed to contribute to worsening antigen-specific immunity.6 We have observed that needle damage (which can be caused by air, saline or antigen injection) in the skin, results in an inflammatory cascade which recruits inflammatory monocytes and blocks antigen-specific T cells via the production of prostaglandin E2.7 These observations led us to propose that blocking inflammation is a therapeutic option to boost immunity in older adults.

**Therapeutic potential of vitamin D**

Vitamin D, which is known as the ‘sunlight’ vitamin, its precursor is generated in the skin via a UVB irradiation catalysed reaction from the sun. Although it is known that vitamin D is vitally important for skeletal function, it is becoming increasingly clear that it also has an important role in immunity by increasing anti-microbial peptides, immunoregulatory T cell populations and decreasing inflammatory cytokine production. Vitamin D insufficiency, as determined by serum 25-hydroxyvitamin D (25(OH)D) levels <75 nmol/L, is more common in older adults, particularly in those who are frail and who have elevated inflammatory markers. Therefore, vitamin D insufficiency in older adults may exacerbate low-grade non-specific inflammation associated with inflammingaging.

We found that those older adults who exhibited a large non-specific proinflammatory response to needle damage were the most vitamin D insufficient. Conversely individuals who had the highest levels of serum 25(OH) D (25(OH)D) levels >75 nmol/L, did not have as large an inflammatory response to saline. These data suggested that vitamin D may have therapeutic potential to inhibit inflammingaging-associated pathways and in turn boost antigen-specific immunity in older people.
We established a clinical study in which older people, who were vitamin-D-insufficient (<75nmol/L serum 25(OH)D), were recruited and were orally administered 6400 IU of vitamin D3 per day for 14 weeks. Antigen-specific immunity was assessed by measuring the clinical response to intradermal VZV antigen challenge and by transcriptional analysis of skin biopsies collected pre- and post-vitamin D3 replacement (Figure 2). There was a significant enhancement of VZV-specific cutaneous immunity in older adults after vitamin D supplementation. This improvement in antigen-specific immunity was associated with reduced non-specific inflammatory monocyte gene signature in response to needle challenge. Concurrently, an increase in T cell-specific gene signature was observed in VZV injected skin. Collectively these data suggest that vitamin D insufficiency is contributing to the manifestation of inflammaging phenomenon in the skin of older people, which is associated with worse antigen-specific immunity. Importantly vitamin D3 replacement can significantly reduce the non-specific inflammation which led to enhancing antigen-specific T cell responses (Graphical abstract).

**Boosting vaccine responses?**

These findings have exciting and wide-ranging implications for aging and immunity, as supplementation of vitamin-D-insufficient older people could be utilised to boost their antigen-specific immunity and potentially enhance vaccine responses. These findings are particularly timely with the current SARS-CoV-2 pandemic which disproportionately causes increased morbidity and mortality in older adults and worse COVID-19 disease outcome is associated with vitamin D insufficiency. Our data suggest that vitamin D3 is an attractive potential therapeutic which could be beneficial for COVID-19 disease. There are a number of ongoing clinical trials looking at vitamin D3 supplementation and COVID-19 disease outcome, such as the CORONAVIT study and I look forward to seeing the outcome of these trials.

However, until we have the results of the clinical trials, vitamin D is a safe, cheap and readily available supplement. Public Health England currently recommends that everyone takes 10ug of vitamin D3 a day during winter. Long-term a reduction in vitamin D insufficiency especially in older adults, is likely to contribute to an improved antigen-specific immunity and thus reduce the burden of infections on the older adult population.

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8. Chambers et al. 2021 Immunotherapy Advances 1 ltaa008 DOI: 10.1093/immadv/ltaa008
It was interesting to see the Nature Communications article published in November 2020 examining the association between early career mentorship and the academic outcome for the mentee (go.nature.com/34zVr7v). The study examined a range of parameters including the gender of the mentor and came to the conclusion that ‘protégés’ (mentees) with female mentors did less well than those with male mentors. Indeed, it was suggested from their study that the academic careers of mentees fared best if they were paired with highly successful so called ‘big shot’ mentors. Needless to say, conclusions drawn from this article attracted world-wide attention not least because it appears to undermine approaches to establish diversity in academia. Following investigation by the Editors, the article was retracted by the authors (go.nature.com/3vqkSnv) on 21 December 2020, less than one month after publication; Nature Communications is yet to comment on the findings from its investigation. However, it is worth examining the article and the parameters studied to determine whether its conclusions are indeed relevant to current practice and future institutional approaches.

The authors examined a large number of mentor/protégé pairs focusing on US institutions. The success of the protégé was determined by examining publications in the absence of the mentor where the academic age of the protégé (years since their first publication) was greater than seven years. The impact of publications obtained in the absence of the mentor was ascertained by determining citation indices five years after publication. From this it can be seen that conclusions are being drawn based on information garnished over an extended timeframe.

Much has changed in many institutions over recent years as the need for diversity and inclusion has been recognised. Indeed, there is an increasing awareness of the role of mentorship in supporting career development. This Nature Commns publication reflects past history (where the mentor is the laboratory head/principal investigator). Big shot mentors were defined on the basis of their publication records and their citations and it is likely that these would have reflected well-resourced laboratories with mentors in positions of authority. This would likely have been largely male dominated at the times reflected in this study. Mentorship itself can have many forms other than co-authorship and in large laboratories in the US the mentor may well be the early career researchers rather than the laboratory head or principal investigator (PI). The study also did not include protégées who took career breaks (most likely women for caring responsibilities). Important questions for the future are [1] how can the mentor–mentee relationship support the goals of many institutions to increase diversity and [2] how will effective mentorship be measured?

The data presented in the Nature Communications paper are based only on publications, but co-authorship does not necessarily count as a mentoring relationship. There have been considerable changes in the publishing world where detailed justifications for authorship are required in many journals. However, the increase in the number of multi-author papers and the expansion in scientific content, particularly in high-impact journals, may leave junior researchers feeling that they are not recognised fully for their contributions. Early career researchers may be subject to a type of ‘bullying’ in being told that their careers depend solely on metrics of publications in high impact journals. They may also feel unable to speak out freely against discrimination, unconscious bias or scientific fraud. If the mentor is the lab-head (the person who holds the purse-strings) then this situation will never improve.

The advent of developmental mentorship

Schemes in which the mentor is completely independent of the laboratory and, ideally, the institution, may work to change research culture by revealing unacceptable practises which do not attract early career researchers to continue in academia. Learned Societies such as the Academy of Medical Sciences and the British Society for Immunology run one-to-one mentoring schemes where the mentee and mentor are independent and work in different
What can mentorship offer?

Mentees should feel free to engage in confidential discussions with an independent mentor on any topic that may impact on career progression. For example:

1. Seeking advice on CV presentation, job applications and mock interviews for internal and external posts.
2. Asking your employer for the support you need to carry out your post, such as child-care friendly working patterns or salary enhancement.
3. Relying on an apparent benefactor who says they will find you a post which may not materialise, and you will have missed career opportunities elsewhere.
4. Waiting for your line manager to put you forward for promotion. Seek independent support and push for promotion if you have achieved the targets which are proscribed by your institution.
5. It is customary for a new employer to request a reference from your current or last employer. If you think your boss will not give you a fair reference, be honest about it. Securing a post is not solely based on a single reference.
6. Find an appropriate mentor at all stages of your career – not just during the ECR period. People in established senior positions often need good advice.
7. If you do not like the advice from a mentor, seek a second opinion.

Moreover, mentoring should not be restricted to those senior people who have survived the rigors of academia but should be inclusive of scientists at all stages of career and working in all relevant disciplines such as publishing or grant funding agencies.

Acknowledgements

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Anne Cooke and Ann Ager

BSI mentoring scheme

We will continue to run our popular mentoring scheme for 2022! Applications for the scheme will open in September. We encourage applications from a range of career stages and different sectors, such as industry and clinical. Keep an eye out for more details coming soon!

FEATURE ARTICLE

What can developmental mentoring offer?

Developmental mentoring across institutions is an important addition to the unspoken, hierarchical form of structural mentoring where mentees rely on their PIs for advice and support for career progression. Apart from networking opportunities, mentors and mentees from different institutions facilitate comparisons in working practices and governance procedures to support a vibrant research culture of openness and accountability.

Conclusions: what developmental mentoring can do for mentees and mentors

Developmental mentoring across institutions is an important addition to the unspoken, hierarchical form of structural mentoring where mentees rely on their PIs for advice and support for career progression. Apart from networking opportunities, mentors and mentees from different institutions facilitate comparisons in working practices and governance procedures to support a vibrant research culture of openness and accountability.

The need for the support of a mentor has grown during the pandemic. Working from home and hybrid working does not suit everyone. Those living alone in single room apartments or juggling childcare, home schooling and other caring responsibilities with work have found it particularly difficult during the pandemic. It would be sensible to re-assess the use of metrics-driven research during, and following, this pandemic. The ability to undertake research has varied significantly across different institutions and areas of research and not all researchers have been affected equally. The realisation that well-being is the key to creativity, productivity and the motivation necessary for scientific research should not be forgotten as we emerge from the pandemic.

Mentees will benefit from mentorship delivered by different sectors such as universities, research institutes and industry. The Wellcome Trust Broadening Horizons scheme pairs early career researcher mentees from academia with mentors from industry organisations thus promoting a diversification of experience and development of additional translational skills. Pharmaceutical industries offer a wide range of mentorship schemes addressing equality and diversity to its own research staff.

Training is not formally part of mentoring but nevertheless an important component in career progression. It is worth noting that training schemes such as Wellcome Inspire Vacation studentships, UKRI CASE awards, ERASMUS scheme (land its replacement in the UK, the Turing scheme) as well as ad-hoc training delivered outside of host institutions all strive to achieve diversity and transferable skills training. They also provide networking opportunities and can result in new collaborations. These schemes were all impacted during laboratory closures from March to August in 2020. Now that laboratories have re-opened, COVID-secure working arrangements vary greatly between and inside individual institutions and opportunities to deliver laboratory training have not yet returned to pre-pandemic capacity.

How will increased diversity be achieved and what would be a reasonable time-frame?

Many institutions inside and outside of academia have realised the need to address gender and other inequalities at senior levels of management. Women and men early in their careers will not want to stay in academia if they do not see a clear pathway to senior levels and the ability to raise a family. If the COVID-19-induced lockdown has taught us anything, it is that there are different ways of working to support career development of all junior scientists, but particularly those with caring responsibilities. This includes participating in virtual meetings, conferences and networking. There are important roles for senior researchers with caring responsibilities in acting as mentors inside and outside of their host organisations to tackle gender equality and diversity.

institutions. The Wellcome Trust requires early career researchers to nominate an independent mentor for their postdoctoral scheme, a practice that is likely to be adopted by other funding organisations. These schemes differ significantly from the historical type of structural mentorship described in the Nature Communications article where the mentor is the PI. In developmental mentorship, mentees are in the driving seat and take time to learn more about themselves and assess their career options, while mentors are able to act as an independent sounding board. Mentee–mentor relationships established under these types of schemes are likely to continue well beyond the term of formal mentorship which is around 12 months. In addition, the mentor has the opportunity to take time to learn how to be an independent sounding board and grow together with the mentee, despite the different levels of experience. Interestingly, there has been an exponential interest in the mentoring scheme run by the BSI since the lockdown in 2020. Continued monitoring of mentees and mentors beyond their term of formal mentorship will be required to measure its success.
A compassionate leader: meet Professor Faith Osier

Professor Faith Osier is the first African woman to be elected President of the International Union of Immunological Societies (IUIS). She has recently started a new role as Executive Director of the Human Immunology Laboratory (HIL) at Imperial College London which serves as the clinical immunology hub for IAVI’s (formerly International AIDS Vaccine Initiative; www.iavi.org) vaccine development partnerships. In this interview, conducted by BSI Forum Chair, Professor Ann Ager, Faith discusses her research into malaria, her ambitions in her new role and as IUIS President, her experience as a role model and her thoughts on the impact of COVID-19.

Professor Ann Ager: It’s wonderful to see you Faith. I wondered if we could start with the science. From what I know, you’re interested in how humans acquire immunity to malaria, looking into longitudinal studies in children in African countries where malaria is endemic and how antibodies to parasite antigens correlate with acquired immunity with the hope to translate this understanding into vaccines for malaria. Could you give us a bit of background about your research?

Professor Faith Osier: I want to understand how we can prevent malaria. While training in medical school, we didn’t see much of this disease, other than you could get it and treat it. It was when I actually began to work as a junior doctor in a rural district hospital, that the reality of the burden of malaria hit me. We were admitting up to five patients a night into a High-Dependency Unit – even with the right treatments, some would survive and others would not. When you see this over a period of time, you begin to think how immensely better it would be to prevent people from getting ill in the first place.

At the same time in that rural hospital, British scientists were conducting malaria research, and through that, I began to understand that you can become immune to this disease. If we could learn how this worked, we could vaccinate people and we wouldn’t have them coming to the hospital and never leaving. How wonderful would it be to use the power of vaccines to prevent these deaths?

My research started locally in the communities where I lived and worked. Soon, I questioned how relevant this was across the African continent and I shifted my focus to multicentre studies. The intensity of malaria transmission can vary greatly within a single country, and this affects the clinical presentation of the disease. Understanding the immune response in these different contexts, including the variation in the strains of malaria parasites that cause disease, has been very interesting and incredibly valuable when thinking about potential vaccines that could work for everybody.

AA: You have recently moved from the Oxford Centre for Tropical Medicine and Global Health as Professor of Malaria to lead human immunology research at Imperial College London. Why did you move and what do you hope to achieve in this post?

FO: There were three aspects that attracted me to the post. First, the focus on product development. After 20 years of research, I wanted to have a real impact on the lives of the people affected by infectious disease. Being able to contribute to the development of products that would be accessible to developing countries was hugely exciting. Secondly, the possibility to continue working on malaria. Driving that progress and getting a product to the clinic that could make life better for the next generation in my own lifetime would be amazing. Lastly, the connectivity with Africa. The lab has a substantial history of strong engagement with Africa, which immediately drew my attention. I’m really passionate about enabling scientists in Africa and capacity strengthening, as this is key to solving pressing health challenges.

AA: On behalf of the BSI, many congratulations! I can see that this move has come at a strategic time in your career,
‘As a society we need to embrace different styles of leadership and allow them to become the norm. If I’m a compassionate leader, I want others to see it – you can be compassionate and still lead.’

which is doubly remarkable with your leadership of IUIS. As President, you lead on bringing together learned immunology societies from all over the world for communication and collaboration through various activities, such as the recent launch of the FAIS legacy project. What are your ambitions for IUIS during your tenure?

 **FO:** It has been a great honour and a great responsibility. First and foremost, my goal as President of IUIS is to be a role model. We’re used to seeing men in leadership positions, but the world is changing, and I think it’s important that the next generation can see a woman, and also a woman of colour, as a leader. An African woman heading this global union of immunologists speaks a lot about the forward-looking nature of IUIS.

As President I believe I have a responsibility to do the best job I possibly can. I have been working to bring immunologists together to support future scientists, particularly from low- and middle-income countries – this is how the FAIS legacy project was born (faislegacyproject.com). This initiative, established with the Federation of African Immunological Societies, aims to train and support PhD students, increase capacity for research in Africa and drive scientific discoveries that touch lives. Throughout the pandemic, IUIS has been doing a fantastic job in communications, education and outreach, not only as an international union but also individually as national societies like the BSI, and within our individual institutions. Now is the time to hone in on training scientists around the world.

 **AA:** How can the BSI membership work with IUIS to support global immunology? I’m a member of the BSI Board of Trustees and I realise that there’s great potential to strengthen our connection. How can the BSI membership work with IUIS to support global immunology?

 **FO:** The UK government’s decision to make cuts to the Official Development Assistance (ODA) funding has impacted a lot of the relationships that the UK has established over many years with partners in developing countries. With the increasingly global connectivity of our lives, it’s not enough to just have great scientists in Britain, we need them all around the world so that we can work together and react rapidly to new threats. I’m hopeful that we can get over this period and get back to supporting science and building research capacity in low- and middle-income countries. I was trained by British scientists and the experience was very valuable. I’d like to see more of that – with PhD placements, opportunities for collaboration and individual training support. It’s a huge investment to develop scientific research leaders and we rely on our well-resourced partners to achieve this. I know many are willing and often hire students for sandwich PhDs but we’re always looking for new partner labs. I would like to encourage BSI members to actively consider students from low- and middle-income countries.

 **AA:** You mentioned being a role model and its importance. I wondered how that feels to you individually as a leading scientist and as part of the wider society. Could you tell us about your experience and share your thoughts on the current activities we have to advance equality, diversity and inclusion (ED&I), such as the Athena Swan initiative?
‘COVID-19 has taught us what is possible – by breaking boundaries in terms of regulatory roadblocks, sheer political will and many partners coming together we got a vaccine within a year of discovering the pathogen.’

**FO:** I think that the current ED&I initiatives are working. There is a shift in society that’s happening on multiple levels at once, with lots of activities coming together and having a snowball effect on the role of women and other minorities. I don’t look at it in isolation, but rather as an important part of a connected network, like a river – and I believe Athena Swan is flowing in the right direction. Thanks to initiatives like this, advocacy for gender equality has moved forward and there is a lot of awareness around it already. But there’s still a way to go!

On a personal level, one of the parts that I struggle with in my position is accepting and showing my own leadership style. I am not your typical alpha-male leader. I often struggle to be myself and feel the expectation to put on a show and display traits more widely associated with leaders. As a society we need to embrace different styles of leadership and allow them to become the norm. I will continue to work to embrace who I am, strengthen my own style and feel comfortable in my own skin. If I’m a compassionate leader, I want others to see it – you can be compassionate and still lead.

**AA:** We have all been thrown into this really difficult time due to the SARS-CoV-2 pandemic. You’re a parent, a carer and a scientific leader. What impact has the pandemic had on these different aspects of your life and how are you managing to maintain motivation, both in your team and personally?

**FO:** The pandemic has been hard on the team and slowed down our work in the lab. I feel that it has affected some more than others; close families have been able to lean on each other, whereas students and trainees have suffered more isolation. On the bright side, immunology gained prominence globally and the value of our contributions really energised the team. Their expertise was drawn on by their communities to explain the developments and they could see the evident impact that working in science has in our society. Immunologists have been (and continue to be) part of the way out of the pandemic and we can all feel proud of ourselves!

For me, the pandemic has been a time to consolidate and regroup. I have been able to spend more time with my family, settle down and strategise about the future. One of the benefits of being able to connect on Zoom is that you can save the time you’d spend traveling across the world to give a one-hour lecture. My young children are really pleased that mummy is home all the time.

**AA:** Immunology is indeed saving the world. But the focus on COVID-19 has had repercussions on other areas of immunology. What impact has the pandemic had on your research into malaria?

**FO:** COVID-19 has turned immunology into something that everyone on the street is aware of. People know what it is and what vaccines are. The message has got through not just in the developed world but also in resource-constrained countries. I often reflect on the impact we could have on malaria if the global society galvanised support in the same way that it did for COVID-19. Unfortunately, malaria is still a far-away disease to most of the Western world. However, COVID-19 has taught us what is possible – by breaking boundaries in terms of regulatory roadblocks, sheer political will and many partners coming together we got a vaccine within a year of discovering the pathogen. This is incredibly exciting and gives me a lot of hope. We can achieve this for malaria. Whether it will be an mRNA platform or a new adenovirus vaccine, the future is bright. With determination, willpower and collaboration, we can go a long way.

**AA:** We’re very pleased to hear that. Thank you for your time. It has been wonderful to speak with you and hear about your experiences.
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The BSI has been continuing its ambitious policy and public affairs programme over the past few months and ensuring that we continue to be a thought leader on immunological issues for policymakers. Our Policy and Public Affairs Manager reviews the current political situation and the last few months of policy work.

**Briefing Parliamentarians**

In April, we met with Nadhim Zahawi MP (Con, Stratford-on-Avon), the Vaccine Deployment Minister, who was very interested to hear about the innovative work that the BSI is doing in partnership with the London Borough of Bexley to train COVID-19 vaccine champions. Both within local community groups and in health/social care worker groups, we are training champions in how to have effective conversations with their networks about COVID-19 vaccines. Nadhim gave us a number of additional ideas and contacts to help advance and expand this work.

We also continued our work ensuring that backbench MPs and Peers receive briefings on the latest immunological developments. Dr Matthew Buckland, a BSI Forum Member, gave a briefing to the All-Party Parliamentary Group on Blood Cancer on the effects of COVID-19 on the immunocompromised and the effectiveness and safety of COVID vaccines for members of that vulnerable population. It was well received with many insightful questions; participants included the APPG Chair, Henry Smith MP (Con, Crawley); the Shadow Public Health Minister, Justin Madders MP (Lab, Ellesmere Port and Neston); and Lord Walney (Crossbench).

**Vaccine passports review**

The BSI has also been a key stakeholder consulted on the practicalities of and evidence behind the potential introduction of COVID-19 status certification and ‘vaccine passports’. Back in March, after a letter the BSI wrote to Rt Hon Michael Gove MP (Con, Surrey Heath) in his capacity as Minister for the Cabinet Office, which is leading the COVID-19 status certification review, Professor Danny Altmann, a member of the BSI Immunology and COVID-19 Taskforce, met with Cabinet Office officials working on the review to discuss the immunological evidence for and against the potential programme. Later on, at the end of April, Dr Ruth Payne, another member of the taskforce, gave oral evidence to the House of Commons Science and Technology Committee on the same issue; this is available to watch online (bit.ly/3fJEpcd).

Over the next few months, we will continue ensuring that the interests and views of immunologists are properly represented to policymakers across the UK, to make sure that policy remains evidence-based and properly scrutinised.

**Parliamentary Questions**

The BSI’s parliamentary questions programme continues in earnest with more MPs asking the Government questions on our behalf about topics that are relevant to our members and our policy objectives.

Since the beginning of 2021, we have had 30 of our questions tabled by MPs from a variety of political parties on topics that span support for early career researchers to the date of publication of the Government’s long awaited Vaccine Strategy. Most recently, Dr Philippa Whitford MP (SNP, Central Ayrshire) has asked Cabinet Office Minister Rt Hon Penny Mordaunt MP (Con, Portsmouth North) about whether the Government is considering immunological limitations in relation to its COVID-19 certification review discussed above and has raised the issue of global equitable access to COVID-19 vaccines with FCDO Minister Wendy Morton MP (Con, Aldridge-Brownhills). Meanwhile, Dan Carden MP (Lab, Liverpool Walton) has quizzed the Science Minister, Amanda Solloway MP (Con, Derby North) on the implications of the £120 million funding gap in the UKRI budget between allocations and

‘The BSI has been a key stakeholder consulted on the practicalities of and evidence behind the potential introduction of COVID-19 status certification and ‘vaccine passports’.’
representing immunology

commitments, a result in the reduction of Official Development Assistance, and on whether COVID-19 research will be saved from these budget cuts.

ODA cuts
These last two questions are highly pertinent to policy work that we have planned regarding cuts to the Official Development Assistance (ODA) budget over the next few months. Because of COVID related financial pressures, the Chancellor of the Exchequer, Rt Hon Rishi Sunak MP (Con, Richmond), announced at the November 2020 Spending Review that ODA would be reduced from 0.7% Gross National Income (GNI) to 0.5% GNI. But because of pre-existing commitments and ringfenced spending such as the UK’s contribution to the World Bank and outlay towards refugee costs, we have found that these cuts fall disproportionately on research, and immunology in particular. This means that instead of across the board cuts of 28%, some areas are protected whilst science and research must contend with a 67% budget cut.

While the Government has retrospectively agreed that any existing global health research being directly funded by the NIHR will be protected, this fails to account for any of the work that has been funded by UKRI, including the Global Challenges Research Fund (GCRF) and Newton Fund. On the ground, this has meant that many projects being carried out in partnership with low- and middle-income countries have had to be scaled back, truncated or terminated completely, including in some instances where funding award letters have been sent and then later reneged upon. As many BSI members will be able to imagine, not only has this had a detrimental effect on the work itself, but has damaged international relationships and trust that have been built up over many years and severely threatens the view of the UK as a funder that can be relied upon. Please watch this space for our upcoming campaign relating to this.

APPG V4A
In summer 2019, the All Party Parliamentary Group (APPG) on Vaccinations for All launched an inquiry into improving vaccine uptake, to which the BSI submitted evidence. At the end of May 2021, we were delighted to see it published with additional evidence that takes into account the effects of the pandemic. The report, ‘Improving Vaccine Uptake’, takes on board a number of recommendations that the BSI put forward in its evidence including increased training for healthcare workers to answer individuals’ questions about vaccines, enhanced community outreach services, and improving accessibility of vaccination services. It is encouraging to see the APPG, led by SNP Westminster Health Spokesperson Dr Philippa Whitford MP, endorse several of the measures that the BSI has been calling for as part of its ongoing policy work around vaccinations and we hope to see these measures incorporated into the Government’s Vaccine Strategy. The report also echoes our view that there is much that could be learned from the COVID-19 vaccine deployment that could be applied to the routine childhood vaccination schedule rollout as well. Find out more here: bit.ly/3ilH0vw.

Global Vaccine Confidence Summit
On 2 June, the BSI attended the world’s first Global Vaccine Confidence Summit, hosted by the UK in the run up to the G7 meeting in Cornwall. The summit brought together governments, NGOs, and the private sector to discuss ways in which to tackle vaccine misinformation and amplify public health messages to improve vaccine confidence. Speakers included Dr Anthony Fauci, the Chief Medical Advisor to the President of the United States; Rt Hon Matt Hancock MP (Con, West Suffolk), UK Health and Social Care Secretary; and Professor Heidi Larson, founder of the Vaccine Confidence Project. The BSI has called on the Government to make increasing vaccine confidence a special legacy of this year’s G7 while the UK holds the grouping’s rotating presidency (bit.ly/3uPS6LY). This legacy could be a long-lasting reminder of the UK’s commitment to improving global public health, while having significant on the ground effects in the fight against COVID-19 and the emergence of viral variants. The UK has led the world in the rollout of COVID-19 vaccines to our population. We are arguing that now we must make sure that we also lead on a global stage and build the trust in these vaccines around the world which will allow the whole world to leave this pandemic behind.

Matthew Gibbard
BSI Policy & Public Affairs Manager
Email: m.gibbard@immunology.org

‘The BSI has called on the Government to make increasing vaccine confidence a special legacy of this year’s G7 while the UK holds the grouping’s rotating presidency. This legacy could be a long-lasting reminder of the UK’s commitment to improving global public health.’
Congratulations to new Fellows

Both the Academy of Medical Sciences and the Royal Society have announced their lists of new Fellows for 2021. Congratulations to the following immunologists on being elected as Fellows in recognition of their outstanding contributions to the discipline.

Royal Society

Professor Adrian Hill, Lakshmi Mittal and Family Professor of Vaccinology and Director, The Jenner Institute, University of Oxford. Professor Hill founded and directs The Jenner Institute. He led the development team behind the AstraZeneca/Oxford COVID-19 vaccine at Oxford University.

Professor Ten Feizi, Director, Glycosciences Laboratory, Faculty of Medicine, Imperial College London. Professor Feizi is a recipient of the Outstanding Research Award of the American Society of Clinical Pathologists and the Rosalind Kornfeld Life Time Achievement Award of the Society for Glycobiology.

Academy of Medical Sciences

Professor Sarah Gilbert, Professor of Vaccinology, The Jenner Institute & Nuffield Department of Clinical Medicine, University of Oxford. Professor Gilbert led the team which developed the AstraZeneca/Oxford vaccine against SARS-CoV-2. She is a co-founder of the University of Oxford’s spin-out company Vaccitech.

Professor Beate Kampmann, Director, The Vaccine Centre, and Professor of Paediatric Infection and Immunity, London School of Hygiene and Tropical Medicine. Professor Kampmann heads the Vaccinology theme at the MRC-The Gambia, where she leads a large team conducting research and clinical trials, aimed at improving global health in West Africa.

Professor Adrian Liston, Senior Group Leader, Babraham Institute. Professor Liston’s laboratory researches how regulatory T cells migrate to tissues and what controls their numbers and their functions. He has been awarded the Francqui Chair, Eppendorf Prize and three ERC grants.

Professor Anna Katharina (Katja) Simon, Professor of Immunology, Kennedy Institute of Rheumatology, University of Oxford. Professor Simon’s work has revolutionised the field of autophagy. In 2018, Katja was awarded the prestigious EFIS-EJII Taaka Asnas Prize, which recognises prominent European female group leaders in immunology.

Dr Jane Osbourn, CSO, Alchemab Therapeutics. Dr Osbourn is a leader in the field of antibody engineering and has over 30 years’ experience in biotechnology. She is Director of Babraham Bioscience Technologies, a Director of Cambridge Enterprise. In 2019, she was awarded an OBE in the Queen’s birthday honours for services to drug discovery, development and biotechnology.

Learned Society of Wales Fellow

Congratulations to BSI member and Trustee, Professor Ann Ager from Cardiff University, who was elected as Fellow of the Learned Society of Wales. The Fellows were welcomed by the Society and highlighted due to their place at the forefront of knowledge and expertise during the past year. The new intake includes academics, researchers and professionals who demonstrate the ongoing excellence of Welsh research, universities and intellectual life.

Communicating Immunology Grants

The BSI is delighted to fund the following projects.

Amanda Gibson and the Comparative and Veterinary Immunology Group have been awarded funding to deliver ‘Bite-Sized Flu Camp’ for 14-16-year-olds, which highlights the zoonotic nature of influenza and the role of vaccination in preventing disease and reducing transmission. The activity will complement the national curriculum to engage students and provide an opportunity to interact with immunologists through Q&A sessions.

James Pearson from Cardiff University’s Diabetes Research Group will be funded to celebrate the centenary of the discovery of insulin by creating a film showcasing type 1 diabetes immunology research. The film will highlight how a research idea is developed to understand more about type 1 diabetes and could contribute to a future cure or prevention.

Georgia Perona-Wright from the University of Glasgow is being funded to create a series of short, animated videos addressing common questions and concerns about COVID-19 vaccines. These accessible animations will present accurate information to reduce vaccine hesitancy and empower people to make confident decisions about vaccinations.

The next application deadline is 1 July 2021 and we welcome virtual project ideas. We’re particularly keen to hear of projects for engaging the public about COVID-19 vaccines. For more details, visit www.immunology.org/grants-and-prizes/communicating-immunology.

RSB Council member

Congratulations to BSI member Professor Louise Cosby who was elected to represent individual members on the Royal Society of Biology Council. Professor Cosby is Head of virology at the Agri-Food and Biosciences Institute and Emeritus Professor in the Wellcome Wolfson Institute for Experimental Medicine at Queen’s University Belfast.

We would love to hear from you about your achievements. Have you or a colleague recently received grant funding, passed your PhD viva or accepted a new appointment? If so, let us know by emailing media@britsocimm.org or tagging @britsocimm on Twitter.
BSI member, Hannah Bialic, finished her MSc at the University of Glasgow a few years ago and has since worked as neuroimmunology researcher at the Institute of Infection, Immunity & Inflammation. Here, she discusses her journey as an early career researcher and the effects of the pandemic, while reflecting on the different ways to enjoy a career in immunology.

I am currently a neuroimmunology researcher at the University of Glasgow. I was not born in Glasgow, nor can I replicate the accent, however, I completed my Master’s in Immunology and Inflammatory Disease at the University in 2018 and never left.

I began my Master’s degree with my eyes trained far into the future, on a point where I hoped my career would take me, based on a culmination of advice and witnessing the path work so well for friends and peers. I never really considered the human aspect; the me aspect. My MSc was, originally, a stepping stone on the way to an MD/PhD (known as the Medical Scientist Training Programme in the US) and onwards to a fruitful and fulfilling career.

I did not foresee when I came to Scotland that nearing five years later, I would be on the road less travelled among my peers; I would still be working – not studying – and moreover enjoying my journey as an early career researcher. I still plan to apply for my MD/PhD next year, however I have not sacrificed any opportunities to fit an abridged timeline.

How did the pandemic affect my research?

For a wet-lab scientist who predominately works with mice, the effects of Covid on our research are immutable and enduring. My lab group investigates the post-infectious autoimmune paralytic neuropathy, Guillain-Barré Syndrome. Our major method of research is through mouse models of disease that have been developed for the various GBS variants. There was an enormous [and ethical] breeding reduction in tandem with the reduction in staff over the past year, but it was the trickle-down effect of reduced breeding groups that resonated throughout our – and many other – labs as restrictions have eased. The use of shared equipment has become a quagmire of booking systems and shared calendars, as most institutes I am sure can attest to. Research is, and very well should be, a collaborative enterprise, which has been difficult to navigate when you can no longer pop in to ask your supervisor a question or run your experiment alongside your co-worker.

As with many lab groups throughout the UK, we prepared to be furloughed in the face of a halt in all research that would not directly impact the Covid response.

Setting up a Covid megalab

At the end of March of last year, an email and survey was sent out to the whole college marked with high importance, asking for volunteers to support the Coronavirus pandemic. The survey enquired after lab skills, some general and some very specific for working with pathogens. I was enthused that I could possibly lend some support to helping what felt like the world combat this crisis. I was selected to be in the first group of 17 volunteers out of the 500 who submitted the survey. I was honoured, nervous, and excited to do something, anything.

We all thought we were going to step in and run a couple PCR machines to test some quantifiable number of samples. Instead, over the following two weeks at the start of April, we built and documented a workflow, ordered in equipment, and prepared our newly gutted lab space in the Queen Elizabeth University Hospital (QEUH) Teaching and Learning Centre to take in the majority of the Covid tests in Scotland. The collaborative endeavour was driven by and successful due to the University of Glasgow, industry leaders, and by the staff at the QEUH. It was inspiring to witness and to be a part of.

The journey, not the destination

Looking back on the last year and the impact it has had on research, public health, the economy, and the world, I am very lucky to have been able to contribute to Scotland’s recovery. If I had followed the well-worn road I used to believe was the only way, I would never have had the opportunity to help build the Lighthouse Lab in Glasgow and develop such a strong professional network here.

If the undergrad direct to post-grad direct to PhD and on to the rest of your career does not fit, then do not force it. There are so many ways to find fulfilment through science – be it in academia, industry or medicine – and enjoying the discovery is as important as the destination.

Hannah Bialic
Institute of Infection, Immunity & Inflammation
University of Glasgow
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Meet the new BSI Groups Secretary

Professor Mark Travis from The University of Manchester has recently taken over the role of BSI Groups Secretary, developing and coordinating our numerous Regional and Affinity Groups and their activities. Here, he tells us about his background, his plans to rebuild face-to-face meetings as restrictions ease and how he hopes to work with our members to further develop our Groups.

A bit about my career so far...

My BSc was in Biochemistry with Genetics from Lancaster University, and I went on to obtain a PhD in Biochemistry from The University of Manchester, where I studied how integrins bind to their ligands and promote intracellular signalling. I then moved to the US for a post-doc at the University of California, San Francisco, where I continued to work on integrins, specifically those that could bind to and activate the cytokine TGF-beta. Still, at this point I was working on cell line systems and had no real immunology experience at all apart from a handful of undergraduate lectures. However, this changed dramatically when a knockout mouse model we made in the lab developed spontaneous intestinal inflammation. Overnight, I became immersed in the world of dendritic cells, T cells and Tregs, fell in love with this new world of CD numbers and cytokines, and have never looked back. I returned to The University of Manchester where I continued the work I started in San Francisco, studying how integrins and TGF-beta regulate mucosal immune responses during health, infection and disease, and this has been the main thrust of the lab ever since.

As soon as I returned from the States as an immunology convert nearly 15 years ago, I became involved with the BSI, attending every Congress and becoming active in a number of Regional and Affinity Groups. These include the BSI Greater Manchester Immunology Regional Group and the BSI Infection & Immunity Affinity Group. It was a great honour to be voted BSI Groups Secretary. I hope to help shape the Groups as we emerge from an incredibly difficult period, but a period where immunology has never been more important and is now embedded in the public consciousness both nationally and internationally.

My future plans

I think everyone would agree that something we have missed during the last year is in-person scientific meetings. As we emerge from the pandemic, one of the main first goals for the Groups is to get things back up and running in this regard, with the re-introduction of in-person seminar series and symposia as soon as it is safe to do so. I look forward to getting to know all the Groups and hope to be able to meet with as many as I can to learn about their needs and wants in this initial period and in the coming years.

As well as rebuilding activities to pre-pandemic levels when we can, it will be important to identify new opportunities, including developing new Groups that capturing the broad cutting-edge research that is being carried out by BSI members around the UK and beyond, and re-stimulating groups where activity has been dormant in the recent past. I will be looking to develop greater synergy between Groups – to share best practice as we plan initial face-to-face meetings but also continue to provide opportunities for online attendance to ensure as wide an audience as possible. Also, co-ordinating international speaker visits to enable their attendance at more than one Group seminar or symposium will be an important aim, and especially important with international travel likely to be at lower levels for some time.

Lastly, I would highly encourage all BSI members to please contact me with any ideas or suggestions for the Groups programme. I would be more than happy to chat to people to explore new directions and look forward to meeting as many of you as possible at the different meetings in the near future.

Professor Mark Travis
Professor of Immunology
The University of Manchester

BSI Regional & Affinity Groups – which ones fit with you?

Our Regional & Affinity Groups are integral to the Society’s activities. BSI Regional Groups connect our members around locations in the UK whereas BSI Affinity Groups are arranged around specific themes in immunology. They provide the perfect way for you to get more involved and make the most out of your membership. Learn more about our Groups and find which ones fit with you:


Follow them on Twitter to discover upcoming events and activities: bit.ly/BSI_Groups_Twitter
Immunology News | June 2021

Immune Update

The BSI journals

Lupus arthritis is characterised by local IL-17A and IL-6 expression in synovial fluid

Arthritis is a common manifestation in systemic lupus erythematosus (SLE). Despite being observed in up to 90% of SLE patients, little is known about lupus arthritis. This study explored the cytokine and cellular compartments of synovial fluids from SLE patients with arthritic manifestations.

Sippl et al. used cytokine bead array and flow cytometry to measure immune cell populations in synovial fluid compared to paired peripheral blood samples. They found increased numbers of potentially pathogenic T cell subsets in synovial fluid, including regulatory T cells, T peripheral helper cells and CCR6-CD4+ T cells. Further in vitro experiments revealed an upregulation of interleukin (IL)-6 and IL-17A in synovial fluid, which are thought to be the major driving factors of local joint inflammation in SLE.

These findings lend support to the theory that lupus arthritis is less autoimmune in character compared to rheumatoid arthritis, by suggesting that it is part of a systemic immune deviation towards Th17 and is not joint-specific.

CSF1R inhibition – potential therapeutic target in COVID-19

Mononuclear phagocytes are the only human cellular system for which we lack a unified marker and origin theory. Blood monocytes present an accessible window on the mononuclear phagocyte system (MPS). With updated analytic tools, this study reassessed the expression of lineage determining cytokine receptors in human blood in the steady state and in disease.

Combes et al. identified seven receptors that drive monocyte development in human bone marrow and are present in the periphery. From these, CSF1R displayed the highest expression in monocytes by whole blood fluorescent-activated cell sorting, distinct from lymphocytes and neutrophils, and was expressed in all conventional monocytes.

To further characterise CSF1R as a pan-phagocyte marker, the authors performed single-cell RNAseq analysis of CSF1R+ cells, concluding that CSF1R is able to select all phagocytes of the monocyte and DC family in humans, as well as pointing to novel monocyte subsets.

Naturally occurring anti-αGal antibody shows broad-spectrum pathogen polyreactivity

Human plasma is rich in various naturally occurring antibodies, but their contribution to host defence against bacterial pathogens is unclear. This study investigated the role of the most abundant of such antibodies, the antibody against terminal galactose-α-1,3-galactose (anti-αGal).

Jensen et al. applied human anti-αGal of the IgG class on a large collection of encapsulated pneumococci and observed reactivity with most serotypes. Their findings confirmed that anti-αGal can comprise significant percentages of human IgG antibodies to pneumococcal capsules; reduced anti-αGal levels were found in humans with recurrent pneumonia, supporting a significant contribution of anti-αGal antibodies to human protective immunity against bacterial pathogens.

Moreover, their results indicate that human anti-αGal is not a single antibody in terms of specificity but instead contains multiple antibody subsets each with additional reactivities. The distinct polyreactive subsets could bind a plethora of distinct structures, including numerous microbial polysaccharides.

Given the increasing microbial resistance to conventional antibiotics, the broad-spectrum pathogen reactivity of naturally occurring anti-αGal antibodies and their contribution to protective immunity is of interest.


Immunotherapy Advances

CSF1R was stably expressed in all healthy subjects, but in COVID-19, a pathology with monocyte and macrophage dysregulation at its core, CSF1R phagocyte numbers were reduced. Moreover, Combes et al. showed that changes in CSF1R expression in specific subsets can segregate COVID-19 patients with confidence.

These findings will enable us to better understand mechanisms of inflammation and MPS activation, pointing to drug and cellular targets to prevent and treat diverse infections beyond COVID-19, as well as immune and autoimmune host responses, cancer and degenerative diseases.

Combes et al. 2021 Immunotherapy Advances 1 https://doi.org/10.1093/immadv/ltab003

Immunology

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Adrenergic regulation of the vasculature suppresses immune responses

Activation of the sympathetic nervous system by psychological or physical stress, responsible for the ‘fight or flight’ response, has been shown to modulate immune responses and can lead to weakened immunity. Here, Devi et al., using two-photon intravital imaging, showed that administration of noradrenaline and other adrenergic receptor agonists led to a rapid decrease in T cell, B cell and CD11c+ cell locomotion in lymphoid and non-lymphoid tissues. The authors revealed that the reduced mobility induced by noradrenaline was caused by the induction of vasoconstriction and decreased blood flow in lymph nodes, which induced hypoxia, causing rapid calcium signalling in cells leading to impaired motility. Importantly, treatment of mice with adrenergic receptor agonists was shown to impair the induction of T cell immunity to herpes simplex virus, malaria and a syngeneic melanoma model.

This study therefore provides a mechanistic link between adrenergic receptors and reduced immunity through the regulation of local blood flow.

Devi et al. 2021 Immunity
DOI: 10.1016/j.immuni.2021.03.025

Debaryomyces is enriched in Crohn’s disease intestinal tissue and impairs healing in mice

Intestinal microbes are a well-established target of aberrant immune responses in Crohn’s disease. Using an intestinal biopsy injury model, Jain et al. found that antibiotic-treated mice had impaired wound healing. They discovered that the sites of intestinal injury were enriched with Debaryomyces hansenii, a fungus commonly found in dairy products but rarely associated with disease.

Analysis of gut tissue identified the same species of fungus in inflamed but not healthy tissue from patients with Crohn’s disease. The majority of the fungi co-localised to macrophages and induced elevated expression of CCL5 which was dependent on type 1 interferon signalling. Impaired wound repair could be reversed by targeting either CCL5 or its receptor, CCR5.

How CCL5 impairs wound healing remains to be determined but this discovery highlights how disruption of the gut microbiome can influence immune homeostasis and could lead to improvements in the way inflammatory bowel disease is managed.

Jain et al. 2021 Science 371 1154–1159

TCR-β selection is required at the CD4+ CD8+ stage of human T cell development

T cell and antibody receptor rearrangement represent critical steps in the development of T and B cells as illustrated by the failure of lymphocytes to mature in the absence of recombination-activating genes (RAGs). Specifically for T cells, failure to rearrange the TCR-β chain results in the arrest of T cell development at an early stage (DN3). This picture is not so clear in human T cell development.

Deleting the RAG-2 gene in human stem cell lines, by CRISPR/Cas9 gene editing, Chen and colleagues show that, in the absence of TCR-β rearrangement, differentiation of these cells resulted in the arrest of T cell development at the CD4+CD8+ double positive (DP) stage. Further studies revealed that the function of TCR-β is required for the survival and proliferation of DP cells.

These results give important insights as to the distinct requirement for the TCR-β chain during human T cell development.

Chen et al. 2021 J. Immunol. 206 2271–2276
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