The Royal College of Pathologists

Pathology: the science behind the cure

Annual report & accounts

2020–2021

Introducing the College

The Royal College of Pathologists is a professional membership organisation with more than 12,000 fellows, diplomates and affiliates worldwide. We are committed to setting and maintaining professional standards and promoting excellence in the teaching and practice of pathology, for the benefit of patients.

Our members include medically and veterinary qualified pathologists and clinical scientists in 17 different specialties, including histopathology, haematology, clinical biochemistry, medical microbiology and veterinary pathology.

The College supports pathologists at every stage of their careers. We set curricula, organise training, run examinations, publish clinical guidance and provide opportunities for continuing professional development.

We engage a wide range of stakeholders to improve awareness and understanding of pathology and the vital role it plays in everybody's healthcare. Working with members, we run programmes to inspire the next generation to study science and join the profession.

Contents

Welcome from the President Professor Mike Osborn

Hello and welcome to our annual report for 2020-2021.

This report gives an insight into the activities of the College and our members over the last 12 months. Although no such report can ever hope to cover the whole range of exciting and important work that College members and staff have been involved in over this strangest of years, it can provide an overview − a flavour if you like − of the huge selection of activities that pathologists are responsible for and are vital to.

This report contains examples of activities across our 17 specialties. It demonstrates the innovation, dedication and hard work of the clinical scientists and pathologists who are involved in and vital to so many healthcare interactions.

Despite the COVID-19 pandemic continuing to overshadow all our lives and activities − both professional and personal − our members have continued to work and contribute to providing excellent healthcare, teaching, training and research. Much of this work relates directly to COVID-19, but so much does not. This demonstrates how pathology and pathologists are integral to providing high-quality healthcare whatever the situation. Like our members, College staff have worked extremely hard in often difficult circumstances to support and develop the work of the College and of our members. Members and staff have worked closely to promote excellence in all areas of pathology practice, ranging from writing nationally and internationally recognised guidelines, to providing expert advice to the NHS and government, to developing novel and effective treatments through research and providing teaching and training for doctors, scientists and other healthcare professionals. The topics covered are diverse too − from cancer genomics to blood testing in livestock − and reflect the diversity of our specialties and how the work of our members affects almost everyone's life.

I would like to congratulate and thank everyone involved in our work − members and staff alike − for their considerable efforts during this difficult time.

NOVEMBER
2021

ROYAL COLLEGE OF PATHOLOGISTS
ANNUAL REPORT & ACCOUNTS

SECTION 01
INTRODUCTION

Message from the Registrar Dr Lance Sandle

This year's annual report is again very different from previous years.

The content of last year's report was agreed as we were going into the first lockdown and since then remote working has become the norm for many. This has raised challenges, not least for pathology trainees who rely on uninterrupted support during training and examinations as a core College function. The enforced contingency of developing an online examination platform in such a short timescale has been a major achievement that could not have been anticipated last year. We should applaud the work of the Learning Directorate who have sought to minimise the effect of the pandemic on training and career progression as much as possible. Our thanks also to trainees who have been tolerant and highly adaptable as we have responded to an unprecedented situation.

Many other teams across the College have had to adapt their way of working, with much of the work that would normally take place at our Alie Street premises moving online. This includes conferences, training courses, committee meetings, honorary officer meetings, management and team working, as well as interaction with government departments, other royal colleges and professional bodies. The second series of COVID-19 webinars was launched in early 2021, providing essential updates during a fast-moving situation, and reaching hundreds of weekly attendees.

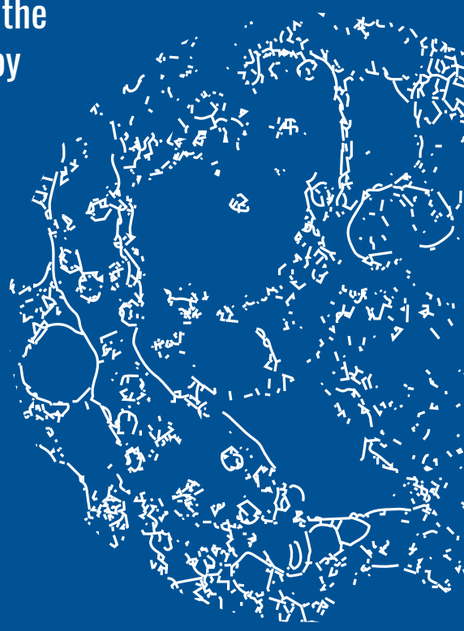
The inevitability of staff turnover means that some teams have staff who have never physically met, as is the case with the current honorary officers since the last Annual General Meeting was an online event. However, one of the advantages of holding events virtually is being able to connect with more people and from all around the world. Our virtual fellowship ceremonies allowed more fellows to attend and share this proud moment with their families and friends.

On behalf of the honorary officers I thank all our volunteers and College staff for the extra time and effort required to ensure continued College activity. We live in a time when the availability of information technology has ensured operational continuity for the College and we should be prepared to spend more time in virtual workplaces in future. Nevertheless, given that between 70 and 93% of communication is non-verbal we will always be more effective with conventional human interaction, and I look forward to the day when this can resume.

Our achievements

02.

> I'm thrilled and honoured to be the 1,000th medical examiner trained by the College. The medical examiner system is vitally important to support bereaved families, the work of the coroner and improve patient care. The College course has provided me with an excellent grounding in the role of the medical examiner and I am looking forward to integrating this new role with my career as an emergency medicine consultant in the future.
>
> *– Dr Yasmin Kapadia, an Emergency Medicine Consultant from London*



Shaping pathology services and supporting future pathologists

The College is at the forefront of developing standards for pathology education, training and research to improve patient care and safety. We continue to support members to excel in the practice of pathology in the face of ongoing and severe constraints of SARS-CoV-2. We have adapted significantly with major changes to support our essential work in relation to examinations and curricula with impressive progress and expansion of the medical examiner service. We continue to support and inspire the next generation of pathologists.

19

Certificates of Eligibility for Specialist Registration (CESR) evaluated

61

Certificates of Completion of Training (CCT) awarded

Launching our new curricula

The curricula produced by the College for all specialties and subspecialties ensure trainee pathologists develop the highly specialised technical and non-technical skills they will require to provide high-quality patient care.

Over the past three years, the Training team has been working with stakeholders across the UK to revise the curricula in line with the General Medical Council's (GMC's) revised standards. This requirement to produce new curricula has provided us with the opportunity to create curricula that better support the needs of patients and will meet future challenges for the workforce as pathology services evolve. In May and June 2021, we obtained GMC approval for seven of our curricula.

Transferring to the new curricula will require a period of adjustment. To keep our trainees up to date on developments, new pages on the website were developed outlining the process of developing the new curricula with timelines. It is vital that we support trainees, trainers and education supervisors during this transition. The Training team hosted three launch events in August 2021 to introduce trainers and educational supervisors to the new curricula.

At our next New Trainee Welcome Day we will dedicate time to discuss the new curricula and we will hold events throughout 2022 for current trainees who will transfer to the new curricula from August 2022.

Supporting families through the medical examiner service

Despite the challenges of the pandemic, the implementation of medical examiner services has continued. About half of all deaths in England and Wales, predominantly in hospitals, are now scrutinised by medical examiners. Medical examiner services are now extending to cover deaths in the community and, ultimately, every death in England and Wales will be reviewed. With no in-person events being able to take place, medical examiners have completed the interactive 'face-to-face' part of their training online and over 100 medical examiner officers have also attended online training days. In February 2021, we celebrated the 1,000th medical examiner to complete their training – Dr Yasmin Kapadia. Over 600 medical examiners and officers have now joined the College as members.

April 2021 saw the first annual Medical Examiner Conference, with 370 delegates attending online to hear the latest policy and implementation updates. The National Medical Examiner, Dr Alan Fletcher, launched his 2020 Report at the conference, highlighting the progress made over the last year.

Supporting bereaved families is at the heart of the medical examiner service and feedback from one relative sums up the importance of the service:

> "It was brilliant to speak to someone kind, who listened to my concerns and was understanding. It's like a voice for the person who's died. My mother would have liked that something good came out of it, with better care for other patients.

Transforming examination delivery

Throughout the last 18 months the College has had to adapt its way of working to ensure continuity of member services. A major challenge for both the College and trainees has been the disruption to examinations. Working closely with the Trainees' Advisory Committee (TAC), the Examinations team introduced a new online examination format to get examinations back on track. To support trainees as they prepared for the examinations, we launched a series of webinars – What I wish I'd known – which included informal tips and advice from trainees who have previously sat examinations.

The flexibility and adaptability of both trainees and the College was evident during this process. We will continue to work with the TAC and trainees whose feedback will be invaluable as we improve the experience for those participating in future examinations.

153

new specialty registrars registered with the College

2,215

FRCPath, Diploma, Certificate, Stage A and Biomedical Scientist examination results issued

Key achievements

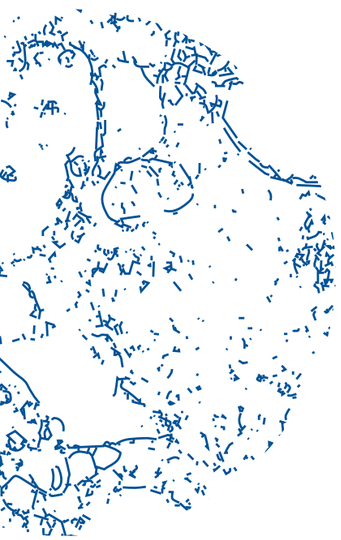
- Delivering 74 examinations across all 17 specialties, with 57 provided through online platforms for the first time in the College's history.
- Obtaining approval for seven curricula that meet revised GMC standards and strategic workforce needs.
- Training over 1,000 medical examiners to support bereaved families and improve patient safety.

24

Pathology Foundation Fellows successfully applied for the scheme

8,261

workplace-based assessments were used in annual reviews of competence progression (ARCPs)



Welcoming our new trainees

Our annual New Trainee Welcome Day introduces trainees to the College and the role we play in pathology training. It is also an opportunity for trainees to get a clearer understanding of pathology training programmes, examinations and the support available. The 2020 welcome day in September was held virtually for the first time, which allowed our highest ever number of attendees to attend – over 140.

Adapting training delivery

It is essential that trainees feel supported throughout their training to help with the many and varied challenges they face. The need for support and the wellbeing of trainees are two areas that have been highlighted by the severe disruption to training experienced during the pandemic. The TAC has worked with the College to provide extra support mechanisms and address concerns.

A team of qualified coaches volunteered to provide free sessions, giving trainees opportunities to talk through experiences and develop new strategies to address specific challenges. Peer support is also very important during stressful times and the TAC Chair arranged evening drop-in sessions for trainees to talk about particular concerns that could then be addressed with the help of College officers.

Although the pandemic has disrupted training programmes, there have been some positive changes with the introduction of online tutorial and training sessions. These have allowed specialties with lower numbers of trainees and smaller training programmes to connect with geographically remote trainees.

Engaging Foundation doctors

In 2020, the College launched a new initiative − the RCPath Foundation Fellowship scheme – which is open to Foundation doctors who secure a post in which they will rotate through a pathology specialty. The first 24 Pathology Foundation Fellows were announced at the end of September 2020 and the College will be continuing the scheme in 2021. It gives successful applicants access to a range of information and educational events to support them during their foundation training.

> “Support is needed to get training back on track. We have been in active discussion with HEE and other organisations around the need to embed training recovery into service reset.

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Promoting reflective learning

Reflecting on performance is an important aspect of training and professional development, resulting in self-improvement and increased self-awareness. A new form of workplace-based assessment – assessment of performance (AoP) − was introduced for cellular pathology specialties. AoPs focus on capturing trainees’ progress towards independent practice across the wide range of pathology activities and improving the feedback provided to consolidate learning and reinforce good practice.

Looking ahead

After three years’ work, the College launched the new medical curricula and related workplace-based assessments. To complement this work, the LEPT platform will be developed to map to the new curricula and assessment programmes, with all trainees transferring to the new formats from spring 2022.

The Pathology Portal, which is being developed in conjunction with Health Education England (HEE), will provide pathology trainees with a bespoke and adaptive online learning platform mapped to the new pathology curricula. The Pathology Portal will launch in late 2021 and the aim is to add more specialties as the Portal develops.

Following our first online examinations in 2020, the College has reflected on the advantages and disadvantages of this format for the different examinations we offer. We plan to continue offering FRCPath Part 1 examinations in their new virtual format while FRCPath Part 2 examinations will return to their former face-to-face format as they are less suited to online delivery.

In the longer term, digital Part 2 examinations are planned for relevant specialties where digital images will be used, negating the need for microscopes. This will help standardise the examination and facilitate the creation of more examination centres globally. A working group has been set up to examine how this can best be achieved.

Many trainees have experienced disruption to their training because of the pandemic for a range of reasons, including a lack of routine biopsies to study or a focus on COVID-19 to the exclusion of many other infections. Some trainees have also experienced redeployment and sickness absence, the need to self-isolate and disruption to their examinations. Support is needed to get their training back on track. We have been in active discussion with HEE and other organisations around the need to embed training recovery into service reset. These discussions will be further informed by the results of our COVID-19 training impact survey, which was circulated to trainees by the TAC.

642

trainees used the LEPT system to create annual reviews of competence progression (ARCPs)

Agile working and improving patient care

The College continues to champion new technology and new ways of working. This has enabled staff to work remotely and support our members. There has been an ongoing focus on guideline development and implementation, quality improvement, and patient safety. We have risen to the challenge of delivering high-quality academic activities during the pandemic with excellent attendance and feedback across a range of events supporting our many specialties.

36

conferences and educational events managed

Remote professional development

The need to adapt quickly in these challenging times has seen the Events team move all College academic activities online. This involved many hours running practice sessions and developing best practice for delivering high-quality online events.

Throughout the pandemic, the College has remained committed to providing continuing professional development (CPD) events. This has been highly valued by our trainees and members, with lots of positive feedback and a consistent satisfaction score of over 90%. One of the benefits of our online events was the engagement with more of our members, both regionally and internationally. This will be reflected in the strategy for our CPD programme, which will incorporate face-to-face events and online learning.

Opportunities for development

Increased workloads and limits on travel have reduced the opportunities for our members to undertake CPD activities. To help members, the CPD deadline was deferred by three months and the Professional Standards team ensured all CPD returns were processed even if submitted late.

Weekly and monthly postings were included on our website, social media and in the President's newsletter directing members to the various ways in which they could collect CPD, be it through reflective learning, participating in clinical audit certification or attending College educational events. This resulted in a CPD return rate of over 90% by March 2021.

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Improving maternity safety

Progress is being made on improving maternity safety in the UK, but more improvements are still required to achieve the national aim of halving rates of stillbirths, neonatal deaths, maternal deaths and brain injuries that occur during or shortly after birth, by 2030.

The College is advocating for improved maternal safety and pathological investigations after stillbirth. Alongside the Healthcare Safety Investigation Branch (HSIB) and NHS England, we are working to understand and overcome the barriers to wider implementation of our guideline for histopathological examination of the placenta. A shortage of specialist paediatric pathologists is also an issue in some parts of England.

We have recommended that medical examiners (ME) work with coroners to investigate stillbirths and neonatal deaths. This would help identify unusual patterns, such as high numbers of deaths at one hospital, which can be a strong indicator of poor care.

Our evidence to the Health and Social Care Committee's Expert Panel on the safety of maternity services in England showed the value of the role of MEs, noting '…a further benefit of expanding the jurisdiction of MEs to include stillbirths would be their ability to provide independent scrutiny of maternity services, including speaking to relatives to hear their views.'

> We have recommended that medical examiners work with coroners to investigate stillbirths and neonatal deaths. This would help identify unusual patterns, such as high numbers of deaths at one hospital, which can be a strong indicator of poor care.

3,515

people attended events

271

events approved for continuing professional development

90%+

satisfaction score for our new online-managed events

Key achievements

- Providing support, advice and assistance to over 6,000 CPD participants at the onset and during the COVID-19 pandemic.
- Delivering our second COVID-19 webinar series highlighting new developments in diagnostics, vaccines and therapeutics.
- Launching our guideline webinar series to support the pathology community to implement our NICE-accredited guidelines.

10

NICE-accredited guidelines were published

14

audit templates were published

Learning through experience and collaboration

Patient safety bulletins are submitted case studies that recall an experience in the workplace where something happened, action was taken and where lessons were learned. They are an excellent tool for self-reflection and a valuable resource for sharing knowledge and experience among pathologists in different specialties. The College is committed to improving patient care and safety and we have developed our patient safety bulletin programme, publishing eight in the past year.

In January 2021, we signed a Memorandum of Understanding (MOU) with the Care Quality Commission that will safeguard the wellbeing of people receiving care in England and support improvements in care. The MOU confirms that we will share information about the quality of pathology services including any concerns or evidence of safety risks.

Providing pathology input into consultations

As a NICE stakeholder, the College represents the professional interests of our members by providing expert pathology input into consultations. Our members are instrumental in providing the evidence and advice NICE relies on to inform clinical guidelines on patient care and to appraise the clinical benefits and cost of technologies.

Supporting the implementation of our guidelines

The clinical guidelines produced by the College are important resources for members, providing data on best clinical practice and ensuring a high standard of care for patients. It is therefore important that the guidelines are implemented quickly and consistently.

A survey of our members in 2020 highlighted the difficulties they faced in implementing specific areas of the guidelines. A webinar programme was proposed by the Clinical Effectiveness team and Working Group on Cancer Services to provide support.

> "Patient safety bulletins ... are an excellent tool for self-reflection and valuable resource for sharing knowledge and experience among pathologists...

A programme of guideline implementation webinars is now in place and these have proved a popular learning resource among our members, with over 450 people attending the first two webinars. The webinars provide practical tips on how to collect data and clinical scenarios for data items.

Looking ahead

The increasing use of digital pathology and artificial intelligence in the management of patients across pathology specialties has the potential to improve patient safety and support the pathology workforce. While the College supports the use of such technologies, we will continue to highlight the need for investment in IT, workforce and staff training.

Through our Digital Pathology Committee, we will promote digital pathology in both diagnostic services and research arenas by producing standards, best practice guidance and resources for the profession.

There is the opportunity to increase the use of digital pathology in screening programmes and the Digital Pathology Committee has engaged with Public Health England on the proposed changes to breast screening. The Committee will continue this dialogue.

To ensure the success of digital pathology as a diagnostic tool, it must be integrated into curricula and trainees' learning must reflect the need to develop these skills.

Digital pathology can also assist in the education and training of pathologists through online educational platforms and its use in the delivery of examinations. The College will work with stakeholders and committees both in the UK and internationally to identify areas where digital pathology can support our members, share experiences and improve its implementation.

39

audits were submitted to the audit certification scheme for evaluation

8

patient safety bulletins published

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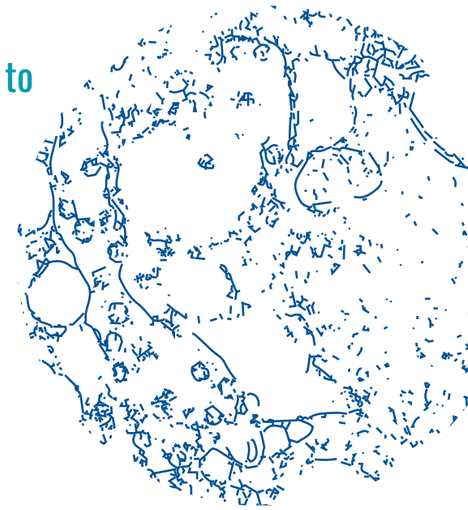


Influencing policy, championing pathology and strengthening the workforce

The College greatly values and promotes the expertise of our medical and scientific workforce across all our pathology specialties. We have been very actively engaging with governments, ministers, parliamentarians and policymakers to raise awareness of pathology as essential to safe, high-quality patient care. We are highlighting the ongoing challenges that have arisen during the COVID-19 pandemic with the need to address the backlog of tests to support diagnosis and treatment. We have focused attention particularly on concerns over cancer services and screening, the backlog of diagnosis and treatment, and pathology workforce issues.

402

job descriptions reviewed and approved

292

College assessors recruited for advisory appointment committees in England, Wales and Northern Ireland

Our COVID-19 response

With pathology at the core of the healthcare response to the pandemic and many of our trainees and members involved, the College has an important role in advising the government, and engaging stakeholders, media and members of the public.

The College continues to publish guidance to reflect advances in knowledge and changes in policy. Although much of this guidance is for our members and healthcare professionals, it's important that the public can access up-to-date guidance. We published a user-friendly guide to COVID-19 tests that covers the most widely used diagnostic tests, exploring their accuracy and when they should be used. The guide is one of the most visited pages on our website and was referred to in the media.

Our members attended All-Party Parliamentary Groups (APPGs) and various committees to provide data and evidence on testing, vaccines and how core NHS services could be delivered during the pandemic. Professor Mike Osborn spoke to the media about the need to use the data and information currently available to inform decision making and to adjust advice as the situation evolves.

The focus now is on what we can learn and recovery. Members have given evidence to APPGs and the Health and Social Care Committee on the testing programme, long-term health implications and the next steps for diagnostics. Our members listened to the concerns of patients whose diagnoses and treatments have been affected by the pandemic.

Raising concerns on the backlog and patient care

The pandemic has affected services across healthcare and there have been growing concerns about the backlog of tests to diagnose and treat a range of illnesses, including cancer. The College anticipates a backlog of as many as a million pathology tests. Anxiety among patients, together with limitations to services, have caused a significant drop in cancer referrals with an estimated 350,000 fewer referrals over a period last year and a gap of 36,000 in the number of first cancer treatments in England.[1]

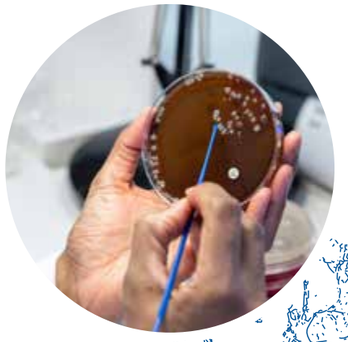
The College submitted evidence and attended roundtable discussions and cancer summits informing reports, including 'Catch Up With Cancer – The Way Forward'. This report sets out seven recommendations to the government, highlighting the need for urgent action. We will continue to support colleagues, raise members' and patients' concerns and advocate on workforce issues as the backlog is tackled.

Tailoring diagnosis and treatment

Genomic medicine is an opportunity for faster diagnosis and tailored treatment for people with cancer and inherited diseases. One of our core strategic aims is the development of a high-quality, user-friendly genomics service and we will ensure the voices of our members are heard as NHS England roll out the Genomics Medicine Service (GMS) via the seven Genomic Laboratory Hubs (GLHs). All seven GLHs and their equivalents in the devolved nations now have cellular pathology representation, and we will support these leads as the service develops.

Our Cellular Pathology Genomics Focus Group has become the main contact group for NHS England for cellular pathology and we aim to achieve representation on working groups involved in the National Genomic Test Directory.

The College has continued to showcase the benefits of genomic medicine through discussions with other experts and policymakers. The President has emphasised the potential of genomic medicine to transform healthcare and the need for investment in genomic services, with laboratories with the right equipment and enough staff trained and equipped with the right skills.



> The College anticipates a backlog of as many as a million pathology tests and the number of first cancer treatments shows a gap of 36,000 in England.

Key achievements

- Delivering our first fully virtual National Pathology Week with 50 online member-led events engaging members of the public and medical professionals around the UK.
- Successfully advocating for funding towards an additional 35 histopathology and four haematology training posts in England.
- Working with key partners to expand the eligibility criteria for the Higher Specialist Scientific Training in haematology for biomedical scientists, which will help to address the scientific workforce shortage.
- Working with our members, faith leaders and communities to create 27 videos addressing specific myths and misconceptions that exist about COVID-19 vaccinations.

> Only 8% of inflammatory bowel disease services have enough histopathologists.

Succession planning

Succession planning is an important aspect of the work carried out by the College's Workforce team to ensure continuity of the profession and patient care. Accurate and current data is central to this planning. A new feature on our website uses pop-up reminders to encourage members to complete the online workforce census and this has resulted in a huge increase in submissions. Around 30% of UK members have responded in the last month compared with 1.5% across the whole of 2020 – a 180% difference in response rate.

We used the workforce data collected to lobby Health Education England (HEE), highlighting the widening gaps in the pathology workforce and the need for urgent action. HEE have now allocated funding for 35 additional histopathology training places and four haematology posts.

Collaborative working

As well as collecting data through the census we also use workforce surveys to gain a better understanding of the changing landscape of both the pathology workforce and pathology services. Our workforce data was used by Cancer Research UK in their report on the cost of growing the cancer workforce. We were closely involved in the production of the report, which indicated a 45% staff increase is needed across seven cancer-related professions to provide a world-class cancer service by 2029.[2] This included histopathology, for which current trends suggest a decline in staff numbers.

It is not just cancer services that are affected by a shortage of pathologists. A recent report by the IBD UK alliance (of which the College is a member) found that people were waiting too long for Crohn's and colitis diagnoses and only 8% of inflammatory bowel disease services have enough histopathologists.[3]

> Succession planning is an important aspect of the work carried out by the College's Workforce team to ensure continuity of the profession and patient care. Accurate and current data is central to this planning.

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> Bringing pathology to those who would not usually access our activities and resources is important in diversifying the future pathology workforce...

Pathology for all

Bringing pathology to those who would not usually access our activities and resources is important in diversifying the future pathology workforce and improving public confidence in pathology services. We have worked with a range of different partners, including the Social Mobility Foundation (SMF) who provide opportunities for young people who aspire to study at university but who lack the support at home. We ran several medical ethics workshops over the past year with over 380 school students attending.

Approximately 15,000 people in the UK have sickle cell disorder − a group of inherited health conditions that affect the red blood cells – and haematologists treat patients with sickle cell disorder. We worked with the Sickle Cell Society to produce interviews with several of our members who detailed how they treat patients and how treatment has changed over time.

The virtual science festival for visually impaired young people organised by the charity VICTA provides inspiring activities and careers talks about different areas of science. Five of our members contributed to the festival providing recorded interviews about their careers and running a virtual art-science workshop about the heart.

Starting conversations

To mark the start of British Science Week 2021, we launched a new set of free resources called Viruses and Vaccines, which aim to stimulate discussion and improve understanding of the vital role vaccines play in preventing disease.

The Viruses and Vaccines collection includes colouring in and origami activities, hands-on STEM activities for primary and secondary schools, and video interviews with pathologists. We also ran several online events for schools, families and undergraduates, with the help of our members who kindly volunteered their time and expertise to answer questions from the virtual audience.

We reached out to faith leaders and members within specific communities to help dispel misinformation and concerns about the COVID-19 vaccines. Imam Mohsen Elbeltagi from Swansea University Mosque prepared answers to questions surrounding the COVID-19 vaccines and fasting during Ramadan.

100+

volunteers delivered public engagement activities

£4,000

was awarded across seven projects by the Public Engagement Innovation Grant Scheme

We also created a series of 27 short videos with information about the COVID-19 vaccines. The videos feature messages from eight pathologists that address specific myths and misconceptions that exist within their community or ethnic group. The messages have been recorded in English as well in French, Spanish, Arabic, Hindi, Punjabi, Urdu and Tamil.

Delivering virtual NPW

With restrictions in place during November 2020, we delivered our first online National Pathology Week (NPW), which provided the opportunity to innovate and engage with a wider audience both in the UK and beyond.

Our theme was ‘Pathology: at the heart of healthcare’ and new art-science resources that explored health and disease were developed. Families were able to attend workshops where they could make their own origami ‘beating heart’ and ask questions about the heart and how it works.

NPW 2020 also saw the launch of our RCPath Book Club series. The virtual event featured ‘Pandemic Century’ and explored a range of topics, including pandemics through recorded history and what we can learn from them. Since then, we have delivered three more book clubs reaching audiences around the world, with 20−35% of the audience based outside the UK.

> “...a new set of free resources called Viruses and Vaccines ... aim to stimulate discussion and improve understanding of the vital role vaccines play in preventing disease.

Inspiring the next generation of pathologists is a core function of our public engagement activities and NPW is a chance to showcase the diverse nature of a pathology career.

We engaged with school students through our ‘Meet the Pathologists’ series, which gave students an insight into a typical day and the different paths you can take to work in pathology.

NPW 2020 showed once again how successful online events are with more people than ever coming to our website to view activities and career resources.

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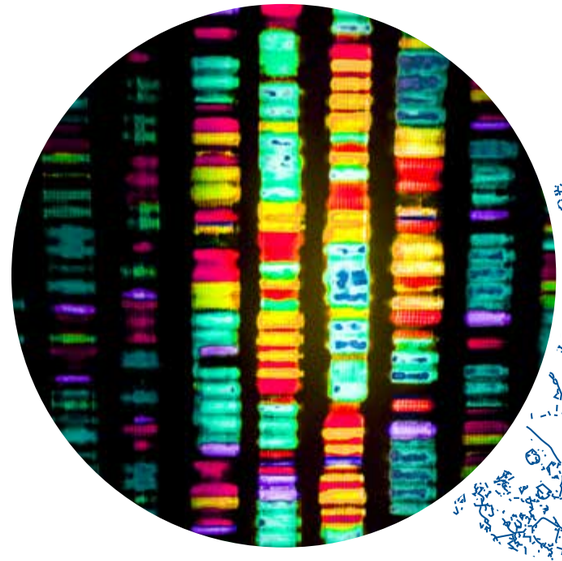
Looking ahead

After a signification reduction in the number of patients being referred for cancer diagnosis and treatment during 2020, we are now seeing a surge in referrals both for cancer and other illnesses. This will severely affect pathology laboratories and our members. The College will continue to raise this issue with policymakers to ensure that funding is prioritised and appropriately distributed among laboratories, to ensure there are sufficient numbers of staff to cope with this sudden increase in workload.

Genomic medicine has tremendous potential and investment is essential to ensure its success. To better understand the effect on the pathology workforce, and to gain an overview of how testing is implemented, can be improved and the effect on service delivery and patient care, we surveyed members in September 2021. The evidence will be used in discussions with health agencies and commissioners of pathology in genomic medicine. It will provide us with information for our advocacy with parliamentarians.

The Genomics Medicine Service roll out will require user-friendly and integrated IT systems, as well as workforce recruitment and training. The College has positioned itself to be part of the conversation around logistics and financing and will put forward its concerns and suggestions to MPs, civil servants and policymakers.

> “The [Genomics Medicine Service] roll out will require user-friendly and integrated IT systems, as well as workforce recruitment and training. The College will position itself to be part of the conversation around logistics and financing...



*1 Summary of the Commons Health and Social Care Committee session on Cancer Services. **13 July 2021.***

*2 Cancer Research UK. Estimating the cost of growing the NHS cancer workforce in England by 2029. **Published October 2020**.*

*3 IBD UK alliance. Crohn’s and Colitis Care in the UK: The Hidden Cost and a Vision for Change. **Published April 2021**.*

Resourcing the future of the College

The College is a responsible, sustainable organisation committed to delivering first-class services to all members. We have worked hard to improve our financial stability in the face of the challenges of the pandemic to achieve our strategic aims and charitable objectives. We are committed to supporting and developing our staff, and we have reviewed and strengthened lay involvement in key College activities and function.

The outsider inside: taking advantage of lay involvement

We all have views and perceptions, but often when you have a group of like-minded individuals with similar experiences, the views and perceptions you have can be too similar to allow for effective challenge. This limits opportunities and thinking. The College recognises this and engages with non-medical members of the public to ensure the work of the College is challenged and benefits from diverse views and thinking. This is achieved in two ways – through the lay trustees on the Trustee Board and a Lay Network, which supports the committees and work of the College.

The College's Trustee Board has previously had two lay members as trustees. With elected College trustees they are responsible for the management and administration of the charity to ensure it is solvent, well run and delivers the outcomes for which the charity was set up. The lay trustees provide independent views and strengthen the overall Board with specific skills in areas such as business, governance or legal experience.

Following a governance review, several changes were agreed and approved to provide greater continuity of experience and broaden available skills. These changes relate to the extension of available terms by lay members from one to two, the appointment of a third lay trustee and the appointment of a lay trustee as Board Chair. The previous Lay Governance Group was replaced by a Lay Network comprising eight members who provide a lay point of view to College business and are a 'critical friend' to the College.

> Our lay members provide an outside, independent perspective on the activities of the College, helping us work to maximise the contribution of pathology to high-quality patient care.

– Professor Mike Osborn, President

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The Lay Network brings expertise from diverse backgrounds and their input and feedback helps ensure the College's outputs are in line with the needs of our members and the public and our work is transparent. The Lay Network is involved in work to develop a robust framework for external quality assurance and the delivery of patient safety awareness weeks that will support improvements in care and promote patient safety. They are also involved in decisions around award nominations and review public engagement resources, which allow the College to champion pathology, and raise the profile of our members, our work and our specialties with the public. Lay members also have specific roles for designated areas of College work according to their expertise, for example reviewing best practice recommendations and clinical guidelines that support patient safety by promoting best practice in pathology.

The Lay Network will continue to develop and provide valuable input into College work.

> I joined RCPath as a lay trustee in May 2021 and it has been a pretty immersive experience so far... Everyone has been incredibly welcoming to such an extent that I feel I will suffer from some level of 'imposter syndrome' but hopefully, will be able to genuinely contribute to the great work being done!

– Vince Voon, lay trustee

Key achievements

- Gaining Investors in People accreditation, highlighting the College's focus on supporting and developing its staff.
- The appointment of a third lay trustee and a lay Trustee Board Chair to further broaden the skills and experience across our Board.

Supporting and motivating staff

The College recognises the positive effect that investing in its staff has in terms of continuity, productivity and achieving our strategic aims. After several years of using the Investors in People framework as our strategic benchmark for organisational development and following external appraisal from Investors in People, including an opportunity for staff members to provide feedback, we received accreditation in June 2021.

As a membership organisation this is a significant achievement − it means that we have the principles and practices in place to support our staff and everyone understands how to use them to make the College a better place to work. The people management strategy follows this framework to support, motivate and develop staff to deliver the best services to our members.

Some of our achievements recognised during accreditation include the transition to remote working between 2020 and 2021. Staff were supported during this transition by IT and HR and wellbeing measures were put in place to support staff's wellbeing. Collaboration has been key during this period of remote working and teams have ensured a continuous service to members regardless of location.

Our focus on learning and development of staff has continued with training now delivered online and adapted to reflect the new challenges staff face working remotely. For example, management training focused on specifically how to support teams while working remotely. Our 2020 annual staff survey showed increased scores under leadership and communication despite teams not being together in the office, which shows the value of adaptable and reflective learning.

As we transition to a hybrid model of in-office and remote working, we will continue to provide staff with the resources they need to provide a high-quality service to our members.

> Collaboration has been key during this period of remote working and teams have ensured a continuous service to members regardless of location.

Member engagement through committee work

The College's 37 committees engage with members to advance and disseminate knowledge across all pathology specialties. Despite COVID-19 and increased workloads, members continued to give time and provide expert advice and perspective through their committee roles. For example, they contributed evidence-based insight to a myriad of national consultations, including the development of clinical guidelines in the management of COVID-19.

Two new committees were developed during 2020 and 2021 to support work of immediate importance. The COVID-19 Advisory Group was created to respond to urgent requests for opinions and advice relating to SARS-CoV-2 from a range of organisations and members. As part of self-evaluation exercises within both Trustee Board and College Council, the Diversity & Inclusion Advisory Group was created.

The Advisory Group considered how the College could promote inclusivity and diversity in committee membership. Changes to and new processes for committee appointments have been agreed to improve transparency and fairness. The intent is to ensure College committees reflect the diverse nature of our membership and our commitment to diversity and inclusion. In May 2021, the Trustee Board agreed the establishment of a Diversity Network, which will focus on the changes needed to improve diversity and inclusion within the College and in all aspects of the College's work.

> Despite COVID-19 and increased workloads, members continued to give time and provide expert advice and perspective through their committee roles.

There has been a growing move towards building networks for members to be better involved and supported. This included ending the formal structure of the England Regional Council and developing four English Regional Representative roles to better represent members across the English regions.

> ...the Diversity Network ... will focus on the changes needed to improve diversity and inclusion within the College and in all aspects of the College's work.

Throughout the year, the Governance Committee has continued work to deliver organisational governance aligned to best practice and effective committee governance, service and engagement for members.

We are regional

The College's Regional Councils provide professional leadership within their regions and contribute to a national steer on the development of pathology services and the quality of care that patients receive. They form links to help influence stakeholders and build strong relationships with key decision makers on behalf of the College. The Councils for the devolved nations have continued to facilitate two-way communication between the College and its members. The England Regional Council has been replaced with four new representatives exploring new ways to strengthen connection with members in their regions.

Our election priorities

As a medical royal college one of our aims is to work with governments, associated bodies, opinion formers and decision makers across all devolved nations to raise awareness of the critical role of pathology.

In May 2021, the people of Scotland and Wales elected their representatives to the Scottish parliament and Welsh Senedd, respectively. These new governments have now taken responsibility for a range of devolved areas, including health services. Prior to the elections, the College launched its priorities for the new governments, which were drawn up by members of the College Councils for those countries.

The College priorities for Scotland focused on the challenges facing already stretched laboratory services and we called on the new government to address these areas. Our priorities for Wales highlighted the variation in access to services depending on location. For people in rural areas of Wales access to healthcare can be limited, with people in these areas facing longer waits for appointments and diagnoses. This was further worsened by the pandemic. Difficulties in recruiting and retaining staff and a reliance on agency staff to fill gaps in the workforce can affect patient care.

There were overlapping priorities that highlight the challenges all pathology services face regardless of where they are based within the UK. These included investing in workforce, IT and infrastructure.

Our policy calls have been welcomed by parliamentarians in both countries and we will continue to advocate for the vital role of pathologists in prevention, diagnosis and treatment.

Workforce concerns

The need for investment in the pathology workforce and infrastructure to prevent delays in the treatment of patients for non-COVID-related illnesses has been a key message from the College over the past year. Dr Jonathan Kell, Chair of the Wales Regional Council, met Chris Bryant MP to discuss workforce concerns in Wales and the backlog of cancer diagnosis and treatment as a result of the COVID-19 pandemic.

Chris Bryant has highlighted workforce concerns leading to delays in treatment in parliament and the media and has been supportive in promoting the College's key messages.

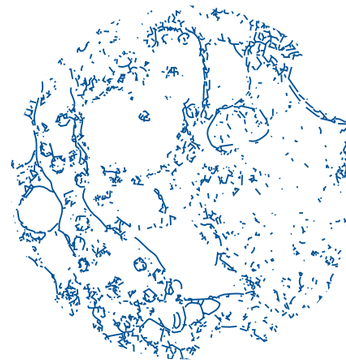
> We are calling for increased investment in pathology services, particularly in the recruitment and training of pathologists and scientists. More funded training places are needed to help meet the rising demand for cancer diagnosis, which has been exacerbated by the COVID-19 pandemic.
>
> *– Dr Jonathan Kell, Wales Regional Council Chair*

The Northern Ireland Regional Council has been voicing its members' concerns about the workforce challenges they are currently facing. Following a meeting between Professor Ken Mills, Chair of the Northern Ireland Regional Council, and Department of Health officials we updated our briefing on pathology specialties involved in cancer services in Northern Ireland.

Key messages from the policy briefing included the need for capital investment in pathology modernisation and investment in pathology services, particularly in the recruitment and training of pathologists, scientists, biomedical scientists and laboratory staff.

There are concerns around training posts, with trusts indicating they will not take on future Scientist Training Programme posts unless there is a consultant post available for them in the future, as well as a lack of funding for higher specialist training. It is essential funding for posts is supported to bridge gaps in the workforce and address the issues facing specialist services such as paediatric histopathology.

The Elective Care Framework published in June 2021 proposes investment over the next five years and plans to reduce the backlog of patients currently waiting for assessment and treatment. It commits to supporting the pathology Network so Health and Social Care pathology services are equipped to support delivery across all relevant rebuild programmes.



> Pathology services are critical to prompt and accurate diagnosis of patients with cancer and other diseases. It is essential that the Stormont Executive recognises the impact that pathologists and clinical scientists make and invests in their expertise and technologies.

– Professor Ken Mills, Northern Ireland Regional Council Chair

Improving regional representation

One of the College's priorities is to support our members across all regions and ensure they are part of College discussions and strategies. We recognise that the challenges our members face can be region specific and these issues need to be explored with that in mind. The disbanding of the England Regional Council was an opportunity to put a new structure in place that provided more digital and interactive forms of communication for local and regional representation.

Four new English Regional Representatives were elected to represent the North, Midlands and East, South, and London. They will explore new ways to connect with members in their regions and will represent their interests across all specialties at College Council meetings.

> The COVID-19 pandemic has once again highlighted the importance of laboratory tests and laboratory professionals within the healthcare landscape. As we emerge from the pandemic, it is vital that such services are reinforced and supported to optimise healthcare recovery...

– Dr Bernie Croal, Scotland Regional Council Chair

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Scotland

In response to a letter sent to the Cabinet Secretary for Health and Social Care Humza Yousaf, Dr Bernie Croal, Chair of the Scotland Regional Council, received a welcome letter from the Scottish government recognising the vital contribution laboratory professionals have made in these unprecedented circumstances.

Northern Ireland

Professor Ken Mills, Chair of the Northern Ireland Regional Council, met Department of Health officials to discuss the workforce challenges facing pathology specialties involved in cancer services in Northern Ireland.

England

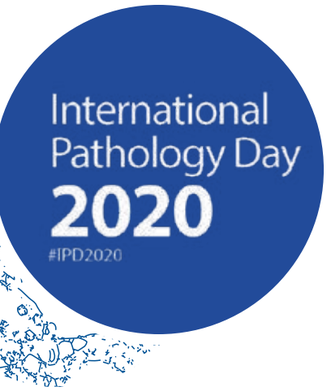
Four English Regional Representatives were elected to address the specific challenges facing the different regions within England and to give voice to members in those regions.

Wales

Dr Jonathan Kell, Chair of the Wales Regional Council, met Chris Bryant MP to discuss workforce concerns in Wales and the backlog of cancer diagnosis and treatment. Chris Bryant has highlighted workforce concerns leading to delays in treatment in parliament and the media and has been supportive in promoting the College's key messages.

We are international

The College has a clear vision and goal to support and advance excellence in pathology internationally as outlined in our 'Pathology is Global' strategy. We have appointed new international team members to support many key activities engaging overseas members and sharing knowledge and expertise as widely as possible. Our achievements include a highly successful virtual International Pathology Day, launch of a new International Pathology School toolkit together with essential support for overseas trainees for GMC registrations and preparation for examinations.



International Pathology Day 2020

International Pathology Day (IPD) recognises and celebrates the contribution and achievements of pathology and laboratory medicine services in addressing global health challenges and improving the health outcomes of global communities. It is an opportunity to share knowledge and expertise with pathologists around the world based on international best practice.

IPD 2020 explored how the global pathology community has managed infectious outbreaks in the past and how it is dealing with the current COVID-19 pandemic. For the first time it was delivered online, which allowed participants to join without restrictions.

Four COVID-related presentations explored the social, economic, cultural, technical and biological factors that affect the spread of infections, as well as the role of testing, the development of new diagnostic approaches and the search for vaccines and treatments.

The roundtable was a multifaceted discussion on the importance of international information exchange – especially in a pandemic – and how screening, diagnosis, treatment selection and health monitoring differ between countries. Against the backdrop of COVID-19, it was agreed that it has become more important than ever not to place boundaries on our ability to learn from one another.

> "International Pathology Day 2020 is very important for acknowledging the efforts made by the pathologists around the globe, especially during a pandemic. The day gives us an opportunity to share our knowledge globally and raise awareness about our contributions in the field of medicine.

45

overseas doctors applied for General Medical Council (GMC) registration

110

medical schools attended this year's International Pathology School

Global collaboration

Strong global coalitions that provide reciprocal opportunities to pool knowledge and resources and to share and acquire new skills are vital to the College's international work. Our aim is to promote capacity building to improve pathology provision, predominately in resource-limited countries.

The importance of international collaboration between intercontinental agencies, government departments, non-governmental organisations and professional pathology bodies is recognised in the form of a memorandum of understanding (MOU), which allows a clear programme of work over a three-year period to be agreed.

In November 2020, the College signed a new MOU with the Mohamed Bin Rashid University of Medicine and Health Sciences (MBRU) with agreement to cooperate on a range of activities. We now have MOUs with eight international organisations, including the Shupyk University of National Healthcare of Ukraine (SUNHU) and the National Postgraduate Medical College of Nigeria (NPMNCN).

Several of our MOUs cover areas of shared interest that focus on assisting international medical graduates (IMGs) with their pathology training and FRCPath examinations. They are essential in strengthening our relationships with international pathology institutions.

Representing our international members

With around 20% of our membership located internationally it is vital that they have the opportunity to contribute to the College's decision-making processes and governance structures. Our International Committee acts as a representative voice for both international members and UK members with international interests.

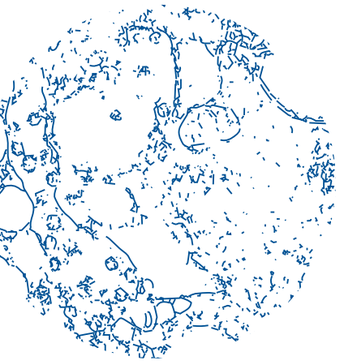
Over late 2020 and early 2021, the International Committee went through a number of changes as terms came to an end and new roles were included to provide greater coverage across international regions. A new Clinical Director of International Activities was appointed along with six International Regional Advisors.

20%

of the College's membership are located in one of six overseas territories

Key achievements

- Delivering our first-ever virtual International Pathology Day to over 100 people across 18 different countries.
- Developing our new International Pathology School toolkit to offer international undergraduate medical students the opportunity to learn more about a career in pathology and its integral role in healthcare.
- Supporting overseas medical graduates and undergraduates to apply for GMC registration and Tier 5 (Government Authorised Exchange) visas and prepare for FRCPath examinations through our international schemes.



The International Regional Advisors will provide proactive advice, leadership and direction in relation to the development and implementation of the College's activities and champion the College's international strategy 'Pathology is Global' within their respective regions.

> My firm belief is that fellows practicing overseas should maintain strong links and be involved with the College. This belief fired my desire to be an integral part of championing the importance of keeping up to date with high standards of practise, training and assessment.

– Professor Ismail Matalka, Clinical Director of International Activities

Supporting international students and trainees

The Medical Training Initiative (MTI) scheme enables IMGs to come and train in the UK for a maximum of 24 months before returning to their home countries. The College works closely with the GMC and the Academy of Medical Royal Colleges to assist IMGs in obtaining registration with the GMC and the Tier 5 visa. The College also supports IMGs who wish to pursue a career in pathology through the Sponsorship Scheme, assisting with their GMC registration so they are able to work and train in the UK.

These schemes benefit both the IMGs and UK hospitals. IMGs develop new skills, expertise and practices that can be used to advance the level of patient care in their countries of origin on their return. UK hospitals who provide a placement for IMGs benefit from increased workforce capacity and the experience and skills that IMGs can share with their UK colleagues.

> One of the most valuable aspects of the MTI scheme is the immense clinical experience you gain. Every day is a chance to gain new experience and knowledge.

The International Trainee Support Scheme supports and mentors IMGs in preparation for their FRCPath examinations by identifying gaps in their knowledge and training. Our two newly appointed International Educational Leads will help the College to further develop this scheme, which currently runs for histopathology and medical microbiology.

> Strong global coalitions that provide reciprocal opportunities to pool knowledge and resources and to share and acquire new skills are vital to the College's international work.

Our recently designed International Pathology School toolkit offers international undergraduate medical students the opportunity to learn more about pathology and its integral role in healthcare and how rewarding a career in pathology can be. In January 2021, the toolkit was piloted through a two- to three-day interactive event in the MENA region, in collaboration with the University of Science and Technology in Jordan. The event was attended by over 110 medical students from regions including Jordan, Qatar and the United Arab Emirates.

Looking ahead

According to the British Medical Association, there are approximately 800 refugee doctors in the UK; however, the number of those who are pathologists is unknown. The College has produced a plan to support refugee doctors in pathology, which includes signposting to relevant information and resources from a dedicated College webpage, creation of a mentor database, free College membership for one year, access to a defined number of free College events and free or reduced fees for up to two attempts at FRCPath Part 1.

The International team is working to promote the College's aims in knowledge and excellence worldwide through the new International Pathology Schools, as well as the established International Pathology Day, which in 2021 will focus on digital pathology and artificial intelligence.

> I cannot emphasise enough how useful it can be for UK trainees to work and study alongside overseas trainees … For me this was a mutually enriching partnership in preparation for the FRCPath examination…

Award winners: celebrating pathology

The College greatly values excellence in pathology practice, research and education. In particular, we recognise the excellent achievements of our trainees with medals for original research and the Furness Prize for Science Communication.

We continue to remember two colleagues through essay prizes named in their memory. The Hugh Platt Foundation Essay Prize this year recognises a heartfelt and personal experience of the impact of pathology. The Paola Domizio Undergraduate Essay Prize was awarded for a clear account on the benefits and challenges of technology. Many congratulations to all our winners.

Trainee Research Medals

The College's research medals are awarded for outstanding research work undertaken by trainees.

Gold medals

Matthew Clarke
Histopathology

Matthew Clarke won the gold medal with a paper on infant high-grade gliomas that comprise multiple subgroups characterised by novel targetable gene fusions and favourable outcomes.

Caroline Watson
Haematology

Caroline Watson won the gold medal with a paper on the evolutionary dynamics and fitness landscape of clonal haematopoiesis.

Silver medals

Lara Menzies
Clinical Genetics

David Marshall
Clinical Biochemistry

Ben Challoner
Cellular Pathology

Marwan Kwok
Haematology

Thomas Milner
Neuropathology

Hugh Platt Foundation Essay Prize – Chuer Zhang

Chuer's essay, 'Tiny test, huge impact' follows the case of a six-year-old boy who was taken to the emergency department by his family to assess 'an apparently innocuous ecchymosis' (bruise) on his left arm. The essay is a touching account of the importance of pathology and its effect on patients and their families. Chuer reveals, towards the end of the essay, that the young boy in her story is in fact her brother.

> I'm honoured to have my experience read by more people. Entering the competition makes you reflect on your experience more and appreciate the role pathology plays in the course of a patient's treatment.

Furness Prize for Science Communication – Matthew Clark

Our annual science communication prize celebrates and recognises trainees and undergraduates who have undertaken public engagement activities to cultivate the awareness and understanding of pathology. Matthew's dedication to delivering public engagement and science communication activities over the last couple of years was clear to see. Matthew has tirelessly promoted pathology and helped to inspire the next generation of pathologists.

> It is a wonderful feeling to have won this year's prize! Winning this prize encourages me to continue pursuing my science communication projects with the general public, undergraduates and junior doctors.

Paola Domizio Undergraduate Essay Prize – Harry Adams

Could pathologists soon be replaced by robots? In his essay, Harry considered the potential benefits and challenges posed by technology, as well as the impact on patients and on pathologists' working lives.

> It is a great opportunity to practice essay writing skills and appreciate topics not usually taught at university.

Our specialties and case studies

03.

> Our 17 specialties … demonstrate the innovation, dedication and hard work of the clinical scientists and pathologists who are involved in and vital to so many healthcare interactions.
>
> *– Professor Mike Osborn, President*

Our specialties

The College is very proud of all our medical and scientific colleagues working across 17 specialties and many subspecialties. Our colleagues make exceptional contributions to health at all stages of our lives. Examples of this essential work range from diagnosing inherited and acquired disease in the fetus and newborn, immunisation in childhood and adults, care of pregnant mothers, diagnoses, investigation and treatment of a multitude of disorders, infections and cancers together with screening programmes right through to post-mortem examinations that inform the care of the living. We have briefly outlined the key roles of each specialty with a further spotlight on just some of the ongoing work in the clinical case studies in the next few pages.

Cellular pathology

Cellular pathology includes many subspecialties, including cytopathology and dermatopathology. Cellular pathologists are doctors and scientists who diagnose and study diseases including cancer and inflammatory diseases, such as ulcerative colitis, in tissues and organs. Cytopathologists diagnose cervical cancers through the screening of cells. Examination by microscope of a small biopsy or tumour can provide the diagnosis but, increasingly, this is supplemented by DNA examination of cancers to tailor treatment.

Chemical pathology

Chemical pathologists and clinical biochemists monitor bodily fluids like blood and urine to detect important changes in the body's chemistry. They play a key role in diagnosing and monitoring patients with a wide variety of illnesses, from high cholesterol to thinning bones. Chemical pathologists interact with patients at several different points through their treatment journeys – they investigate test results and meet patients in person to support their treatment.

Forensic pathology

Forensic pathologists perform medico-legal post-mortem examinations to determine the cause of death, including cases where a crime is suspected. They collect, examine and interpret tissue specimens under the microscope, as well as documenting and interpreting injuries, including on living victims. They provide scientifically objective expert reports for the police, coroners, procurators fiscal and solicitors and give expert evidence in crown, family and coroner's courts among others.

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Genetics and genomics

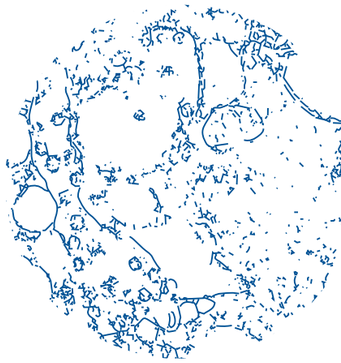
As advances in technology have allowed us to study DNA in ever greater detail, genetics and genomic medicine have become an important weapon in the fight against disease. Doctors and scientists working in genetics diagnose inherited diseases and advise families on treatment. Genomic testing also contributes to the better understanding of infection, including mapping of the COVID-19 pandemic.

Genomic medicine is at the forefront of transforming patients' lives by enabling a quicker diagnosis for patients with a rare disease; matching people to the most effective medications and interventions; and increasing the number of people surviving cancer each year because of faster, accurate diagnosis and tailored treatment with targeted therapies.

Haematology

Haematologists are experts in blood cells, including those circulating round the body and in the blood cell factories of the bone marrow. Haematologists diagnose and treat malignancies such as leukaemia and anaemias like sickle cell disease. They also deal with abnormalities of the blood clotting system, such as haemophilia. Haematologists care directly for patients on hospital wards and out-patient clinics, and carry out diagnostic work in laboratories.

Histocompatibility and immunogenetics



Histocompatibility and immunogenetics (H&I) is the study and testing of the genes and proteins that are important in the matching of organ and bone marrow transplant donors with recipients. H&I scientists ensure that transplanted organs and cells are compatible with the recipient to lessen the chances of rejection. They also support transfusion of platelets and granulocytes and are involved in investigations into transfusion reactions. H&I tests are important in the diagnosis of inflammatory diseases and can help predict adverse reactions to drugs used to treat disease, e.g. HIV.

Immunology

Immunologists deal with the study, diagnosis and management of people with disordered immune systems and immune deficiency. They advise on conditions in which immunological treatment forms an important part of therapy and/or prevention. Immunologists also specialise in the diagnosis and treatment of allergies. This specialty is playing a key role in better understanding the immunological response to SARS-CoV-2, including the development of potential therapies and vaccines.

Microbiology

Medical microbiologists support and oversee the prevention, diagnosis and treatment of illness caused by microorganisms such as bacteria. They give advice on clinical and laboratory diagnosis of infection, identify the best treatment for infectious diseases and monitor patients following treatment. They also ensure antibiotics are prescribed and used appropriately so patients receive the best treatments and to minimise antimicrobial resistance.

Microbiologists have been at the forefront of the response to the SARS-CoV-2 pandemic, advising on infection prevention and control measures, public and occupational health, strategic planning and overseeing COVID-19 testing and diagnosis in centres where there is no onsite virologist.

Molecular pathology

Pathologists working in this specialty examine molecules, particularly DNA, within organs, tissues or bodily fluids to study and diagnose diseases. Molecular tests check for specific changes in genes or chromosomes that can cause disease, such as cancer and infectious diseases. Molecular pathologists have an important role in personalised medicine, which identifies patients that can benefit from targeted therapies based on the molecular characteristics of the tumour present.

Neuropathology

Neuropathology is concerned with diagnosing and investigating diseases in the nervous system, i.e. brain, spinal cord and nerves, as well as the muscles of the skeleton. These include a wide range of disorders, such as tumours, inflammatory disorders, infections and genetic diseases. Neuropathologists use microscopes to examine samples of tissues but in recent years, findings from molecular tests have been increasingly incorporated into their reports, for example for brain tumours. This provides much more detailed information to the clinicians with whom they work closely.

Oral and maxillofacial pathology

This lesser-known branch of dentistry – oral and maxillofacial pathology – is concerned with diagnosing diseases in the head, neck, mouth, jaws and face. Oral and maxillofacial pathologists use soft tissue and bone biopsies alongside information from dental examinations and X-rays to investigate patients' cases. They are also involved in research into the development of treatments for head and neck cancer and the investigation of the genetic causes of developmental diseases.

Paediatric and perinatal pathology

Paediatric pathologists diagnose, investigate and monitor disease in children from conception up to 18 years of age. This includes areas such as genetic disorders, congenital diseases, cancers, disorders of metabolism, inflammatory disorders and infection. They are experts in a range of pathology specialties, such as cellular pathology, laboratory medicine and medico-legal pathology. Perinatal pathologists diagnose and investigate disease processes that affect unborn babies, neonates and infants. They investigate causes of pregnancy loss, miscarriage, stillbirth and neonatal disease. They are experts in pathology involving the placenta.

Reproductive science

Using increasingly sophisticated technology, scientists working in reproductive science can give hope to couples who are having trouble conceiving. They are experts in diagnosing infertility, as well as investigating, offering advice and insight on treatment options and delivering treatments, such as in vitro fertilisation.

Toxicology

Toxicologists are scientists who work across a broad range of environments in healthcare. In hospitals, they analyse samples from patients who have, for example, taken recreational drugs or overdoses of prescription medicines. They also advise public health bodies and industry on chemical and environmental hazards and on drug safety.

Transfusion medicine

Transfusion doctors and scientists are haematologists who specialise in transfusion medicine. They make sure that every patient who needs a transfusion is matched with blood from a suitable donor. They oversee the health and wellbeing of donors, the testing of blood for infections, the management of hospital blood stocks and promotion of the safe and appropriate clinical use of blood and components. Transfusion staff participate in and contribute to haemovigilance activities promoting patient safety.

Veterinary pathology

Veterinary pathologists work in animal disease surveillance, prevention, diagnosis and treatment. They play a key role in the development of safe and effective medicines and vaccines for animals and humans. They investigate diseases in pets and farm animals, as well as exotic species. They also contribute to animal conservation and protection, and public health.

Virology

Virologists are doctors and scientists who oversee the diagnosis, management and treatment of patients with viral infections, from common viruses like chickenpox to emerging infections like Zika and Ebola. Virologists are also involved in public health – studying and advising on infections spreading globally as a result of travel and climate change. Some virologists specialise in vaccine development. This specialty has been particularly recognised in making an enormous contribution to COVID-19 testing and diagnosis, which have been essential to the care of healthcare staff and patients throughout the pandemic.

CASE STUDY

Targeted cancer therapy using CAR-T cells

Reprogramming a person's own immune system to target cancerous cells provides a truly individual approach to cancer treatment, which involves collaboration between haematology and pathology services. Here, Dr Julia Wolf and Dr James Griffin describe how CAR-T therapy was used to treat an aggressive form of blood cancer.

CAR-T therapy is a novel and highly complex immune therapy that redirects the body's own immune system to fight cancer. CAR-T cells are often described as 'the living drug' because they actively search and target malignant cells. It uses a type of immune cell called a T-cell, which is extracted from patients' blood before being genetically altered to allow it to target surface proteins found on cancer cells.

> CAR-T cells are often described as 'the living drug' because they actively search and target malignant cells.

The cell collection is performed by passing the blood through an apheresis machine that separates the white cells, including T-cells. The collected cells are then transported to manufacturing sites where the CAR-T cell drug is created by inserting a man-made gene, the chimeric antigen receptor (CAR), into the DNA of T-cells. As a result, the engineered cell can recognise and fight cancer cells. The CAR-T cells are then expanded and infused back into the patient after chemotherapy.

Since Food and Drug Administration approval in the USA in 2017, CART-T therapy has emerged as one of the biggest breakthroughs in cancer therapy in decades. Several products are now used routinely or in trials to treat a range of haematological and non-haematological malignancies.

The collection, processing and storage of patient cells that form the basis of CAR-T therapy depends on a multitude of clinical and laboratory processes, which are supported by NHS Blood and Transplant (NHSBT) and pathology services.

> Prior to the emergence of CAR-T therapy, treatment options for relapsed ALL following stem cell transplant were extremely limited and outcomes sadly often extremely poor.

The first patient to receive CAR-T therapy at University Hospitals Bristol and Weston (UHBW) NHS Foundation Trust was Nitya. Nitya was diagnosed with acute lymphoblastic leukaemia (ALL), an aggressive form of blood cancer, at the age of 16. She received standard multiagent chemotherapy and achieved a good initial response but, unfortunately, her leukaemia relapsed only 23 months into treatment. Nitya required more chemotherapy, which achieved a complete remission from ALL. Despite her intensive treatment she also managed to complete her A-levels and received a place to study at University College London (UCL). However, these remissions are a fragile and temporary state and need to be consolidated with allogeneic (donor) stem cell transplant.

> Nitya was accepted as one of the first NHS patients to receive CAR-T cells ... What followed was a journey filled with anxious waiting.

The histocompatibility and immunogenetics laboratory in NHSBT Filton carried out tissue typing, which tests to see how closely a donor's stem cells or tissue match your own, and found that Nitya's sister was a full match for her. Her sister underwent successful apheresis stem cell collection. Nitya received more chemotherapy to prepare her body for transplant before having an infusion of her sister's stem cells. She tolerated the treatment well despite developing graft versus host disease (GvHD). GvHD is a frequent complication of allogeneic stem cell transplant that occurs when the donated cells view the healthy cells of the person receiving the transplant as foreign and attack them. Unfortunately, three months after the transplant, Nitya had relapsed again.

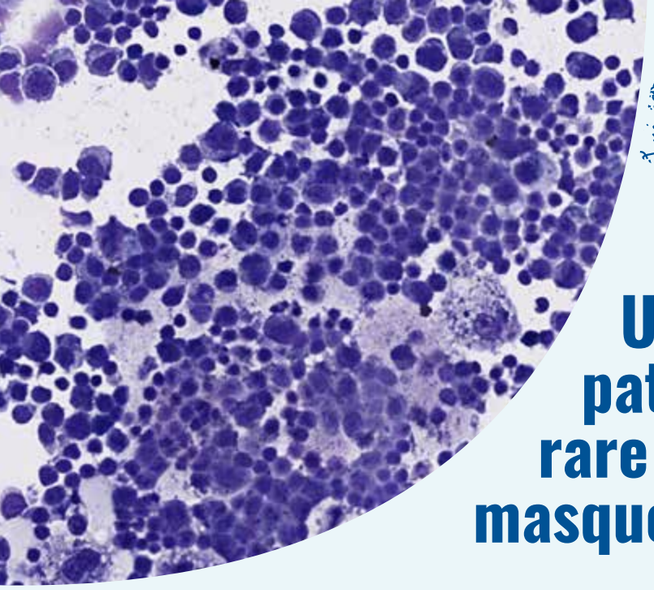
Prior to the emergence of CAR-T therapy, treatment options for relapsed ALL following stem cell transplant were extremely limited and outcomes sadly often extremely poor. However, UHBW had set up its own CAR-T programme and was now offering this treatment as one of only six sites in the UK. As CAR-T therapy is associated with significant and complex adverse events, the decision of whether to offer CAR-T therapy to Nitya was not taken lightly. Specifically, there were concerns that Nitya's GvHD could recur and be exacerbated through further immune therapy.

As other treatment options were inadequate, Nitya was accepted as one of the first NHS patients to receive CAR-T cells in December 2018. What followed was a journey filled with anxious waiting. Nitya received further chemotherapy, which again put her into a complete remission. She achieved a good apheresis collection but cells had to be cryopreserved and shipped to the USA for manufacture. The manufacturing process for CAR-T cells is complex and not always successful meaning some patients need further chemotherapy to hold their disease at bay. Some relapse despite this, making CAR-T treatment impossible. In Nitya's case, the CAR-T cells were returned to the UK four weeks later. Nitya underwent yet more chemotherapy to prepare her body for the CAR-T cells before receiving the infusion.

Her treatment went well but was complicated by severe GvHD affecting her liver. While this was predicted as a possible complication, it had not been previously described in the literature. Nitya was very unwell and required treatment with extracorporeal photopheresis. This is an apheresis-based therapy that involves collecting the patient's white blood cells, adding a chemical to the cells and exposing them to ultraviolet light outside of the body to cause programmed cell death. The dying cells are re-infused back to the patient where they affect how the patient's immune system works. Nitya received this therapy regularly for a year after CAR-T treatment but has now stopped after achieving a complete response.

And Nitya's leukaemia? The CAR-T therapy appears to have cured the ALL with no detectable disease in her bone marrow within a month after treatment. This remains the case 18 months later.

Despite her often tumultuous treatment course, Nitya managed to start her studies at UCL and is planning on spending a year abroad soon. This would have been impossible without the close collaboration between pathology and clinical haematology services at UHBW, NHSBT and international manufacturing sites, highlighting the need for teamwork and partnership when aiming to achieve the best outcomes for our patients.



CASE STUDY

Using molecular pathology to unveil the rare ocular tumour behind masquerade syndrome

Molecular testing is becoming a vital tool in diagnosing cancers, as well as guiding and monitoring treatment. Here, Professor Sarah Coupland, a Consultant Histopathologist specialising in ocular pathology, explains how molecular pathology is improving the detection of a rare type of eye tumour and, potentially, patient outcomes.

The use of novel molecular diagnostic technologies is advancing at a fast pace not only in the most common cancers, but also rare types. An example of the latter is vitreoretinal lymphoma (VRL) − a highly aggressive B-cell lymphoma that is associated with central nervous system lymphoma.[1] B-cells are a type of white blood cell called a lymphocyte that make antibodies specific to pathogens, such as bacteria or viruses, and are involved in the immune response. B-cell lymphomas develop when the body produces abnormal B-cells that grow out of control.

VRL has an estimated incidence of 0.46 to 1 per 100,000 persons per year. However, the incidence of VRL is increasing, in patients both with and without immunosuppression (where your immune system doesn't function as effectively). VRL is currently associated with a poor prognosis, typically due to delays in diagnosis and a lack of effective therapies once it spreads to the brain.[1,2]

VRL most often affects patients over the age of 50 years, with a mean age of 63, and affects both males and females equally.[1,2] VRL is known for its gradual and slow onset, often mimicking a wide range of other ocular diseases; therefore, it is often called the masquerade syndrome. It can affect one or both eyes, and can present before or at the same time as brain disease.

> The use of novel molecular diagnostic technologies is advancing at a fast pace not only in the most common cancers, but also rare types.

Once VRL is suspected, a vitrectomy (the surgical removal of a gel-like fluid that fills your eye called vitreous) is performed by ocular surgeons. Cytological examination − where cells within the vitreous fluid are examined under a microscope − is required, followed by immunocytology (where stains are used to highlight specific cell types) and, when possible, molecular analyses.

Since these samples are often small and consist of fragile cells, clear communication between the ocular surgical team and the receiving laboratory is essential to ensure the samples are transported quickly after the operation to the laboratory. In turn, experienced biomedical scientists and ocular pathologists play a major role in successfully processing the diagnostic material and interpreting the results.

> The advantage of NGS panels is that they are flexible and allow for the inclusion of new genes as more is revealed about the different types of cancer.

Molecular examination of these samples has become a valuable tool to confirm the diagnosis of lymphoma. For example, B-cell immunoglobulin gene rearrangement tests detect changes (rearrangements) in specific genes in B-cells. Rearrangements are part of the normal development of B-cells and create an array of B-cells with different profiles that can protect you against different kinds of infections. In lymphomas, the abnormal B-cells produce identical copies of themselves, creating rearrangement profiles that are identical. The test determines whether the rearrangement profiles are diverse or identical and is a mainstay in VRL diagnosis.

The sensitivity of these tests ranges from between 65% and 95%, depending on a number of factors, including the quality of material and experience of the laboratory.[1,2] False-negative results, however, may still occur in these analyses, because of the large number of naturally occurring (somatic) mutations that occur in B-cells reducing the effectiveness of the test.

To overcome this problem, bespoke next generation sequencing (NGS) panels, which allow DNA and RNA to be sequenced, have been designed over the last five years for VRL.[3,4] The panels have been created based on the improved understanding of the molecular biology of the disease, including the revelation that around 75% of VRL show a mutation in the *MYD88* gene in neoplastic B-cells.[3]

Consequently, *MYD88* mutational analysis is becoming part of the routine work-up of VRL in many laboratories worldwide, and has enabled earlier definitive diagnoses in patients.

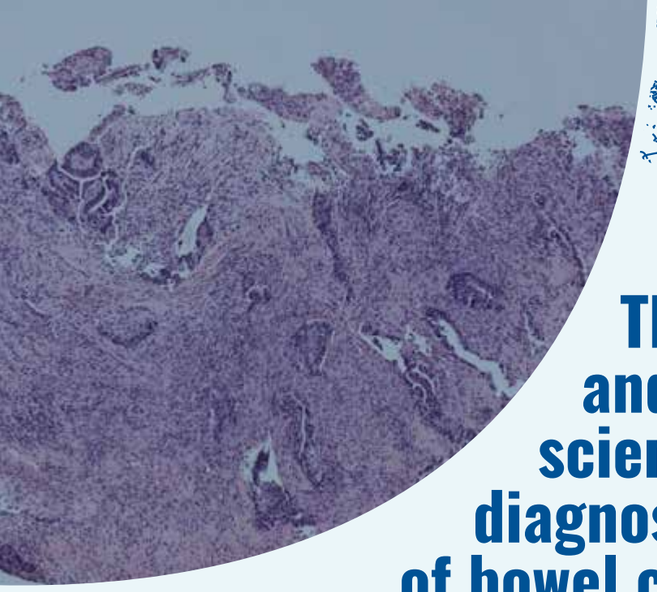
In a recent multicentre collaboration, VRL was shown to display additional mutations and alterations in their tumour cells. These involved the following genes: *PIM1, CD79B, IGLL5, TBL1XR1, ETV6*; and deletions in chromosome 9p21/CDKN2A.[5] The study also showed that cell-free DNA of the vitreous fluid supernatant (i.e. the non-cellular component of the sample) could be used to demonstrate the presence of the above mutations with reliability. This is of importance since the number of viable cells within vitrectomy samples can be very low.

> [Vitreoretinal lymphoma] is currently associated with a poor prognosis, typically due to delays in diagnosis and a lack of effective therapies.

The advantage of NGS panels is that they are flexible and allow for the inclusion of new genes as more is revealed about the different types of cancer. It is likely that the VRL NGS panels will be modified further to include some of the new genes discovered in the multicentre study, to further improve the detection of this disease. There is also promise that one or more of these genes could be targeted by new therapeutic agents designed to treat this aggressive and usually fatal disease.

1. Araujo I, Coupland SE. Asia Pac J Ophthalmol 2017;6:283−289.
2. Fend F, Ferreri AJM, Coupland SE. Br J Haematol 2016;173:680−692.
3. Bonzheim I, Giese S, Deuter C, Süsskind D, Zierhut M, Waizel M. Blood 2015;126:76−79.
4. Cani AK, Hovelson DH, Demirci H, Johnson MW, Tomlins SA, Rao RC. Oncotarget 2017;8:7989−7998.
5. Bonzheim I, Sander P, Salmeron-Villalobos J, Süsskind D, Szurman P, Gekeler F. Blood Adv 2021; doi: 10.1182/bloodadvances.2021004212 (Epub ahead of print).

Image (page 44): May Grunewald Giemsa (MGG) stain of a cytospin made from the intraocular biopsy taken from the affected area.



CASE STUDY

The role of pathology and healthcare scientists in the diagnosis and management of bowel cancer syndrome

Medical pathologists and healthcare scientists work collaboratively to improve pathology services for patients. Here, Dr Jo Horne and Patrick Kumah describe the role of consultant scientists in the diagnosis and treatment of bowel cancer.

Every year over 40,000 cases of bowel cancer are diagnosed in the UK.[1] Most diagnoses are made through diagnostic biopsies, taken at colonoscopy, where images are taken of the colon to detect any abnormalities. Biopsies (small samples of tissue) are taken to investigate symptoms that patients presented with, such as a change in bowel habit or bleeding. We usually receive biopsies from patients who are being investigated via the national bowel cancer screening programme.

Surgical resection specimens (larger pieces of diseased tissue) are examined, described and dissected by both medical histopathologists and healthcare scientists, with representative areas of individual specimens sampled and processed through the laboratory. The samples are stained to assess any significant changes in the structure of the tissue.

Consultant histopathologists, and increasingly, consultant scientists make the diagnosis. Consultant scientists have been eligible to train to report histopathology samples from the gastrointestinal tract (and other sites) since 2012. Our main role is to produce a histopathological report on the patient's specimen. For biopsies, the report will contain diagnostic information and molecular test results.

Diagnosis is usually made on a glass side using a light microscope but, increasingly, digital pathology is being utilised for routine diagnostic histopathology. In digital pathology, images of the glass slide are created and captured with a scanning device to provide a high-resolution image that can be viewed on a computer screen or mobile device.

Cells that have grown normally have a uniform and organised appearance. By contrast, abnormal cells show a different range of features, a deeper colour on staining and a disorganised growth pattern. The bowel is made up of tissue layers, and when these abnormal cells grow in the wrong areas, this is known as cancer. To aid diagnosis, further investigations, using genetic testing or immunohistochemistry (a technique that makes proteins visible and helps to identify whether the patient has abnormal mismatch repair genes), are performed. Mismatch repair genes are responsible for correcting any errors that are made when DNA is copied within a normal cell. Cells with abnormal mismatch repair genes build up many DNA mutations, which can lead to bowel cancer developing. Knowing whether there are abnormalities in the mismatch repair genes helps to exclude an inherited disorder called Lynch syndrome. It can also predict how the tumour will respond to any treatments that are planned for the patient.

Part of the role of healthcare scientists is to attend colorectal multidisciplinary team meetings (MDTs). In these meetings the team confirms the cancer diagnosis and sets out the patient's individual treatment pathway. We review the histopathology reports beforehand. With increasing access to rapid molecular testing, we inform oncologists of any gene mutations that may indicate Lynch syndrome. All newly diagnosed cases of bowel cancer are assessed for Lynch syndrome. This is an inherited condition that puts people at a much higher risk of developing bowel cancer, as well as increasing the risk of other cancers including ovarian cancer, stomach cancer and womb cancer. Family members may have the condition, and they can be referred for genomic testing and counselling.

Attending MDTs allows scientists to fully integrate within clinical teams and has the added benefit of releasing time for medical histopathologists to undertake other, more complex work. The role of pathology in the diagnosis, staging and monitoring of colorectal cancer has increased greatly over the last few years. Scientists and pathologists are responsible for ensuring that the right tests are carried out to the highest standard on behalf of patients. As the workload continues to increase, there must be an appropriately trained and experienced clinical workforce, comprising both medical histopathologists and healthcare scientists.

Scientists are highly qualified and experienced individuals and, with appropriate training programmes and opportunities, in line with other healthcare professions, are in a perfect position to contribute to safely managing the increasing workload within histopathology. We can act as the conduit between the laboratory, MDT coordinators and clinicians, ensuring that cases are ready for discussion at MDT. We have the skills and knowledge to increase collaboration and integration between histopathology, molecular pathology departments and genomic testing laboratories, and to develop and quality assure new tests and ways of working, such as digital pathology or rapid molecular testing and interpretation.

The key now is to develop new, improved and widened workplace and academic training programmes for scientists in histopathology. We need to work towards more collaborative and integrated training programmes for medics and scientists, both nationally and within pathology networks. Undertaking this work, alongside increasing training places for medical histopathologists, is essential to safely sustain and improve histopathology services, ensuring that every person diagnosed with bowel cancer receives the right diagnosis and right treatment at the right time.

1. Cancer Research UK. ***Bowel cancer statistics****.*

Image (page 46): H&E section of the patient's colonic biopsy showing a malignant tumour (adenocarcinoma).

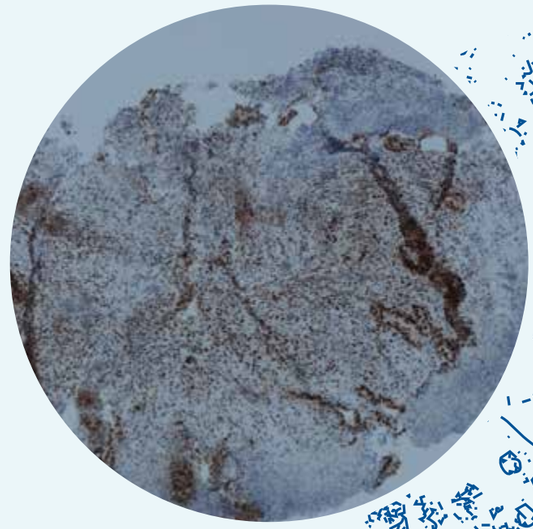


Image above: Positive staining within the tumour cells in the patient's biopsy for the mismatch repair protein, MLH1.

Image: A bag of combined red blood cell and plasma treatment.

CASE STUDY

Improving patient outcomes through clinical studies

To ensure the best outcome for patients, early intervention is essential in cases of major traumatic haemorrhage. Here, Dr Harriet Tucker, Trauma Research and Whole Blood Fellow, and Dr Laura Green, Consultant in Haemostasis and Transfusion Medicine, share the story of a patient who received a combined red blood cell and plasma transfusion from paramedics at the scene of the injury.

The red cell and plasma study was a multicentre cohort study to establish the feasibility of pre-hospital transfusion of a combined red blood cell and plasma product delivered at the roadside to critically injured patients.[1] The study was a collaboration between NHS Blood and Transplant, Barts Health NHS Trust and Queen Mary University of London.

> The use of a combined component ... can overcome ... logistical challenges allowing quicker, earlier delivery of blood products in equal ratios, and the potential to improve survival rates.

The UK standard of care in-hospital for traumatic haemorrhage is early haemostatic resuscitation – delivering a balanced ratio of blood products to the patient as early as possible. Most potentially preventable deaths for people who bleed due to traumatic injury occur in the first three hours of injury, and acute traumatic coagulopathy begins at the point of injury. Trauma-induced coagulopathy (TIC) is a clinical syndrome driven by the combination of shock and tissue injury, resulting in uncontrolled bleeding; management focuses on stopping the bleeding, reversing the shock and preventing worsening TIC by restoring the circulating blood volume.

> Most potentially preventable deaths for people who bleed due to traumatic injury occur in the first three hours of injury...

To help reduce these early deaths, which often occur before the patient reaches the hospital, most UK Air Ambulances carry separate bags of red blood cells and plasma. The latter is carried either in the form of pre-thawed fresh frozen plasma (which has a short shelf-life and must be stored cold) or lyophilised plasma (which has a longer shelf life but must be reconstituted prior to use). The use of these separate components in a pre-hospital setting presents storage, resource, logistical and operational challenges. These challenges include a limited number of transfusion sets, limited blood warmers to warm the blood prior to use to prevent hypothermia and prevent worsening of TIC, storage constraints to carry enough bags of each component, and the time taken to ensure safety checks are carried out appropriately for each blood component transfused.

The use of a combined component, such as red cell and plasma, can overcome many of these logistical challenges allowing quicker, earlier delivery of blood products in equal ratios, and the potential to improve survival rates. For example, one bag of combined red cell and plasma is the equivalent of transfusing one bag of red blood cells and one bag of thawed plasma – all of which need to undergo safety checks, be transfused separately and sequentially, through limited intravenous sites.

Alvin's story

In December 2018, Alvin suffered a stab injury to his right thigh, just above the knee. He lost a lot of blood on scene, and a bystander performed initial first aid by putting pressure on the wound and applying a tourniquet made from rope. The paramedic team then applied three combat application tourniquets to reduce the bleeding.

> Alvin's story highlights the benefits of trialling new products and interventions and constantly striving to improve patient care...

20 minutes after the injury, the London Air Ambulance arrived. Alvin was unwell, displaying signs of shock from significant blood loss. He had a reduced level of consciousness, his heart rate was very fast and his blood pressure was low. In the 22 minutes that the pre-hospital critical care team were on scene, they performed a pre-hospital anaesthetic, gained intravenous access into a large central vein and transfused three bags of red cell and plasma through this single line and through one blood warmer. By only having to transfuse three bags (instead of six separate bags) through one intravenous line, Alvin could be resuscitated rapidly, reducing the time needed for blood transfusion on scene, correcting TIC earlier and allowing the small team to perform other time critical interventions, all of which was paramount to his survival.

Alvin was flown to the Royal London Hospital arriving just 70 minutes after the time of his injury, where he was met by the 'Code Red' trauma team. The Code Red team manage patients who are bleeding and who need immediate attention to stop their bleeding and save their lives. He received a blood transfusion in the Emergency Department and was taken directly to the pre-prepared operating theatre. Here, he underwent repair of the blood vessels that had been damaged in his leg and further blood transfusion. Alvin was transferred to the intensive care unit and less than ten days after being admitted, he was discharged home to his family. Alvin was able to move independently and was shortly back to work with support from the hospital's After Trauma Team.

Alvin's story highlights the benefits of trialling new products and interventions and constantly striving to improve patient care to give them the best possible opportunity to go home to their families and continue their lives as they would want to.

1. Red cell and plasma study. Available at: ***https://www.c4ts.qmul.ac.uk/research-programmes/red-cells-and-plasma-transfusion-study***

CASE STUDY

A One Health approach to high blood cholesterol

As the past 18 months have shown us, the health of humans, animals and ecosystems are interconnected. Here, Dr Simon Spiro, Wildlife Veterinary Pathologist at the Zoological Society of London, explains how studying disease in one species can further our understanding of pathogenesis in humans.

The great joy of being the veterinary pathologist for the Zoological Society of London (ZSL), the international conservation charity behind ZSL London and Whipsnade Zoos, is getting to work with the widest possible range of species, from the smallest corals to the biggest whales. Every species presents its own challenges at post mortem. For an elephant, these are mostly solvable with a team of helpers and a JCB, while a starfish may require long hours of reading and Googling just to familiarise myself with the anatomy. Against this background, a post mortem of a medium-sized, non-venomous, soft-bodied animal like a meerkat may seem like an opportunity to relax into familiarity. However, as this case will demonstrate, nothing can be taken for granted in the world of wildlife.

> The great joy of being the veterinary pathologist for the Zoological Society of London ... is getting to work with the widest possible range of species, from the smallest corals to the biggest whales.

Meerkats are a common species at zoos around the world and their high levels of activity and anthropomorphic qualities make them a favourite of visitors and keepers alike. We were all very saddened when one of our older meerkats, Hari, was found collapsed and semi-responsive in his enclosure at ZSL Whipsnade Zoo last December. Hari was immediately rushed to our veterinary hospital, where radiology revealed changes to the meninges (the surface coverings of the brain) that blurred the distinction between brain and skull. Because of the poor prognosis and lack of response to supportive therapy, the sad decision was taken to put Hari down. Post-mortem examination quickly revealed the true nature of the brain lesion − a gelatinous mass fusing the parietal lobes of the brain and the overlying skull into a single, indivisible unit.

Meerkats are most closely related to cats, of all the domesticated species. If I had seen a similar lesion in a domestic cat, I would have expected the symptoms to have been caused by tumours, such as a meningioma or osteosarcoma, or a chronic inflammatory process such as osteomyelitis. Histopathology revealed that the true diagnosis was one almost unique to meerkats − a meningeal cholesterol granuloma.

Cholesterol granulomas are an inflammatory lesion formed of needle-shaped cholesterol crystals surrounded by foreign-body type inflammation. In humans, they are most commonly found in the petrosal bone around the ear, while in veterinary medicine they are sometimes found within the lateral ventricles of horses' brains. In both cases, they are thought to be the result of chronic haemorrhage, with the cholesterol-rich membranes of the blood cells slowly breaking down and inducing a granulomatous response. In meerkats, no association with haemorrhage has been shown. Instead cholesterol granulomas seem to be directly related to high blood cholesterol (hypercholesterolaemia).

In human medicine, hypercholesterolaemia leads to cholesterol plaques being deposited in the walls of arteries (atherosclerosis), potentially leading to coronary heart disease. In meerkats, these plaques are deposited in the brain causing neurological disease. In both humans and meerkats, hypercholesterolaemia is, at least in part, the consequence of poor diet choice. In the wild, meerkats eat a wide variety of arthropods, such as beetles, termites and scorpions. In captivity, however, such variety is hard to replicate, and zoos have traditionally fed meerkats high calorie, high fat foods like mealworms, mice and day-old chicks. These are the meerkat equivalent of burgers and chips.

> By thoroughly investigating ... we hope to not only improve the health of captive and wild meerkats around the world, but also understand more about the fundamental pathology of disease in animals and in humans.

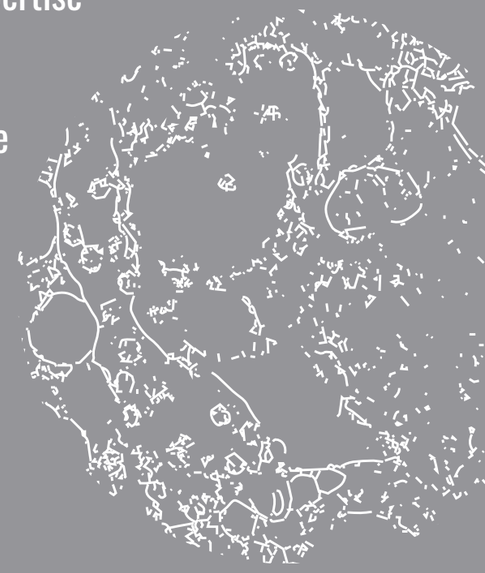
At ZSL, we carefully monitor the blood cholesterol of our meerkats and feed a high protein, low fat diet including crickets and mixed vegetables to minimise and manage the risk of hypercholesterolaemia, although cases such as Hari's do still present. We know that a minority of visitors to our zoos ignore our signage and will attempt to feed the meerkats with inappropriate treats. When we were closed during the COVID-19 lockdowns we saw the meerkats start to lose weight, suggesting that they were receiving significant amounts of unsuitable food in this way.

ZSL takes a rounded approach to animal health, and employs specialists in veterinary medicine, pathology, behaviour, welfare and nutrition to tackle these knotty problems. By thoroughly investigating and publishing these cases, we hope to not only improve the health of captive and wild meerkats around the world, but also understand more about the fundamental pathology of disease in animals and in humans.

Our governance

04.

> The Lay Network brings expertise from diverse backgrounds and their input and feedback helps ensure the College's outputs are in line with the needs of our members and the public and our work is transparent.
>
> *– Robert Smith, lay trustee and Chair of Trustee Board*



Governance of the College

College review of the Royal Charter, Ordinances and Bye-Laws

Following a review of our Royal Charter, Ordinances and Bye-Laws and in consultation with College fellows, proposed changes were approved at the 2020 Annual General Meeting and subsequently put forward to Privy Council. These changes have now been approved and will see the role of College President rotating between candidates working in different specialties. The President will be unable to stand for re-election after serving their three-year term. Gender-neutral terminology will replace masculine pronouns in the Charter and Ordinances and voting rights have been extended for our diplomate members. They will now be able to participate in the election of honorary officers, general Council members and, if the diplomate lives in England, English Regional Representatives on Council. This will provide diplomates with a valuable opportunity to contribute to the future of the College.

The Trustee Board also enacted a change that provides for a lay trustee to take on the role of Chair for the Board. A third lay trustee appointment has been added to the Board to strengthen overall diversity of skills and experience.

Council and Trustee Board
as at 30 June 2021

Trustee Board
- Robert Smith, Chair and Lay Trustee
- Professor Mike Osborn, President
- Professor Sarah Coupland, Vice President for Communications
- Professor Angharad Davies, Vice President for Learning
- Professor Peter Johnston, Vice President for Professionalism
- Dr Andrew Boon, Treasurer
- Dr Lance Sandle, Registrar
- Dr Esther Youd, Assistant Registrar
- Professor Ken Mills, Chair, Northern Ireland Regional Council
- Dr Bernie Croal, Chair, Scotland Regional Council
- Dr Jonathan Kell, Chair, Wales Regional Council
- Jill Gauntlett, Lay Trustee
- Vincent Voon, Lay Trustee

Regionally Elected Members
- Dr Laszlo Igali, England, East Midlands Region
- Dr Rachael Liebmann, England, London Region
- Dr Negar Maghsoodi, England, South Region
- Dr Alison Robb, England, North Region

Nationally Elected Members
- Professor Simon Cross, Elected
- Professor Roger Feakins, Elected
- Dr Giovanni Satta, Elected
- Dr Ravinder Sodi, Elected

Co-opted Members
- Dr Lisa Ayers, Chair, Clinical Science Committee
- Dr John Ashcroft, Chair, Intercollegiate Committee on Haematology
- Dr Maadh Aldouri, Former Chair, International Committee
- Professor Neil Anderson, Chair, Clinical Biochemistry SAC
- Dr Louise Jones, Chair, Genomics and Reproductive Science SAC
- Dr Darren Treanor, Chair, Digital Pathology Committee

Observers By Invitation
- Dr Shubha Allard, Clinical Director of Publishing and Engagement
- Dr David Bailey, Chair, Death Investigations Committee
- Dr Adrian Bateman, Chair, Cellular Pathology SAC
- Professor Louise Burke, Dean, Faculty of Pathology RCPI
- Dr Nicki Cohen, Clinical Director of Training & Assessment
- Dr Nigel Cooper, Chair, Forensic Pathology SAC
- Dr Matthew Clarke, Chair, Trainees' Advisory Committee
- Professor Paul Cross, Chair, Cytopathology Sub-committee
- Dr Samantha Holden, Chair, Prenatal, Perinatal and Paediatric Pathology SAC
- Lt Col (Dr) Emma Hutley, Military Observer
- Professor Roberto La Ragione, Chair, Veterinary Pathology SAC
- Dr Lynne Jamieson, Chair, Dermatopathology Sub-committee
- Dr Ann-Margaret Little, Chair, Histocompatibility and Immunogenetics SAC
- Dr Sanjiv Manek, Clinical Director of Examinations
- Professor Ismail Matalka, Clinical Director of International Activities and Chair, International Committee
- Dr Berenice Lopez, Clinical Director for Safety and Quality and Chair, Quality Assurance in Pathology Committee
- Dr Suzy Lishman, Chair, Medical Examiners Committee
- Dr Stephen Morley, Chair, Toxicology SAC
- Dr Shruthi Narayan, Chair, Transfusion Medicine SAC
- Professor David Roberts, Chair, Research Committee
- Professor the Hon Richard Tedder, Chair, Joint Medical Microbiology and Medical Virology SAC
- Dr Stephen Warton, Chair, Neuropathology SAC
- David Wells, IBMS Representative
- Dr Patrick Yong, Chair, Immunology SAC

Financial report

The income of the College amounted to £6.7 million, with expenditure of £5.9 million, and a resultant surplus of £803k.

During the previous financial year, the College was unable to run the spring 2020 examinations owing to the COVID-19 pandemic, which were deferred until this financial year. The fees payable by candidates, although received in the bank account of the College, could not be brought into the accounts until the point in time that examinations had actually taken place, hence the reason why income from postgraduate education and examinations has increased to £2.2 million compared with £895k last year.

Income from the trading activities of the College through the Events@No6 conference centre had to cease operation in March 2020 and have operated on an extremely limited basis for allowable educational events as and when permitted to do so. Some staff from the commercial arm of the College, unfortunately, had to be made redundant because of the severe reduction in income.

Some other staff for this activity and generally across the College were furloughed under the Coronavirus Job Retention Scheme. All such staff have returned from furlough as of 30 June. Costs for the trading area of activity were reduced and managed wherever possible, with a conscious decision to retain the sales and marketing function in place to ensure that the College is on the front foot as this activity recommences. Further savings have been made against the salaries budget due to vacant positions that were not filled during the year, or which were delayed before being recruited to.

The College has been holding virtual committee meetings rather than face-to-face meetings throughout the year, so there have been savings on travel and related costs and the provision of refreshments at meetings. Most meetings will continue virtually for the ensuing financial year. Savings in building-related costs (including cleaning, energy consumption and building maintenance) have been identified as a result of closing the building on 24 March 2020. All staff have been working remotely since that date. The office reopened on 13 September 2021, with the conference centre opening fully from 19 July 2021.

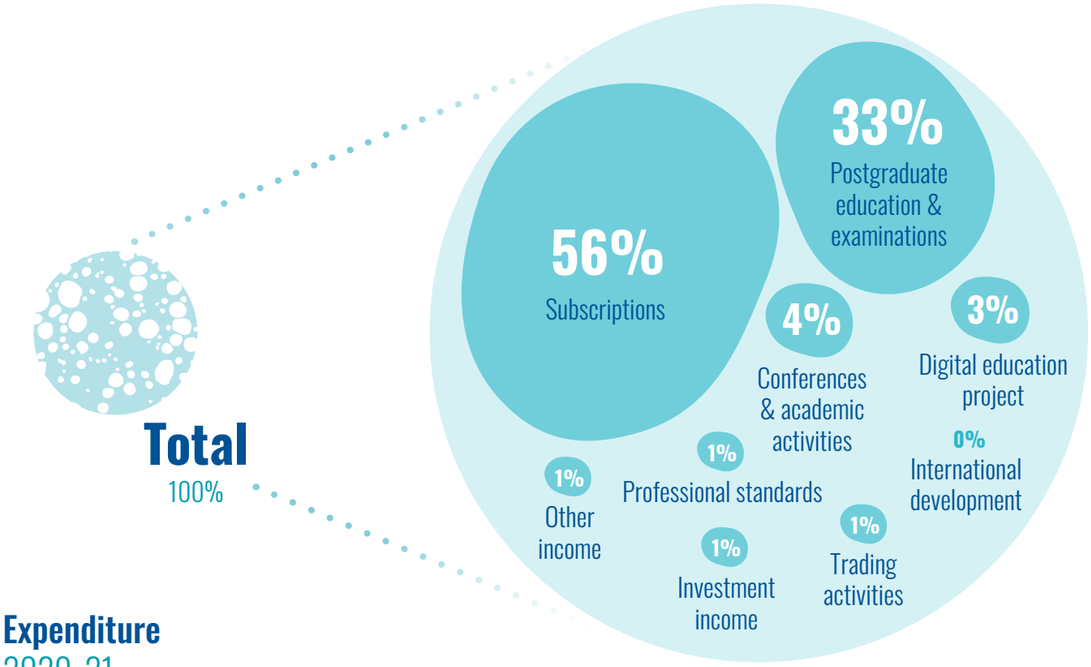
The last 12 months proved eventful for world economies and markets. Equity and other risk markets have performed well against this backdrop, with financials, industrials and materials challenging technology returns for the first time in decades − their rally being prompted by the vaccine news in November. Unsurprisingly, given the strong economic upturn, defensive sectors like utilities and consumer staples lagged at the bottom. The College's portfolio has seen a good return of +24.5% in the 12 months to 30 June 2021. Over the longer term, the portfolio has delivered +40.5% and +74% on a three-year and five-year timeframe, respectively.

The accounts published overleaf are not the statutory accounts, but a summary of information relating to both the statement of financial activities and the balance sheet. The full financial statements have been audited and contain an unqualified audit report. They were approved by the Trustee Board on 5 August 2021 and have been submitted to the Charity Commission. Any member may request a copy of the full accounts by writing to the Chief Executive.

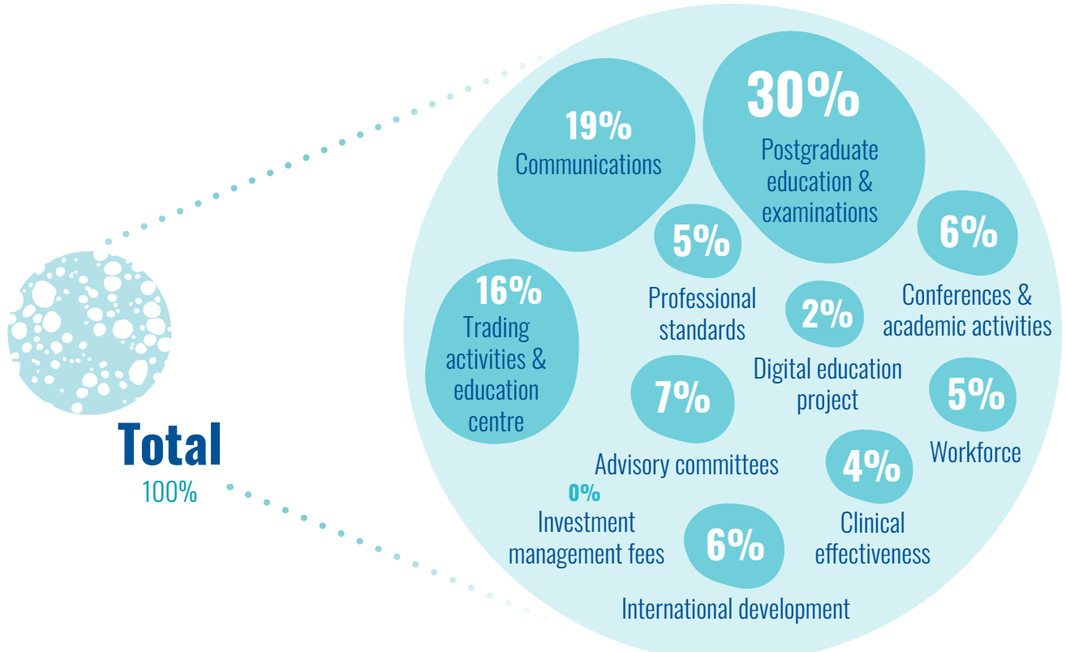
Dr Andy Boon, Treasurer
Mr Daniel Ross, Chief Executive

NOVEMBER 2021
ROYAL COLLEGE OF PATHOLOGISTS ANNUAL REPORT & ACCOUNTS
SECTION 04 OUR GOVERNANCE

Income
2020-21



Expenditure
2020-21



Consolidated Statement of Financial Activities
for the year ended 30 June 2021

	Unrestricted General Funds	Unrestricted Designated Funds	Restricted Funds	Total Funds 30 June 2021	Total Funds 30 June 2020
	£	£	£	£	£
Income from:					
Donations & legacies	1,483	-	-	1,483	3,892
Charitable activities					
Subscriptions	3,785,867	-	-	3,785,867	3,622,145
Postgraduate education & examinations	2,194,501	-	5,000	2,199,501	894,774
Pathology Portal	-	-	175,000	175,000	100,127
International development	14,316	-	-	14,316	108,787
Conferences & academic activities	262,107	-	-	262,107	187,950
Professional standards	52,626	-	-	52,626	59,788
Communications	423	-	-	423	5,000
Trading activities	68,324	-	-	68,324	743,280
Investments	91,757	-	2,189	93,946	147,619
Other	79,820	-	-	79,820	79,751
Total income	**6,551,224**	**-**	**182,189**	**6,733,413**	**5,953,113**
Expenditure on:					
Raising funds					
Trading activities	945,670	600	-	946,270	1,408,765
Investment management fees	23,557	-	-	23,557	14,472
Charitable activities					
Postgraduate education & examinations	1,737,826	-	13,000	1,750,826	1,672,503
Pathology Portal	-	-	138,871	138,871	26,153
International development	355,670	-	5,000	360,670	420,827
Conferences & academic activities	262,873	-	91,943	354,816	385,451
Research	-	-	3,462	3,462	3,884
Professional standards	269,543	-	-	269,543	332,372
Clinical effectiveness	251,717	7,583	-	259,300	299,697
Workforce	313,000	-	-	313,000	337,097
Communications	1,095,270	-	820	1,096,090	1,235,916
Advisory committees	391,165	22,584	-	413,749	478,274
Total expenditure	**5,646,291**	**30,767**	**253,096**	**5,930,154**	**6,615,411**
Net income / (expenditure) before net gains on investments	904,933	(30,767)	(70,907)	803,259	(662,298)
Net gains on investments	871,548	-	164,075	1,035,623	150,475
Net income / (expenditure)	1,776,481	(30,767)	93,168	1,838,882	(511,823)
Transfers between funds	(604,420)	603,420	1,000	-	-
Net movement in funds	1,172,061	572,653	94,168	1,838,882	(511,823)
Reconciliation of funds:					
Total funds brought forward	6,424,037	28,864,164	1,364,466	36,652,667	37,164,490
Total funds carried forward	**7,596,098**	**29,436,817**	**1,458,634**	**38,491,549**	**36,652,667**

Consolidated Balance Sheet
as at 30 June 2021

	2021	2020
	£	£
Fixed assets:		
Tangible assets	38,403,585	39,036,481
Investments	6,294,113	5,281,517
Total fixed assets	**44,697,698**	**44,317,998**
Current assets:		
Stocks	4,900	11,231
Debtors	477,465	564,210
Cash at bank and in hand	6,143,921	5,202,564
Total current assets	**6,626,286**	**5,778,005**
Liabilities:		
Creditors: Amounts falling due within one year	(4,040,079)	(4,332,997)
Net current assets	**2,586,207**	**1,445,008**
Total assets less current liabilities	47,283,905	45,763,006
Creditors: Amounts falling due after more than one year	(8,792,356)	(9,110,339)
Total net assets	**38,491,549**	**36,652,667**
The funds of the College:		
Unrestricted funds − general funds	7,596,098	6,424,037
Unrestricted funds − designated funds	29,436,817	28,864,164
Restricted funds	1,458,634	1,364,466
Total College funds	**38,491,549**	**36,652,667**

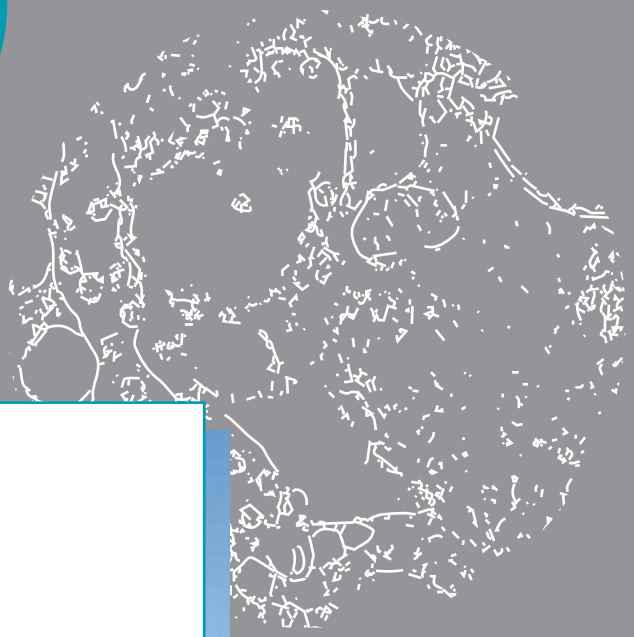
The financial statements were approved by the Trustee Board on 5 August 2021 and signed on behalf of the Trustee Board by Professor Mike Osborn, President, and Dr Andy Boon, Treasurer.

Independent Auditor's Statement
to the Trustees of the Royal College of Pathologists

The full financial statements were audited by Begbies, Chartered Accountants, and approved by the Trustee Board on 5 August 2021 and signed on their behalf by Professor Mike Osborn and Dr Andy Boon.

Begbies
Chartered Accountants and Registered Auditors 9 Bonhill Street, London EC2A 4DJ
5 August 2021

The Royal College of Pathologists
Pathology: the science behind the cure



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