QMB Innovation Centre

QUEEN MARY BIOENTERPRISES

Discovery

H2 2017

NEWS, VIEWS AND EVENTS AT QMB

IN THIS ISSUE

WELCOME

EDITOR'S WELCOME

Welcome to the latest issue of QMB's Newsletter.

The Life Sciences Industrial Strategy Board recently delivered its strategy to the UK government.

The Board, headed by Sir John Bell, Regus Professor of Medicine at Oxford, outlined its vision for a thriving Life Sciences sector, emphasising the vital role incubators can play in boosting the pace of economic growth.

Just a cursory glance at this newsletter confirms the vital role incubators play in bringing science, technology, innovation and talent together to develop the therapies of the future, while also helping to generate the economic benefits this will bring.

In this issue, we speak to Dr Rob Lambkin-Williams, aka Dr Flu and Executive Scientific Advisor at hVIVO, about their search for a Universal Flu Vaccine.

In other news, ADC Therapeutics (ADCT) goes from strength to strength with news it has secured $200 million in funding through a private placement. Meanwhile MedImmune, the global biologics research and development arm of AstraZeneca, which owns QMB tenant Spirogen, has entered into a licensing agreement with GamaMabs Pharma to use MedImmune's technology to research and produce an antibody-drug conjugate (ADC) as a potential cancer therapy. As we see in the oncology report from KPMG, cancer is a big and growing business for pharmaceutical companies.

We also catch up with our colleagues at QMI to see what's new in the world of technology transfer, including exciting news from QMUL, where a team led by Professor Federica Marelli-Berg found that an AstraZeneca drug called AZD1656 increased the activity of an enzyme called glucokinase. While it's still early days, QMI have filed a patent and clinical trials could follow. If successful, survival rates following lifesaving organ transplants could be significantly improved.

So it's been a busy six months for everyone at QMB and QMI as we continue to build a thriving Life Sciences hub in east London. Have a great festive holiday and see you next year.

We're eager to hear your perspective too, so please share your feedback in the comments section on our website, or join the conversation on our Twitter page. For more updates and the latest news from QMB, please visit our website.

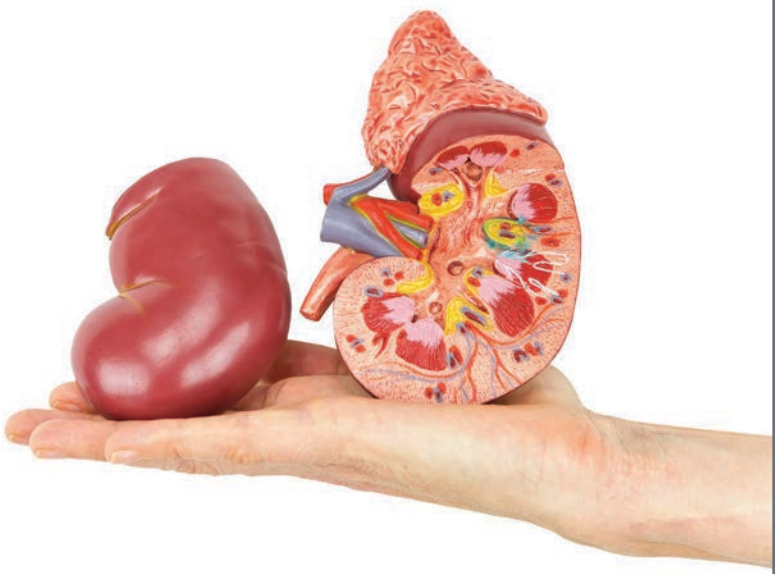
Nas

QMUL reveals shelved diabetes drug could be repurposed for organ transplant patients

A research team at Queen Mary University of London (QMUL) led by Professor Federica Marelli-Berg has discovered that a drug originally tested for type-2 diabetes treatment, could potentially be "re-purposed" as a drug to treat organ transplant rejection.

The QMUL team found that a drug manufactured by AstraZeneca called AZD1656 increases the activity of an enzyme called glucokinase. The enzyme helps to initiate the migration of regulatory T-cells that can resolve the bad inflammatory responses often associated with organ transplantation.

#QMBInnovation



Professor Marelli-Berg has been working closely with Dr Beatrice Lana from Queen Mary Innovation (QMI) to prepare a patent application, filed in September, claiming the use of AZD1656 in organ transplantation and also in other immune-related diseases.

"Federica's preliminary results are very promising and we plan to further evaluate the use of this drug in the clinic. We hope that this drug will demonstrate the potential to considerably improve the prospects for organ transplantation patients," said Dr. Beatrice Lana, Commercialisation Executive in the Biopharma team at QMI.

Drugs currently used to prevent organ rejection typically need to be taken for the rest of a patient's life. These drugs also have a number of side effects and include a greater risk of infection and cancer due to the fact that their effect is not restricted just to the part of the immune system responsible for organ rejection.

It is hoped that a pilot clinical trial, led by Professor Magdi Yaqoob, could begin shortly on patients undergoing kidney transplants. If successful, the discovery could have a major impact on the future survival rate following lifesaving organ transplant.

There were 4,755 organ transplants in the NHS in 2016/17, including 197 heart transplants. Almost 6,500 patients are on the waiting list. But about one in six patients who receive a new heart die within a year, with survival rates worse among those who undergo a joint heart and lung transplant.

hVIVO Promotes Former Vectura COO Trevor Phillips to Executive Chairman

hVIVO
better treatments, faster

hVIVO has appointed Dr. Trevor Phillips as Executive Chairman as of November 13th. He succeeds Jaime Ellertson who has held the role since June 2014. Ellertson remains as a Non-Executive Director at the company.

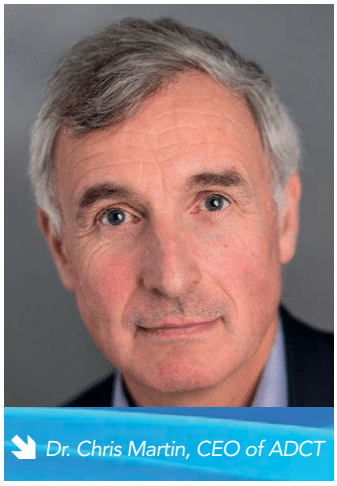
Phillips had held the role of Non-Executive Director at hVIVO since June 2017. Prior to that, he was Chief Operations Officer and President of US operations for seven years at FTSE 250-listed Vectura Group PLC, a company that is also focused on respiratory diseases.

"I am delighted that Trevor has accepted the role of Executive Chairman and I, as well as the rest of the management team, look forward to working closely with him. I would like to thank Jaime for all his support and guidance as Non-Executive Chairman over the past three years and we look forward to continuing to benefit from Jaime's counsel as a Non-Executive Director," said Chief Executive Officer Kym Denny.

Denny added: "This has been a formative time for hVIVO as we have sought to strengthen the Company's position as a specialised centre of excellence for the clinical research and development of new therapies for respiratory and infectious diseases. Trevor's expertise in operations and corporate development in this space will be invaluable as we seek to refine our strategy to drive revenue growth and build a robust and profitable business that is centred on our proprietary Pathomics platform."

Speaking on his appointment as Executive Chairman of hVIVO, Dr Phillips said: "I am excited at this opportunity to work with the hVIVO team to drive the business forward. I believe the Pathomics platform that the company has developed, coupled with the Company's clinical expertise and know-how is a valuable and unique asset for those involved in the discovery and development of drugs for diseases that impact the airways and so enable precision therapies. I look forward to guiding the management team to ensure that the commercial potential of the platform and the business is realised so as to generate significant and sustainable shareholder value."

ADC Therapeutics Raises $200M to Fund Two Lead Programmes in Non-Hodgkin's Lymphoma


Dr. Chris Martin, CEO of ADCT

QMB tenant ADC Therapeutics (ADCT) has raised $200 million through a private placement, which will be used to advance two registrational clinical trials in 2018, assessing ADCT-301 and ADCT-402, both candidates for the treatment of non-Hodgkin's lymphoma (NHL).

The latest round brings ADC's total venture take to $455 million, positioning them for a pair of Phase II studies that could potentially put them in line for an accelerated approval — particularly if they come close to matching the original proof-of-concept data that was posted last June.

Preclinical studies have shown that PBD is a highly potent killer of cancer cells, even when such cells are resistant to current best therapies. ADCT-301 outperformed Adcetris (brentuximab vedotin), a drug approved for the treatment of Hodgkin's lymphoma and anaplastic large cell lymphoma, in mice models.

Dr. Chris Martin, CEO of ADCT, said: "With more than 250 patients dosed, and encouraging data to be presented at the upcoming congress of the American Society of Hematology, this financing is a key step in our strategy and will enable us to accelerate our lead programmes and to continue to develop our pipeline."

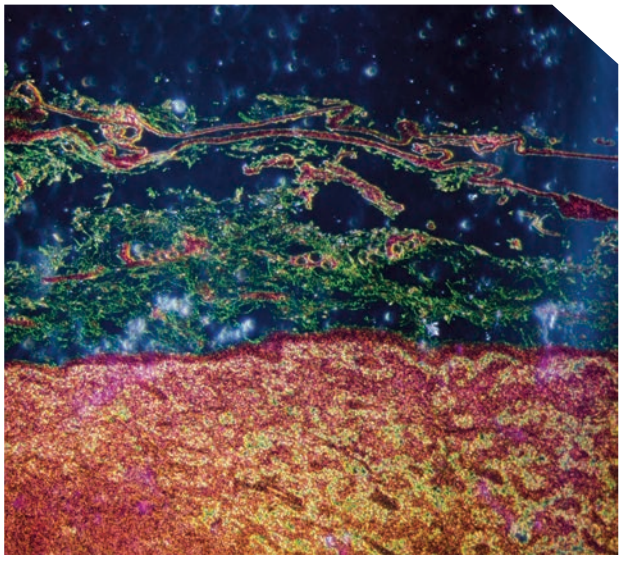
Both ADCT-301 and ADCT-402 are antibody-drug conjugates (ADC), meaning they are composed of an antibody specific for cancer cells, bound to an anti-cancer drug. Both candidates are currently in four clinical studies in important sub-types of lymphoma and leukaemia. ADCT will also advance ADCT-301 into a combination study for solid tumours.

ADC THERAPEUTICS

ADCT-301 uses a CD25 antibody (licensed from Genmab), linked to a toxin based on the PBD (pyrrolobenzodiazepine) compound. CD25 is found in Hodgkin's lymphoma (HL) and many types of NHL, including follicular lymphoma and diffuse large B-cell lymphoma.

The Company has four PBD-based antibody drug conjugates in six ongoing Phase 1a and 1b clinical trials in the USA and in Europe.

Dr. Chris Martin, CEO of ADCT, added: "This transaction also reflects the potential value to patients of rapidly developing these active drugs as standalone and combination therapies. We continue to grow our pipeline of proprietary antibody-drug conjugates in important haematological and solid tumour indications both on our own and in partnerships."



THE FUTURE OF ONCOLOGY

Cancer is a big and growing business for pharmaceutical companies. All of the major players are looking to get a piece of the action, as demonstrated by AstraZeneca's MedImmune who stumped up $200 million in cash in 2013 for a QMB tenant, Spirogen, with a promise of a further $240 million on reaching milestones.

But that's not all. MedImmune also entered into a collaboration agreement with ADC Therapeutics (ADCT), another QMB tenant, to jointly develop two of ADCT's antibody-drug conjugate programmes in preclinical development. Not only that, but MedImmune also made an equity investment in ADCT, which has an existing licensing agreement with Spirogen.

New cancer therapies are hot property. The industry is shifting from relying on conventional technologies to newer approaches, whether it's Antibody Drug Conjugates, immune checkpoint inhibitors or T-cell therapies.

Getting in early is a good strategic move. In total, oncology spend globally is forecast to rise 53% from 2015 to 2020, with this trend persisting to 2030 and beyond unless the approach to care is fundamentally altered, according to consulting and professional services giant KPMG.

But even though changing demographics – diet, lifestyle and ageing – will predispose more populations to the emergence of the disease, it is by no means certain that those companies now dominating the market will continue to do so in future.

In fact, a recent report by KPMG called 'The Future of Oncology, A focused Approach to Winning in 2030', says that even though the market will show strong growth in coming years, the status quo is going to change in the face of pressure on revenues as payers chase value for money and research and development (R&D) expenditures rise.

"Spiralling costs in R&D, shorter product lifecycles, fragmented patient markets and an increasing requirement to demonstrate value through a wider range of outcomes, are all limiting the potential return from expensive treatments," the report says.

"Incumbents failing to evolve in line with these trends are in danger of being outmanoeuvred by novel entrants."

This is good news for innovators and niche players, especially since KPMG estimates that by 2020 only 18% of traditional product volumes in developed markets will be for "branded assets".

Because of this, pharmaceutical companies are going to have to modify their business and operating models to ensure their outcomes are improved while their costs are contained.

A key change that is coming is the replacement of the so-called blockbuster oncology treatments that have traditionally delivered significant revenues, with highly targeted personalised treatments which result in lower rates of occurrence due to better prevention, a higher cure rate and a reduction in expensive follow up and relapse treatment.

This will result in treatments being indicated for highly specific sub-sets of people with cancer that, while effective for patients, would lead to smaller volumes – and revenues – of particular treatments for manufacturers.

KPMG advises the big players, should they want to remain in the oncology market, to change their business and operating models. They will have to either broaden their offering along the entire care pathway or focus on "priority malignancies" rather than the whole market.

This is not yet evident but as the changes that are emerging in the market continue apace, KPMG hypothesises the emergence of three new "business archetypes" which will respond to the increasing importance of patients in the ecosystem as opposed to other parts of it, including the big pharma companies.

These are the active portfolio company (APC), the virtual value chain orchestrator (VVC) and the niche specialist (NS).

Active portfolio companies are agile and flexible and are able to distribute risk across a portfolio of subsidiaries. They are able to focus on management of the product lifestyle and maintain a sharp focus on value for shareholders.

With the rapid development of oncology therapies and the huge array of new technologies being developed, these companies will be able to outsource, through partnerships and licencing agreements, early stage development rather than having to focus on doing it in house.

According to KPMG, should the early-stage development become commercially viable, the APC will get the rights to commercialisation, keeping up its share of the market. If not, the APC is only liable for what it has agreed to – and these costs can be shared with JV partners.

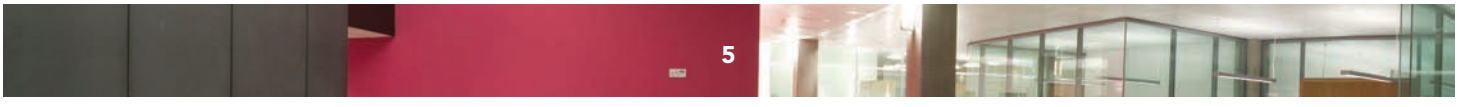
This will lead to an active deal/licencing market as APCs try and stay in front of major new developments.

VVCs lower financial risks and costs and are simple to scale-up and will allow the entry of non-traditional players into the oncology space. This is already being seen, as large multi-national technology corporations have already made inroads into health care and the lucrative market could be very attractive for such companies in the future.

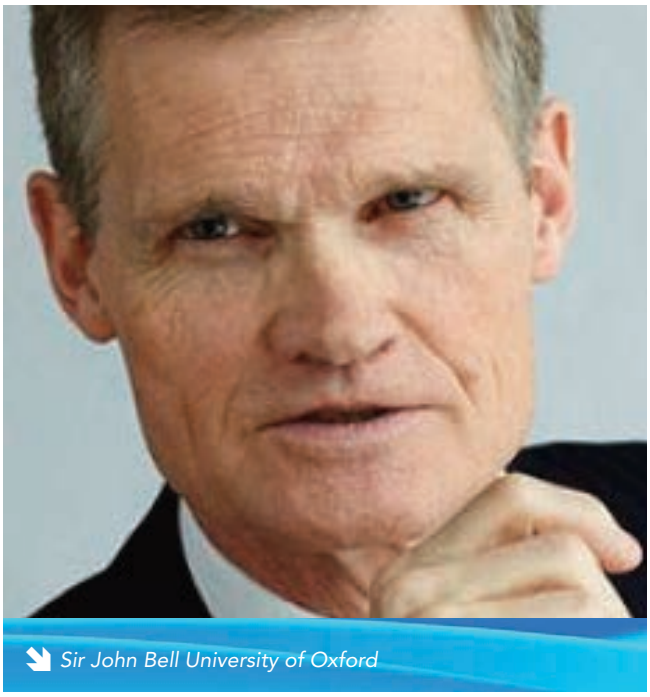
KPMG says VVCs will drive the "introduction of digital solutions into the oncology landscape, across all states of consumer health and throughout the R&D process" and they could end up owning the consumer relationship, providing a primary point of contact for oncology patients throughout the treatment process.

NSs can focus commitment and strengthen the brand, and facilitate a lean and agile model. This sector comprises of predominantly smaller businesses focused on a specific therapy area or disease. They could be funded through partnership or acquired by an APC.

The full paper can be accessed at:
https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/08/the-future-of-oncology.pdf



LIFE SCIENCE INDUSTRY REPORT HAILS ROLE OF INCUBATORS



Sir John Bell University of Oxford

The Life Sciences Industrial Strategy Board recently delivered its strategy to the UK government, outlining its vision for a thriving Life Science sector and emphasising the vital role incubators can play in boosting the pace of economic growth.

The report set out its recommendations, actions and targets for the government, which are aimed at putting the UK in a world-leading position to take advantage of the health technology trends over the next 20 years. It also sought to address the key challenges the UK faces in respect of science, growth, data, skills and the role of the NHS, in a pre and post-Brexit world.

The report highlights how incubators are an essential component of the infrastructure that underpins new growth in life sciences, and how the specific requirements of life sciences start-ups can, often, only be met by specialist providers, such as incubators and science park facilities.

"There is evidence to suggest that companies based in incubators have a better survival rate and attract more investment than those that are not," the report said.

Lifting Investment Barriers

The report called for innovative changes to the UK's capital raising, regulatory and finance regimes to address the issue of scaling small companies to create more mature enterprises.

"The UK has a history of great companies emerging from UK science but has not had success growing these companies and they have been acquired before they have reached their potential," the report said.

It said new approaches are needed for scaling small and mid-sized companies and to establish and expand the UK manufacturing base, citing the misalignment of the available types of risk capital currently available, compared to the realities of 10-15 years for discovery and development.

The report proposed the US and Continental Europe offer the stability necessary for long-term growth by using different share classes, allowing business founders to retain ownership through voting shares held by a limited number of investors, to ensure long-term strategies can be adopted successfully; and encouraging substantial shareholdings to be held by families or foundations, with the ability to pass shares between generations without tax exposure.

The report criticised the effectiveness of the public capital markets for the sector, contrasting the lack of trading on the LSE or AIM, particularly for emerging mid-sized companies, with the more active trading seen on NASDAQ. It attributed this to more conservative and costly listing rules in London compared to the US, a lack of sector-specific analysts or commentators and general conservatism among UK investors.

"It is vital to create incentives for longer-term investment that will help new biopharmaceutical and medtech companies to emerge with products and sales and to be based in the UK," the report said.

Post-Brexit Opportunities

The report also outlines recommendations to ensure the UK's education, skills and immigration policies support growth of the sector, post-Brexit.

It highlights the need to improve management and entrepreneurship training at degree and PhD level, address the lack of students studying mathematics beyond age 16 and embed core analytical and statistical skills among home-grown STEM graduates.

In addition, it calls on the UK's existing life sciences clusters to be better and more coherent selling their 'brand' to the

outside world and recommends joining cluster organisations, trade bodies and academic consortiums to form a 'single front door' to the UK for research collaboration, partnership and to attract inward investment to the right places.

The potential disruption associated with Brexit risks the loss of talent from the sector, so the report reinforces that access to highly skilled scientists over the next five years will be crucial. It advocates future immigration policy needs to ensure non-UK staff can remain, enable intra company transfers and reduce barriers to recruitment by removing salary caps, simplifying visa processes and reducing the time a role needs to be advertised to meet the Resident Labour Market Test.

It also recommends a government and charity funded high-level recruitment fund to pay the real cost of bringing successful scientists from abroad to work in major UK university institutions – including funds to launch research programmes straight away and support spousal employment, schooling and housing costs.

"With the depreciation in sterling, the cost of recruiting high-level scientists has risen by 15-20% but funds need to be available for these top talents."

The full strategy report proposes a number of hard goals, including attracting 2,000 new discovery scientists from around the globe, establishing 2-5 digital innovation data hubs; and, in the next 10 years, creating of 2-3 entirely new industries and four UK companies valued in excess of £20 billion market cap; and, in the next five years, supporting a 50% increase in the number of clinical trials, attracting 10 large and 10 smaller life science manufacturing facilities and for the NHS to engage in 50 collaborative programmes in late-stage clinical trials, real world data collection, or in the evaluation of diagnostics or devices.

"If managed carefully, EU exit may be used as a catalyst to take steps to speed the growth of the life sciences sector in the UK," the report said.

Summing up, the report said: "Successfully implemented, this strategy should ensure that the UK remains one of the great global leaders in life sciences research, creating opportunities for inward investment, building new, significant companies that make and sell products internationally, and train and employ a high-value workforce in all areas across the value chain from fundamental discovery through to manufacturing and commercialisation."

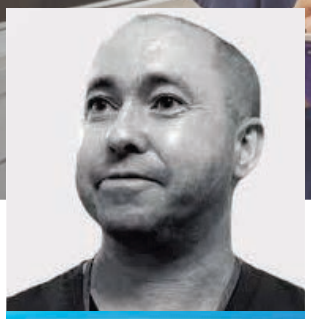
The report, 'Life Sciences Industrial Strategy', was developed in consultation with the Life Sciences Industrial Strategy Board, and broad representation from across the sector, including SMEs, pharmaceutical, medtech and diagnostics organisations, the medical charity sector and the NHS.

The full report can be read here:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf

QMB INTERVIEW

QMB Meets Dr. Flu

Between 10,000 and 15,000 deaths are attributed to flu in the UK each winter and, if the recent flu epidemic in Australia is anything to go by, this year could be very challenging time for those most at risk in the UK.



Dr Rob Lambkin-Williams, Executive Scientific Advisor, hVIVO

QMB caught up with Dr Rob Lambkin-Williams, Executive Scientific Advisor at hVIVO and an expert on all things flu-related, to talk about how hVIVO is working hard to uncover a Universal Vaccine.

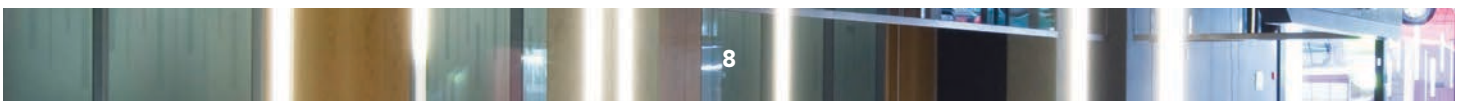
Some people incorrectly see flu as just a really bad cold, but with a more debilitating punch. So what exactly is flu?

A flu virus is very different to the common cold. A common cold will give you very mild symptoms, often with a scratchy throat, a day or two to start and a bit of snot, but you won't normally have a temperature and you won't have to go to bed. The flu virus is made up of another set of viruses that, in most cases, will hit you much harder. You're more likely to get a temperature, you're more likely to end up in bed and it's likely to happen a lot quicker. That's the big distinction. Flu can also be quite mild and often be mistaken for a cold. Even though it's mild for you, you can have mild flu and mistake it for a cold. But you can spread that flu virus and give it to someone who might have a very bad reaction to it.

What is the distinction between 'bird flu' and 'swine flu' and how do these relate to 'human flu'?

Flu is a very interesting virus that affects most animals. Its genetic structure means that if it infects one animal, and another animal picks up another version of the virus, the two versions can mix together to create a brand new virus, and that's what we saw in 1918, 1957, 1968 and 2009. In 2009 we saw a virus that was part bird, or avian, part human flu and part pig, which mixed together to create a whole new virus to create what became known as Swine Flu. Bird Flu is very similar; it's just a virus that's been mixed up, more often than not between chickens. Most of the time the bird flu virus just infects other birds, but occasionally they can infect people, and that's one of the biggest risks we have now in that we know bird flu has the potential to kill people but it needs a certain number of mutations for that to happen. We could see this appear tomorrow or in 20 years' time, we just don't know.

Swine Flu and Bird Flu are essentially two different sides of the same coin, they're just jumbled up versions of flu that we haven't seen yet. Each year the virus changes, mutating slowly, and that's why we have to change the vaccine each year. As we adapt and mount immune responses to the flu virus, it too changes and adapts. The seasonal flu that people contract in winter is what we call 'drifted' flu, while the bird flu and swine flu is referred to as the 'shifted flu', which means the genetic material of the virus has been jumbled up to create a new version.



When it comes to flu, what is the biggest challenge facing the NHS this winter?

I think it's the sudden increase in people visiting A&E or GP surgeries and that includes people who work in hospitals and doctors' surgeries. That's why the vaccination of health workers is so important. We need to vaccinate the people most at risk of catching flu but also those who can pass it on to those most at risk. So together with the usual festive challenges that hospitals face, I think it's the dramatic increase in people seeking medical help.

Any flu outbreak in Australia is often seen as a harbinger of what we can expect here in the UK, why is that?

Flu moves around the world. It might develop in Australia during their winter, which is what we've just seen, where they may not have been able to perfectly match the vaccine to the flu and it's given them one of the worst seasons they've ever seen. We can potentially expect to see the same thing happening here but we can never be 100% sure with flu. At the moment, the UK's using the same vaccine as the one used in Australia and it didn't prevent a big outbreak. That doesn't mean we shouldn't be vaccinating here as we'll still benefit from it and we will want to be as prepared as possible in case that virus arrives.

'Shifted' flu tends to originate from locations where humans live in close proximity to animals, and China is a classic example of that. In rural areas, you often find chickens living in the same houses as people, which gives the virus the opportunity to jump from animal to human. We know flu viruses tend to thrive in colder months during the winter.

With "Drifted Flu" the virus just cycles between the two-hemispheres and we try and keep one step ahead of it. The experts gather every year to try and predict what vaccine to make for the following year but it takes from nine to 12 months to manufacture a vaccine, so they've got to make a guess on how the virus is going to look a year ahead and they don't always get it right. For example, in 2014, the vaccine was not well-matched to the circulating virus strains and we saw a 50% increase in the number of deaths in the UK during the period.

Medical historians obviously point to the "shifted flu" pandemics of 1918, 1957, 1968 and more recently 2009, as to why we should be concerned about the effects of flu. Why were these particularly bad?

1918 was the famous Spanish Flu. We believe that after the First World War, Spain didn't have the same sort of media censorship that we saw throughout the rest of Europe. The first cases of flu were reported in Spain and even though cases were popping up elsewhere too, the name stuck. Also, in some of the big military bases in France at the end of the war you had pigs, chickens and soldiers all in terrible living conditions and mixing together, and this presented the perfect mixing pot for the virus to jump around from animal to human.

Who is most at risk and why?

Those most at risk are asthmatics, diabetics, children and the elderly and anyone else with a chronic health condition. In the US, they call on everyone to get vaccinated whereas in the UK we don't, but the difference is in the UK the vaccination is free for those identified as at risk. There's also something called herd immunity which means if everyone is vaccinated then the risk of the virus spreading is reduced. A vaccinated child, as well as being protected themselves, is also less likely to infect their at-risk grandparent.

Why is it so dangerous and difficult to treat?

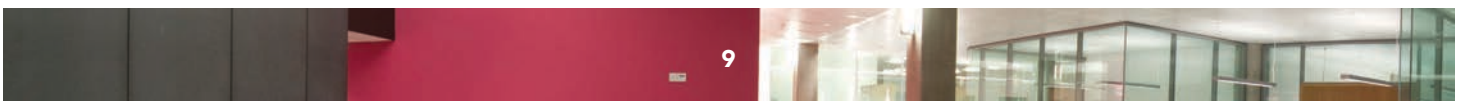
Few effective flu treatments are available today. Antibiotics are useless unless you develop a bacterial infection, and some people will develop that. There are drugs available like Tamiflu™ for very severe cases but in most cases there's nothing you can do to treat the virus itself. This is why, if you've got flu and you call A&E or the GP, they'll ask you not to turn up unless you have serious symptoms. Some groups are developing treatments but right now, all you can do is treat the symptoms with paracetamol, ibuprofen, pseudoephedrine and other decongestants, and then sit it out and let the symptoms pass, and that's all you can do.

Is the UK Government doing enough to warn people about the potential risks and doing enough to prevent a flu epidemic here?

No, I don't think so. We've heard adverts in the media telling people to not use antibiotics for colds and that's good, but they could make vaccination compulsory for healthcare workers. Right now, it's government policy to vaccinate in schools and that's a big thing. While it's only been done for the last few years, it's hugely important because it not only protects the kids but their grandparents as well. It's their grandparents who are really at risk.

Can you tell us more about the current available flu vaccine and what is the difference between a trivalent or quadrivalent flu vaccine?

There are different flus around, grouped into different categories. Up until recently there were only three viruses that caused the greatest seasonal concern, and the trivalent vaccine covers those three. Then the World Health organisation started to recommend a fourth virus be included in the vaccine and that's not as available as it should be. It is available in some pharmacies and people should take that one to cover themselves against the four virus types, but if you can only get the trivalent then get that one.



Why do some people get it and some not, irrespective of age, even in the same household?

There are a number of factors at play: general health, genetics, or they may have been exposed to a milder version of it at some point. For example, in 2009, most people don't recall being infected at the time of that pandemic, but we know that over 70% of people do have antibodies against the virus, suggesting they had become infected.

Is there a 'Holy Grail' of flu vaccines, which eradicates all different strains of flu?

Yes, there is. The work we're doing in this area along with other groups is important. At the moment, the vaccine used only protects against certain viruses, and it's mostly a dead vaccine, it only stimulates one half of the immune system, the antibodies, but there's a second part to the immune system called the cellular response which is equally important. That side of the immune system can protect against a wider range of flu viruses, and potentially even brand new ones. A vaccine that stimulates this type of broad immune response is considered to be the "Holy Grail" of vaccines. It is a vaccine that you either give people once every five or 10 years, and that protects people from not only the seasonal (drifted) flus as they change year on year, but also the new viruses from pigs and bird that occasionally pop up as brand new pandemic (shifted) viruses with devastating consequences. This is accomplished by looking at that part of the virus that doesn't change, and/or the parts of the virus that are common across strains, against which you can target a vaccine that is effective against multiple flu viruses.

How is hVIVO helping address this problem?

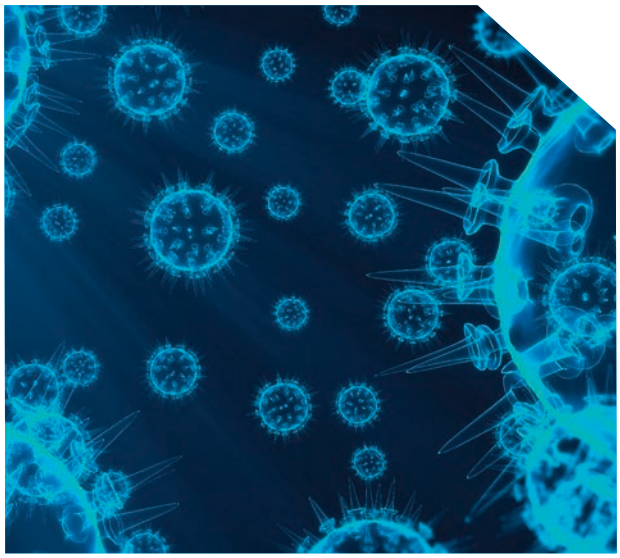
At hVIVO we have something called FluCamp which is integral to our work. We deliberately infect volunteers with a flu virus during controlled clinical studies, called challenge studies, conducted in our quarantine facility. We see how they respond to a flu treatment or vaccine, such as a potential universal flu vaccine. We do that while looking at the cellular side of the immune system.

How close are we to a Universal Vaccine?

We're still several years away from developing a Universal Vaccine but we're learnings new things every day.

What are the next steps?

The next step is to take what we do in FluCamp and translate that into the real world. We closely look at how a healthy volunteer responds when you give them the virus and how they respond to a potential universal vaccine in our challenge studies, and from that we're learning how to better design a clinical study conducted in the field, where instead of us giving the volunteers the flu virus, volunteers catch the flu virus in the real world.



That's why volunteers are so important to the work we do. People get paid for the 10-14 days they stay with us but many of our volunteers take a genuine interest in the work we do and we keep in touch with a lot of them after they've left. When we publish a study we let the volunteers know so they can see the finished article and see how they have contributed to the process.

Being at QMB and in Whitechapel is immensely important too. London is a truly global city and being at QMB we have access to a well educated, hugely diverse ethnic population and that has really helped us.

Rob is an expert in respiratory viruses and HIV. He joined hVIVO, or Retroscreen Virology as it once was, back in 1995 as a Senior Scientist. In 2001 he designed and implemented the first Human Viral Challenge Study to be conducted in Europe in the 21st century, and he has designed and supervised in excess of 40 studies conducted at hVIVO since 2001, acting as the Principal Investigator on many of them.

Rob completed his PhD in Avian Influenza (Bird Flu) at the University of Warwick in 1993 - long before it became a popular news item. He is often the first media point-of-contact regarding Avian Influenza and other virus-related topics.

He has co-authored many papers including a recent paper in the Nature Medicine Journal, which has reset our understanding of the immune response to influenza. Based on the blue skies work into the immune system, and how it responds to an influenza vaccine, hVIVO and its collaborators hope to develop patent applications to support development of new vaccines, such as universal flu vaccines.

GamaMabs and MedImmune Enter Licensing Agreement to Develop Antibody Drug Conjugate Targeting Cancer

GamaMabs Pharma and MedImmune, the global biologics research and development arm of AstraZeneca which owns QMB tenant Spirogen, have entered into a licensing agreement under which GamaMabs will use MedImmune's proprietary pyrrolobenzodiazepine (PBD) toxin and linker technology to research and produce an antibody-drug conjugate (ADC) as a potential cancer therapy.

Spirogen

A member of the AstraZeneca Group

GamaMabs, a biotechnology company developing optimised therapeutic antibodies targeting AMHR2 for the treatment of cancer, will have the exclusive right to utilise MedImmune's proprietary PBD technology to develop an ADC against a single target, suitable as a therapeutic for a broad variety of solid tumours.

As part of the deal, MedImmune will receive an upfront payment, development and commercial milestone payments, as well as royalties on net sales. MedImmune has the first right to negotiate a license to develop and commercialise products created by GamaMabs Pharma with the PBD technology.

MedImmune's PBD technology was invented and developed by Spirogen, a company acquired by MedImmune in 2013. PBDs are a potent cytotoxic agent, or 'warhead' which, when coupled to a specific cancer targeting antibody, together known as an ADC, enable the selective killing of cancer cells. The agreement represents MedImmune's third such licensing agreement of its PBD technology.

"This agreement will further strengthen our breakthrough pipeline in the oncology space and enhance treatment options for cancer patients," said Stephane Degove, Chief Executive Officer at GamaMabs.

Degove added: "We remain steadfast in our commitment to broadening our oncology portfolio. Strategic partnerships such as this one, with a leader in the ADC field, ensure we will continue to expand upon our therapeutic offering for a broad patient base."

Similar to a navigation system that takes a molecule to a specific address in the body, GamaMabs' innovative antibodies, in combination with MedImmune's unique PBD technology, are expected to show a promising capacity to deliver the potent PBD payload to cancer cells expressing a selected target.

Ronald Herbst, Vice President, Oncology Research & Development, MedImmune, said: "MedImmune continues to advance our next generation antibody-drug conjugates — including our proprietary PBD technology—both internally and externally, with the goal of generating novel treatments to meaningfully improve the lives of cancer patients. Our license agreement with GamaMabs enhances our strategy with a partner who is likewise committed to advancing the latest in scientific innovation to discover new cancer therapies."

GamaMabs' clinical pipeline in oncology includes the anti-AMHR2 GM102 monoclonal antibody, which enhances tumour cell killing through the activation of immune system cells.

Queen Mary Innovation (QMI) Ltd is the wholly owned technology transfer arm of Queen Mary University of London (QMUL). We caught up with Graeme Brown, Director of Technology Transfer at QMUL and Executive Director at QMI, and Michele Hill-Perkins, Head of Technology Transfer for Biopharma at QMI, to hear about some of their recent highlights.

BioMoti, Pharmidex and QMUL secures £662,222 Biomedical Catalyst Aware

BioMoti, Pharmidex and QMUL are celebrating after recently being awarded a grant of £662,222 by the UK's innovation agency, Innovate UK.

The grant was awarded under the Biomedical Catalyst funding competition to support preclinical studies of new therapeutic approaches for hard to treat tumours, including advanced ovarian, triple negative breast and pancreatic cancers. The project is co-funded by a further £226,769 investment from the industrial partners of BioMoti and Pharmidex.

The project focuses on BioMoti's innovative approach, Oncojan™, a sustained release precision therapeutics platform targeting CD95L mediated tumour immune evasion. This two-year programme will investigate precision delivery of drugs to solid tumour sites and immune system activation, due to CD95L targeting of tumours.

CD95L is an essential gene for cancer survival and promotes cancer stem cells. High levels of CD95L expression in patient tumours are associated with increased malignancy and poor prognosis.

Dr Davidson Ateh, CEO of BioMoti, said: "It is exciting for us to be supported by Innovate UK to explore our platform's interactions with the immune system following promising efficacy data in cancer models."

Dr Mohammad Alavijeh, CEO of Pharmidex, said: "Partnering on this Biomedical Catalyst award is a great achievement for the Pharmidex oncology research team. This recently established group adds to our well established expertise in ADMET, PK, bioanalysis and CNS."

Professor Joanne Martin, Professor of Pathology at QMUL, added: "Oncojans™ were first developed in my laboratory here at Queen Mary University of London with support from the BBSRC, Heptagon Fund and Barts and The London Charity. We are passionate about what a difference we could make for patients, and it is great to have secured Innovate UK funding."

3rd Street Diagnostics and QMUL sign licence for early detection of pancreatic cancer test

QMUL recently received the second instalment of a licence payment from 3rd Street Diagnostics under the terms of a Licence Agreement signed in 2016. This was due to the successful validation of patient samples in the diagnostic test by 3rd Street Diagnostics for the early detection of the most common form of pancreatic cancer. The test was devised and developed at QMUL by Dr Tatjana Crnogorac-Jurcevic.

The Licence includes milestone and royalty payments to QMUL from 3rd Street Diagnostics as a result of the successful sale of the test.

3rd Street Diagnostics is collaborating with QMUL to further develop a standardised test kit to be used in a clinical study aimed at the early detection of PDAC, which is the most common form of pancreatic cancer.

3rd Street Diagnostics is the Diagnostics Development Unit of the Cedars-Sinai Medical Centre. 3rd Street acquired a global licence to two QMUL patent families that identify specific PDAC biomarkers.

QMI's Dr Michele Hill-Perkins said: "We are very pleased to be working with 3rd Street Diagnostics to develop a non-invasive diagnostic test for patients, aimed at identifying pancreatic cancer when it is in the early stages of disease. This test offers a real opportunity to screen those individuals at risk of developing the disease and improve the prognosis for patients by enabling earlier clinical intervention."

ANGLE signs option on patent applications

ANGLE plc, a world-leading liquid biopsy company, has signed an option agreement with QMUL for an exclusive worldwide licence over the use of its megakaryocyte intellectual property.

Investigation of megakaryocytes in patient blood opens up the potential for a whole new area for cancer diagnostics and, at present, ANGLE's patented Parsortix system is the only system that has demonstrated the capability of harvesting megakaryocytes.

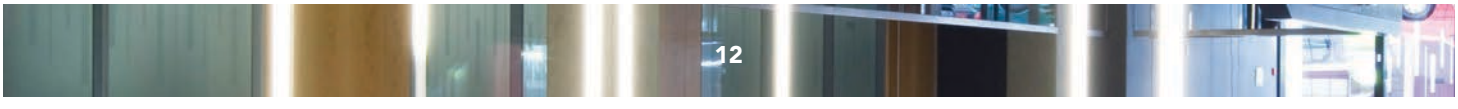
QMUL has filed two patent applications in relation to these findings which are being prosecuted worldwide. ANGLE has signed a two-year option to an exclusive worldwide licence to these patents covering any medical therapeutic, diagnostic, or prophylactic application. ANGLE has agreed to cover the costs of prosecution.

Megakaryocyte analysis could provide medical insight in multiple cancer types and Barts Cancer Institute, which is part of QMUL, is investigating other cancer types to substantiate this.

ANGLE Founder and Chief Executive, Andrew Newland, said: "This deal further strengthens ANGLE's intellectual property position in the fast-emerging liquid biopsy market."

QMI's Dr Michele Hill-Perkins added: "We believe the patents on the role of megakaryocytes in patient blood as a favourable prognostic biomarker have the potential to open up new avenues of research in the fight against cancer. We are delighted to have signed this deal with ANGLE to progress their commercialisation for the benefit of patients."

Dr Yong-Jie Lu, Reader in Medical Oncology at Barts Cancer Institute, and the Principal Investigator for the megakaryocytes discovery, said: "We believe megakaryocytes in patient blood may play a key role in the body's immune response to all solid cancer types not just prostate cancer, and we are currently investigating this in several other cancer types."



Registration for QMUL Enterprise Investment Fund extended

Queen Mary Innovation has extended the deadline to register for the new QMUL Enterprise Investment Fund to December 31.

The new fund will give investors the opportunity to invest in QMUL's range of start-up companies, as well as the opportunity to unearth a potential technological gem of a business.

The new QMUL Fund aims to give investors a straightforward and efficient route to investing. The fund offers tax relief for individual investors under the government's tax-efficient Seed Enterprise Investment Scheme (SEIS) and Enterprise Investment Scheme (EIS). There is also the opportunity for investors to play a more active, mentoring role with the start-ups.

Aimed at high net worth individuals, armchair investors and university alumni, the fund is similar to those launched by other leading UK universities like Cambridge and Bristol.

Managed by Javelin Ventures Limited, an experienced FCA-regulated fund manager, the fund also benefits from a highly-experienced Investment Advisory Committee comprising respected entrepreneurs and investors from across a range of technology sectors.

"We've seen a number of universities make a success of their seed investment funds," said Valerie Jolliffe, Javelin's CEO and fund manager.

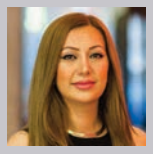
"The beauty of this fund is it gives investors the opportunity to get in on the ground floor and invest in new innovative technologies before they go to market and potentially take off," said Jolliffe.

Over the years QMI has enjoyed notable successes, with the likes of hVIVO, the AIM–listed biopharma company which specialises in human viruses like flu and asthma, and Actual Experience plc, an analytics company specialising in the management of corporate digital supply chains, which joined AIM in 2014.

For more information, please contact Graeme Brown: g.m.brown@qmul.ac.uk

Or please visit: http://www.javelin-ventures.com/qmul-enterprise-investment-fund/

PLEASE CONTACT OUR MANAGEMENT TEAM WITH ANY FEEDBACK OR NEWS STORY IDEAS:



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