

COMMERCIAL INSIGHT: MAY 2018

Commercial insight: cell and gene therapy

Providing a critical overview of the sector's commercial developments – M&As, licensing agreements & collaborations, financial results, IPOs and clinical/regulatory updates, with commentary from our Expert Contributors.



CELL THERAPY: The use of cell therapies for the treatment of type 1 diabetes is an area of research that is making consistent ground. Denmark-based Novo Nordisk, and Boston-based Semma Therapeutics and Sigilon Therapeutics, are all vying to produce a cell-based solution for regulating glucose levels in vivo. Novo Nordisk entered a collaboration with UCSF this past month for the development of GMP pluripotent stem cell lines. Novo will not just invest in research but will actively participate in cell therapy development initiatives with UCSF through the formation of a dedicated GMP laboratory, and by contributing its own researchers. In tandem, Novo is working on a cell encapsulation technology with Cornell University as a solution to immune rejection post-transplant.



GENE THERAPY
Richard Philipson
Chief Medical Officer,
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CELL THERAPY
Mark Curtis
Financial Portfolio
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GENE THERAPY: A busy month at FDA, with a slew of positive regulatory announcements, including Breakthrough Therapy Designation for Bluebird's Lenti-DTM in cerebral adrenoleukodystrophy, Fast Track Designation for Krystal's KB103 for the dystrophic epidermolysis bullosa and Pediatric Drug Designation for Myonexus's MYO-101 for limb girdle muscular dystrophy type 2E. Less welcome though is the Agency's clinical hold for the CRISPR - Vertex collaborative program in sickle cell disease and β -thalassemia, with no clear indication of the work needed to get this IND back on track. In contrast, Spark Therapeutics remains ahead of the pack in hematology, with the news that its treatment for hemophilia B, SPK-9001, reduces annualised bleeding rate by a remarkable 98%.



BLUEBIRD BIO'S STEM CELL-GENE THERAPY RECEIVES FDA'S BREAKTHROUGH THERAPY DESIGNATION

The FDA grants breakthrough therapy designation to bluebird bio's Lenti-DTM for treating patients with cerebral adrenoleukodystrophy (CALD).

X-linked adrenoleukodystrophy, also known as Lorenzo's Oil disease, is caused by mutations in the ABCD1 gene that encodes a protein of the peroxisomal membrane named ALDP. It affects one in every 21,000 male births worldwide. The cerebral form of the disease, CALD is characterized by demyelination and neurodegeneration and is fatal.

The breakthrough therapy designation is based on preliminary results obtained from the company's ongoing Phase 2/3 STARBEAM trial. The study published in New England Journal of Medicine in October 2017 reported the safety

and efficacy of transplanting autologous CD34+ hematopoietic stem cells transduced with Lenti-D (lentiviral vector that encoded ABCD1 gene) in treating young boys with cerebral adrenoleukodystrophy. The primary end point of the study was being alive and having no major functional disability at 24 months after infusion. Interim analysis performed at the median follow-up of 29.4 months showed that 15 out of 17 treated patients were alive at the end of 24 months, with no graft failure and no major functional disabilities.

Lenti-D has also previously received Orphan Drug designation from the FDA and EMA, as well as Rare Pediatric Disease designation by the FDA for the treatment of adrenoleukodystrophy.

Bluebird Bio continues to build a strong package of regulatory endorsements for Lenti-DTM, its treatment for patients with

CALD, by adding Breakthrough Therapy Designation to its existing Orphan Drug and rare Pediatric Disease designations. Breakthrough Therapy Designation (BTD) recognizes the serious nature of CALD and that the preliminary clinical evidence for Lenti-DTM indicates that it may offer substantial improvement over available therapies. BTD is intended to expedite the development and review of new therapies, and will allow the company frequent meetings with FDA senior staff. Whether this closer FDA involvement results in faster development or greater scrutiny of the program remains to be seen, but it is certainly another feather in the cap for the company. –Richard Philipson



EXPERT
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CELLECTIS' OFF-THE-SHELF CAR-T THERAPY TRIAL TO PROCEED WITH AMENDED PROTOCOL

Cellectis, the first biopharmaceutical company to test an allogeneic CAR-T therapy for cancer, has received protocol amendment approval for its Phase 1 clinical trial of UCART123 product candidate in patients with acute myeloid leukemia (AML). The approval is based on the product's current safety and tolerability profile.

The UCART123 clinical trial initiated in the first half of 2017 is a Phase 1, open label dose-escalation and dose-expansion study to evaluate the safety, expansion, persistence and clinical activity of UCART123 in patients with relapsed/refractory AML, and patients with newly diagnosed high-risk AML.

UCART123 is a gene edited T-cell investigational drug that targets CD123, an antigen expressed on the surface of leukemic cells in AML. It is the first allogeneic, "off-the-shelf" gene-edited CAR T-cell product candidate that the FDA has approved for clinical trial.

The FDA review period for the protocol amendment has passed and Cellectis is planning to continue the trial following approval from the Institutional Review Board. Main changes to the protocol include:

- ▶ Increase of dose levels from 6.25×10^4 to 2.5×10^5 UCART123 cells per kilogram body weight, with a capping at 80kg equivalent.
- ▶ Decrease of dose limiting toxicities (DLT) observation period from 42 to 28 days post-UCART123 infusion, except for patients with aplastic bone marrow for whom the DLT observation period will remain 42 days.
- ▶ Decrease of time interval from 42 days to 28 days between the first and the second patient for UCART123 infusion at each new dose level tested. It will remain 42 days in the case of patients with aplastic anemia.

In order to accelerate the product's clinical development, the trial will also be conducted at a second centre, the MD Anderson Cancer Center in Houston, Texas under the expertise of Prof. Hagop Kantarjian and Dr Naveen Pemmaraju. At present, the trial is conducted only at Weill Cornell Medicine with Prof. Gail J Roboz as the principal investigator.



NEW DATA FROM SPARK & PFIZER'S HEMOPHILIA B PHASE 1/2 GENE THERAPY TRIAL

Encouraging results have been presented by Spark Therapeutics and Pfizer on the jointly developed

SPK-9001. The gene therapy is comprised of an adeno-associated virus (AAV) capsid delivering the

human factor IX gene for the treatment of hemophilia B. The latest results cite that the annualised bleeding rate (ABR) of the 15 subjects in the ongoing Phase 1/2 trial has been reduced by 98%, whilst the annualised infusion rate (AIR) – the current treatment of infusing factor IX concentrates – has reduced by 99%, with all patients discontinuing this route of treatment. Additionally, no serious adverse events were recorded as a result of the treatment. The results were presented at the World Federation of Hemophilia (WFH) World Congress.

Katherine High, President of Spark Therapeutics who is

responsible for the Phase 1/2 trialing stages of the collaboration, said:

"We are pleased to see all 15 participants, notably including the first four participants who have been followed for more than two years, continue to show that a single administration of SPK-9001 has resulted in dramatic reductions in bleeding and factor IX infusions, with no serious adverse events. Our commitment to gene therapy research across our hemophilia programs remains steadfast with the goal of developing a novel therapeutic approach with a positive benefit-risk profile that aims to free patients of the need for regular infusions, while eliminating spontaneous bleeding."

FIRST PATIENT TREATED IN NEON'S NEOANTIGEN PHASE 1 TRIAL



Massachusetts-based Neon Therapeutics has dosed the first nonsquamous non-small cell lung cancer (NSCLC) patient in its Phase 1 trial of lead candidate NEO-PV-01. The neoantigen targeted therapy is a personalized cancer vaccine drawing on the DNA mutations found in a given patient's tumor. It is being trialed in combination with Merck's KEYTRUDA®

(pembrolizumab), and chemotherapy. Merck is also a collaborator in the trial which expects to enrol 15 patients. The endpoints of the study are safety, tolerability, and initial efficacy that will include recording immune responses.

President of R&D Richard Gaynor commented,

"Treating our first patient in this clinical study marks an important



Neon Therapeutics treated its first patient with a personalized neoantigen cancer vaccine. The company is developing both peptide-based vaccines and cell-based immunotherapies. The unique aspect of the Neon's platform is that it takes a bioinformatics approach to identify neoantigens, markers that are specific

only to tumour cells that arise from de novo mutations. Neoantigens are sequenced and manufactured into peptides for administration as a vaccine, or use in developing cell-based therapies that are highly tumour selective. Neon's therapy is being trialed in combination with Merck's Keytruda and chemotherapy so we will get a view on the incremental benefit of Neon's neoantigen approach in the near future. –Mark Curtis

milestone for Neon. We see a strong mechanistic rationale to explore the combination and sequence of a personal neoantigen cancer vaccine, anti-PD-1 therapy and chemotherapy.

These data will help us understand the potential of NEO-PV-01 to improve durability and response rates of patients treated in combination with existing immuno-oncology drugs."



KRYSTAL BIOTECH'S HSV-1 MEDIATED DEB GENE THERAPY GRANTED FAST TRACK DESIGNATION

Krystal Biotech's gene therapy candidate KB103 has been fast track designated by the FDA. The herpes simplex virus (HSV-1) mediated therapy delivers a corrective form of the gene coding for type VII human collagen – COL7. This is intended to treat the condition dystrophic epidermolysis bullosa (DEB) which results in severe blistering and skin loss. Given that the chronic condition has no existing treatments, this designation aims to expediate the potential route to market for patients with the condition. The designation speeds up the development and review processes as well as granting the potential for portions of applications to be reviewed before filing.

KB103 has been developed on the company's proprietary STAR-D platform which facilitates the engineering of HSV-1. The vector is delivered directly to replicating and non-replicating skin cells and is being studied in a Phase 1/ 2 trial at Stanford University. The primary endpoints of the placebo-controlled study are the assessment of safety and tolerability.

COO and founder Suma Krishnan commented,

"This Fast Track designation represents another positive step for the development of KB103 and is a clear recognition of the serious unmet need that exists for patients suffering from this debilitating disease."



FDA PLACES CLINICAL HOLD ON CRISPR AND VERTEX'S CTX001 IND REVIEW

The FDA has placed a clinical hold on the IND application for CTX001 – a stem cell therapy being developed by CRISPR Therapeutics and Vertex. The IND was initially submitted in April and progress on the hold is subject to questions that the FDA will pose to the companies in the near future as part of the review.

CTX001 is an autologous therapy which leverages CRISPR editing to engineer a patient's hematopoietic stem cells (HSCs) to produce high levels of oxygen carrying fetal hemoglobin (HbF). This is hypothesised to treat sickle cell and β -thalassemia patients that are currently dependant on transfusions.

Development of the treatment is expected to continue, with plans under a co-development and for initiation of a clinical trial in co-commercialization agreement the latter half of 2018.



Disappointing news from the CRISPR Therapeutics – Vertex research collaboration, with the announcement of a clinical hold for CTX001, its investigational ex vivo CRISPR gene-edited therapy for patients suffering from β -thalassemia and sickle cell disease. The lack of clarity on the reasons behind FDA's decision means the clinical hold could be anything from a bu-

reaucratic hold-up to a more substantial concern about the gene-edited cells. Fortunately, CRISPR and Vertex's problems with the FDA haven't translated yet into a delay in Europe, where they are planning to dose beta-thalassemia patients with CTX001 later this year. This news come hot on the heels of the recent clinical hold placed on Solid Biosciences' gene therapy treatment for Duchenne muscular dystrophy, proving how closely FDA looks at initial IND applications. –Richard Philipson



MYONEXUS THERAPEUTICS RECEIVES FDA RARE PEDIATRIC DRUG DESIGNATION FOR LGMD GENE THERAPY

The FDA has granted Rare Pediatric Drug Designation to Myonexus Therapeutics' MYO-101 program – a gene therapy targeting limb girdle muscular dystrophy (LGMD) type 2E. This follows an Orphan Drug Designation for the same program earlier this year. The candidate is the first gene therapy attempting to treat the debilitating condition.

LGMD type 2E often results in fatality before the age of 30, with symptoms first arising in

childhood. Progressive wasting of muscles results in a loss of ambulation around the teenage years, and no treatments are currently available.

CEO Micahel Triplett commented,

"The FDA's Rare Pediatric Disease designation for MYO-101 reflects the compelling data underlying the MYO-101 program and the potential to provide a first-ever treatment option for LGMD type 2E."



NEW DATA FROM ONGOING ANTI-BCMA CAR-T CELGENE AND BLUEBIRD TRIAL

Celgene and bluebird bio have released data from the ongoing Phase 1 clinical trial of jointly developed

CAR-T therapy, bb2121. bb2121 is an investigational anti-B-cell maturation antigen (BCMA)

CAR-T cell therapy for treating patients with relapsed/refractory multiple myeloma. The ongoing study is assessing the safety and tolerability of the treatment.

Some of the highlights from the 43-patient cohort include the dose escalation group experiencing a median progression free survival of 11.8 months as well as no Grade 3 cytokine release syndrome cases. In addition, all responsive patients were minimal residual disease free at one or more time points.

All patients enrolled in the trial were heavily pre-treated and then grouped into either the dose escalation or expansion groups.

Bluebird bio's CMO David Davidson commented,

'To see a median PFS of 11.8 months in this heavily pretreated patient population is very encouraging. As the data from this program continue to mature, bb2121 has set a high bar as the leading investigational anti-BCMA CAR T cell candidate for relapsed and refractory multiple myeloma. In addition, the deep MRD-negative responses, the activity seen across myeloma with high and low levels of BCMA expression, as well as adverse events observed support the evaluation of bb2121 in earlier lines of multiple myeloma, where patients may experience more durable outcomes.'



PRE-CLINICAL TRIALING OF EDITAS' EDIT-101 DEMONSTRATES GOOD TOLERABILITY

Editas Medicine hopes to file an IND application for CRISPR-based gene therapy candidate EDIT-101 following positive pre-clinical trialing results. EDIT-101 is intended for the treatment of Leber Congenital Amaurosis type 10 (LCA10), an inherited degenerative retinal disorder that is a leading cause of childhood blindness.

The candidate was assessed for tolerability via subretinal injection to non-human primates. In results that were reported at the Annual Meeting of the American Society of Gene & Cell Therapy, it was highlighted that following a course of steroids in combination with the therapy no inflammation was observed; and only mild inflammation was experienced by subjects that were not treated with

steroids. A number of other measures, such as the SPOTS uveitis scoring system, were also used to test tolerability.

"In this study, we administered either EDIT-101 or a non-human primate surrogate vector using the procedure that we plan to use in the Phase 1/2 study, and we found that EDIT-101 was well-tolerated over the duration of the study based on a panel of clinical tests. Importantly, neither the presence of pre-existing nor induced immunity in non-human primates to either AAV5 or Staph. aureus Cas9 impacted productive editing"

said Charles Albright, CSO.

"To date, our comprehensive set of pharmacology, specificity, tolerability, and immunogenicity data gives us substantial confidence in EDIT-101

for the treatment of LCA10 as we make progress towards the clinic and towards our goal of making a CRISPR-based medicine for people suffering from this devastating eye disease.”



UNIQURE ISSUED NEW US PATENTS ON AAV THERAPY DEVELOPMENT AND MANUFACTURING PROCESSES

uniQure has been successful in obtaining a US Patent which covers AAV-mediated gene therapies which encode the hyperactive Factor IX (FIX) Padua variant for the treatment of bleeding disorders, or coagulopathies. The patent number is 9,982,248, and follows an earlier acquisition of Patent Number 9,249,405, originally owned by Italian hemophilia expert Prof. Paolo Simioni. An additional patent issuance was announced by the company – Patent Number 9,840,694 which covers the removal of potential residual baculovirus from insect cell based AAVs using nanofiltration.

The Padua variant is also known as the ‘FIX-Padua’ or ‘Padua

mutant’, it carries a leucine at the R338 position. The development of therapies will focus on the treatment of hemophilia B initially.

Chief business officer Jonathan Garen commented

“We are pleased with the ongoing progress related to our FIX-Padua patent portfolio. Our new U.S. patent, which was prosecuted by uniQure and granted after consideration of the prior art, further confirms the patentability in the US of Professor Simioni’s groundbreaking invention. We believe this patent significantly strengthens our intellectual property portfolio and covers the use of the FIX-Padua variant in AAV gene therapy to treat hemophilia B.”

LICENSING AGREEMENTS & COLLABORATIONS



ATARA EXPANDS COLLABORATION AGREEMENT WITH MSK CANCER CENTER

Atara Biotherapeutics has expanded its existing collaboration with Memorial Sloan Kettering Cancer Center (MSKCC) to continue work on its CAR-T therapy development. The company is working on allogeneic CAR-T therapies for application against cancers, autoimmune and infectious diseases. The agreement will see Atara gaining access to MSKCC’s technologies, such as a novel CAR-T construct

that is hoped has T cell activation properties. The technologies also encompass methods for designing and modifying CAR-T cells.

Atara CEO stated,

“Our earlier MSK collaboration has been highly productive, highlighted by tab-cel(TM), Atara’s off-the-shelf, allogeneic T-cell immunotherapy currently in Phase 3 development. The deepening of our collaboration with

MSK allows us to rapidly advance novel gene-edited CAR T development programs leveraging our existing off-the-shelf T-cell immunotherapy technology platform, manufacturing expertise and research and development capabilities. Going forward, we plan to continue to assemble complementary genetic engineering technologies to grow our pipeline and realize the full potential of our platform."



HARVARD UNIVERSITY LICENSES BASE EDITING TECHNOLOGY TO BEAM THERAPEUTICS

Harvard University has granted a worldwide license to Beam Therapeutics to develop and commercialize DNA base editing technologies for the treatment of human diseases. Beam raised \$87 million in Series A financing to advance the technologies.

Prof. David R. Liu, Professor of Chemistry and Chemical Biology at Harvard University, is the inventor of the base editing technologies and is a cofounder of Beam Therapeutics. He was also a cofounder of one of the original CRISPR companies, Editas Medicine, along with Feng Zhang, an inventor of CRISPR gene editing at Broad Institute, and Keith Joung, a gene editing researcher at Massachusetts General Hospital and Harvard Medical School. Zhang and Joung are cofounders of Beam Therapeutics too.

Existing platforms of genome editing including the CRISPR-Cas9 system works as molecular scissors and makes double-stranded breaks on the DNA, which results in imprecise correction of mutations. On the contrary, the base editing platform developed in Liu's laboratory use an engineered protein to unzip a targeted portion of the DNA, opening up a small bubble in which to correct the single base, without

causing double-stranded breaks in DNA. The base editors can then directly convert the mutated base to the correct base. Liu's first published base editor can convert C to T and G to A. His second model can convert A to G and T to C.

Base editing represents a powerful tool for addressing a large class of genetic diseases that are more difficult to tackle with other methods of genome editing. According to a database, 33000 single point mutations are associated with disease and the four changes that Liu's base editors can make could correct 63% of them in principle.

Under the terms of the agreement, Beam Therapeutics will make a multimillion-dollar upfront licensing payment to Harvard university. Additional terms of the deal are confidential.

Prof. Liu commented:

"We developed programmable molecular machines that go to a target site of our choosing in the genomic DNA of a cell and directly convert one base to another base without making a double-stranded break in the DNA. For some applications, scissors are the best tools. But if the goal is to simply fix a single-point mutation, base editing is really the best tool."



NOVO NORDISK AND UCSF TO COLLABORATE ON HESC PRODUCTION FOR DIABETES THERAPY

Novo Nordisk have licensed a technology from the University of California San Francisco (UCSF) which will allow it to manufacture cGMP compliant human embryonic stem cell (hESC) lines. The company also holds the right to develop these into therapies under the new agreement. The company will work with staff at the university to achieve a new quality standard for stem cell therapy production at the recently inaugurated GMP facility.

Novo has achieved clinical proof-of-concept in differentiating pluripotent stem cells into insulin-producing beta cells for the treatment of patients with Type 1 Diabetes. The company has also

been developing an encapsulation device for the cells in collaboration with Cornell University. The company anticipates the initiation of human trialing within the next few years.

"Finding a cure for diabetes is part of Novo Nordisk's vision and recent progress in our stem cell research and the access to robust and high-quality cell lines raises hopes for people with type 1 diabetes. Our collaboration with UCSF is also expected to accelerate current and future partnerships to develop stem cell-based therapies for treatment of other serious chronic diseases"

said Mads Krogsgaard Thomsen, CSO.



SAREPTA PARTNERS WITH MYONEXUS TO TREAT SEVERE FORMS OF MUSCULAR DYSTROPHIES

Sarepta Therapeutics has entered into an exclusive license agreement with Myonexus Therapeutics, a spinout of Nationwide Children's Hospital's Center for Gene Therapy to develop gene therapies for various forms of Limb-girdle muscular dystrophies (LGMDs).

Sarepta Therapeutics is a biopharmaceutical company focused on developing precision genetic medicine to treat rare neuromuscular diseases. Founded in 2017 and headquartered in Ohio, Myonexus Therapeutics is focused on

developing gene therapies for rare diseases and is the first company to develop a treatment for LGMDs. Its development pipeline is based on research conducted by Dr Louise Rodino-Klapac at the Center for Gene Therapy at Nationwide Children's Hospital. She is the CSO and co-founder of Myonexus.

Under the terms of the licensing agreement, Myonexus will receive an upfront payment of \$60 million from Sarepta. Sarepta will also make additional development-related milestone payments and has the

option to purchase to acquire Myonexus. If all development-related milestone payments are met, Sarepta will make payments of up to \$45 million over an approximately two-year evaluation period.

Myonexus Therapeutics' pipeline includes three clinical stage gene therapy programs (LGMD2E, LGMD2D, and LGMD2B) and two preclinical gene therapy programs (LGMD2C and LGMD2L). The lead program LGMD2E, is intended to treat beta-sarcoglycanopathy, a severe and debilitating form of LGMD characterized by progressive muscle fiber loss. The therapy uses an AAVrh.74 vector system to deliver the gene coding for beta-sarcoglycan protein. Based on the promising pre-clinical safety and efficacy data obtained for LGMD2E, Myonexus

is planning to begin the Phase 1/2a study in mid-2018.

AAVrh.74 vector system is also being used in the micro-dystrophin gene therapy program Sarepta is developing in partnership with Nationwide Children's Hospital for treating Duchenne muscular dystrophy. Dr Rodino-Klapac is one of the principal investigators of the micro-dystrophin program. He stated,

"The culmination of this partnership with Sarepta is important to Myonexus' mission of rapidly advancing our LGMD pipeline. As the inventor of Myonexus' LGMD approach and co-inventor of the DMD gene therapy approach, both of which utilize the AAVrh.74 vector system, we are excited to leverage this knowledge from our work in DMD and now apply it to our LGMD portfolio."



MESOBLAST AND CARTHERICS PARTNER ON ALLOGENEIC CAR T DEVELOPMENT

Mesoblast and Cartherics have entered into a collaboration for the development of CAR-T therapies that are 'off-the-shelf' for the treatment of solid cancers. The partnership will see the former contributing the use of its proprietary allogeneic cell platform technology. Cartherics will be funding alongside Monash University, Hudson Institute of Medical Research and Cell Therapies Pty Ltd, all of whom are part of the Australian Government's Cooperative Research Centres Program (CRC-P).

To date, CAR-T treatments have been autologous. The manufacturing process for such patient specific treatments is extremely costly with estimates for one

patient's treatment costing in the region of \$1.5 million. Allogeneic treatments therefore pose an alternative to this by producing therapies on a large scale. The Mesoblast – Cartheric collaboration will work on producing CAR-T cells from induced pluripotent stem cells, which can then be banked and disseminated to cancer patients.

Mesoblast CEO Silviu Itescu commented,

"With our combined technology platforms and expertise, we are ideally placed to greatly increase accessibility to this very promising new field of cancer therapeutics through the development of highly-scalable, allogeneic cellular immunotherapies."

EXPERT
PICK**Mesoblast pivots
into CAR-T**

Mesoblast is adding CAR-T to its pipeline through a collaboration with Cartherics and the University of Monash. Historically an MSC company, Mesoblast will bring to bare its expertise in allogeneic cell therapy and suspension-based cell culture to help drive development of gene-edited T cells. As a paradigm, allogeneic approaches to cell-based immunotherapy are picking up as the field thinks long-term about cost-of-goods and scale. Evidence of this was seen with the recent formation of Allogene, which completed a \$300M Series A in April to get off the ground. Cartherics is headed up by ex-CIRM President Alan Trounson.

–Mark Curtis

**DISCGENICS COLLABORATES WITH
CCRM AND GE HEALTHCARE TO
SCALE-UP MANUFACTURING OF ITS
CELL THERAPY**

DiscGenics, a clinical stage regenerative medicine company focusing on developing cell therapies for degenerative diseases of the spine, has announced its partnership with CCRM and GE Healthcare to advance the manufacturing capability of its off-the-shelf cell therapy.

DiscGenics' first product candidate, IDCT, is a homologous, allogeneic, injectable cell therapy developed for the treatment of patients with degenerative disc disease (DDD). IDCT is currently being tested in a prospective, randomized, double blinded Phase 1/2 study to evaluate its safety and preliminary efficacy in subjects with Intervertebral Disc Degeneration. The trial initiated earlier this year is expected to complete by mid-2021.

Through the collaboration with CCRM and GE Healthcare, DiscGenics intends to optimize its manufacturing steps including process, assay, and media development, for the production of IDCT. CCRM and GE Healthcare together with the Federal Economic Development Agency for Southern Ontario are conducting the work at Toronto's Centre for Advanced Therapeutic Cell Technologies (CATCT).

CCRM, hosted by the University of Toronto, is a Canadian government-funded organization that supports the development of regenerative medicines and associated enabling technologies, with a specific focus on cell and gene therapy.



MEDIGENE AND BLUEBIRD BIO TO COLLABORATE ON TCRs IN \$15 MILLION UPFRONT DEAL

Medigene and bluebird bio have entered an alliance to conduct research and development into T cell receptor therapies (TCR) for four new targets. The agreement specifies that Medigene will work on the initial portion of TCR generation and delivery, leveraging the company's isolation and characterisation platform. Following this, bluebird bio will be responsible for the clinical development and commercialization stages for the resultant TCRs, to which they will also hold rights to the intellectual property.

The agreement will see Medigene receive an upfront payment of \$15

million, this could increase to a potential \$1 billion over the course of milestone payments and R&D funding that it will additionally receive.

Bluebird bio VP Rick Morgan commented,

"Medigene's proprietary technology to generate highly active natural TCRs makes them an ideal partner, enabling us to broaden our pipeline with TCR-based product candidates against four new targets and continue to build our leadership in immuno-oncology"



\$2.6 MILLION EXTENDS INDEE LABS' SEED FUNDING ROUND

Indee Labs – a company pioneering a new gene delivery platform for oncological gene therapy manufacturing – has extended its seed funding stage to total \$5.4 million, after receiving an additional \$2.6 million. The round was led by San Francisco-based Founders Fund and contributions also came from Australian Main Sequence Ventures amongst others.

The funds will go towards growing the company's team, conducting comparative studies against other gene delivery platforms, and instrument development. Data from the company demonstrating the modification of functional

human immune cells preceded this latest round of funding.

'All of the industry excitement around discovering gene targets for cell therapy has overlooked an inconvenient fact. We do not yet have scalable and efficient means of manufacturing these life-saving cells. The team at Indee Labs has developed a gene delivery technique that is not only inexpensive enough for general use, but fast enough to use the patient's own cells. We expect Indee Labs will become the standard platform for bedside cell therapy,'

stated Aaron VanDevender, Chief Scientist and Principal at Founders Fund.





SEMMA APPOINTS NEW CEO – DR BASTIANO SANNA

Stem cell therapeutics company Semma Therapeutics has appointed a new President and CEO – Dr Bastiano Sanna, formerly of Magenta Therapeutics. Dr Sanna joins the company following a successful Series B financing round. He has previously worked in the cell and gene

therapy unit of Novartis where he was responsible for aspects of the bone marrow transplant and CAR-T therapy programs.

Semma founder Doug Melton commented,

"It's been a thrill to get to know Bastiano and see his passion for the potential for using cells as

medicines. He is the ideal leader for Semma as we look to bring to the clinic our lead program of an encapsulated cell therapy product for the treatment of type 1 diabetes, and plan an expansion into new exciting areas of medicine."



LYSOGENE APPOINTS NEW CSO – DR RALPH LAUFER

Lysogene has appointed industry veteran Dr Ralph Laufer, previously of Israeli Teva Pharmaceutical Industries, as its new CSO and a member of the executive team.

In his previous role, Dr Laufer worked on small molecule discovery, CMC, and nonclinical development.

Dr Ralph Laufer brings over 25 years of industry experience in drug discovery, translational research and drug development at large pharmaceutical and biotechnology companies. In Italy his work included

being Scientific Director of IRBM Science Park, and Head of Pharmacology at IRBM-Merck Research Laboratories – both situated in Rome. Dr Laufer was also the 2013 recipient of the American Chemistry Society's Heroes of Chemistry award for his part in discovering the first integrase inhibitor used to treat HIV patients (Isentress™/ raltegravir). Dr Laufer obtained both his PhD and MSc from the Hebrew University of Jerusalem. At Lysogene he will work on developing gene therapies which target central nervous system disorders.