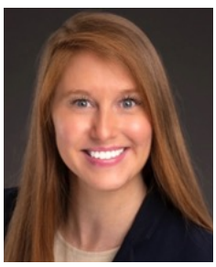
OFFICE OF TECHNOLOGY LICENSING

INTELLECTUAL PROPERTY NEWSLETTER

2024 Issue

Welcome to Lisa and Bethany

Lisa Jordan joins St. Jude as a Senior Vice President to lead our organization's burgeoning technology development and industry engagement initiatives. Lisa has over 25 years of experience as a life science venture capitalist and entrepreneur and is excited to use her extensive experience to further the St. Jude mission of treating and curing catastrophic pediatric diseases. She plans on building a collaborative team of scientists, clinicians, and entrepreneurs with industry expertise, focused on bringing a greater number of St. Jude technologies into the clinic, where they will benefit patients worldwide. Please join us in welcoming Lisa and be on the lookout for many exciting developments to come!



Bethany Furr is the new Administrative Specialist in the Office of Technology Licensing. She is from Madison, Mississippi and attended the University of Mississippi for Paralegal Studies. She shares a passion for legal, compliance and collaboration - the very backbone of our work. With a smile, Bethany is enthusiastic to help coordinate your interactions with us! In her free time, she loves to care for her plants, travel with her dog, Benny, and reflect on childhood memories while watching "The Sandlot."

Sign up for Updates, and/or browse all our available technologies

On our website, http://www.stjude.org/technology-licensing

There are four email update segments you can sign up for:

- Technology Licensing general updates
- Regional Networking and Career Group
- St. Jude Innovators
- Regional Tech Transfer News and Gatherings

You can also follow us on other platforms:
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https://www.facebook.com/LicensePatents
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Internal Transfer of Materials

Materials purchased from web-based repositories (ATCC, DSMZ, Addgene, etc.) include specific terms that restrict transfer to other investigators, even those within St. Jude. This restriction applies to the materials themselves and to modifications that contain or incorporate the original material. To get appropriate permissions in place prior to sharing/transferring these materials/modifications please consult with Esther Allay in the Office of Technology Licensing (OTL).

New MTA Email Address

The Office of Technology Licensing created a new process for anyone needing a Material Transfer or Data Transfer Agreement generated or reviewed. Please forward your requests to mta@stjude.org. These agreements ensure that the data/material is authorized for the approved use by the recipient, and that the provider is credited as the source and protected from liability.

Customer Satisfaction Survey Results

The OTL received over 150 responses to a customer satisfaction survey targeting researchers at all levels. While satisfaction with OTL services is generally high, the survey indicated that there is room for improvement when it comes to internal education about our services, and addressing those respondents who feel they are not working with technologies that can be commercialized.

Forms on the Hub

For those of you internal to St. Jude, http://sjcrh.sharepoint.com/sites/technology-licensing contains information about us, along with news, events, and useful forms for Intellectual Property Assignment, Invention Disclosure (for tangible materials or IP), and the Consulting addendum.

Two New Durable "One-Time" Hemophilia Drugs Approved

Hemophilia is a rare bleeding disorder in which the blood does not clot properly, resulting in extended bleeding time after an injury or internal bleeding, which may be life threatening. Many individuals with hemophilia become physically or mentally disabled from chronic joint damage due to bleeding. Hemophilia is caused by the blood having little or none of a specific plasma protein, or clotting factor, which is needed for normal clotting.

There are 3 types of hemophilia, based on which clotting factor is low or missing, A and B are the most common:

- Hemophilia A — caused by a deficiency of clotting factor VIII
- Hemophilia B — caused by a deficiency of clotting factor IX
- Hemophilia C — caused by a deficiency of clotting factor XI

Conventional treatment for hemophilia is based on the severity of the condition in each individual; along with their activity level and need for future medical or dental procedures. The main treatment is clotting factor replacement therapy, administered prophylactically, usually several times a week. More recently, a non-factor monoclonal antibody administered every one to four weeks has become available for hemophilia A which provides a more consistent bleed protection. Other promising non-factor products for hemophilia A and B are still in clinical trials. In contrast to these conventional therapies which must be administered over and over, a gene therapy for hemophilia B developed using St. Jude intellectual property offers a more permanent solution.

On November 22, 2022, **Hemgenix** (etranacogene dezaparvovec-drlb) was the first gene therapy for the treatment of adults living with hemophilia B to be approved by the Food and Drug Administration (FDA). Hemgenix emerged from pioneering work by St. Jude, led by Drs. Andrew Davidoff and John Gray, and the University College London (UCL), led by former St. Jude post doc Amit Nathwani. It was licensed to uniQure, who partnered with CSL Behring to produce the single-dose treatment to reduce abnormal bleeding by enabling continuous production of factor IX in the liver. It uses an adeno-associated viral (AAV) vector, AAV5, to deliver a Factor IX gene variant utilizing a promoter and optimized codons developed at St. Jude. The genetic instructions remain in those cells to allow stable production levels of factor IX.

On June 29, 2023, **Roctavian** (valoctocogene roxaparvovec) was the first gene therapy for adults with severe hemophilia A to be approved by the FDA. The European Commission had previously approved Roctavian in August 2022. Roctavian is a single-dose treatment for people with hemophilia A using an AAV5-type vector carrying the Factor VIII gene into liver cells enabling a persistent increase of their levels of factor VIII. This has improved their body's ability to control bleeding without regular injections. The vector used in this treatment was largely developed by the same team at St. Jude and UCL that had developed Hemgenix. It was licensed to BioMarin Pharmaceuticals, Inc. in 2013.

The FDA approval was supported by results from BioMarin's pivotal GENEr-8 trial, the longest global phase 3 study to date for any gene therapy in hemophilia A. The therapy was shown to be effective in reducing the rate of bleeding in a cohort of 134 patients for at least three years. Participants in the Phase 2 study have been observed for more than 5 years with evidence of diminishing factor levels over time in some.

Liver-Specific Promotor Available for License in Other Fields

Though the liver-specific promoter with shortened regulatory regions is exclusively licensed for use with hemophilia B gene therapy, the promoter can be licensed nonexclusively in other fields. The size can be adjusted to improve expression levels, which is key for making gene therapy effective in humans. We believe it can be further used to express many genes of interest in a size-constrained environment, such as in a self-complementary gene therapy vector system. Please contact us if you are interested in learning more about this groundbreaking advancement in gene therapy.

Ongoing Work to Develop an Inexpensive Global Solution

The 2014 research (N Engl J Med. 2014 Nov 20;371(21):1994-2004. doi: 10.1056/NEJMoa1407309) suggested one infusion of a factor IX gene-carrying vector can achieve long-term factor IX levels high enough to prevent most to all abnormal bleeding without the need for repeated administration of factor concentrate. The unique vector designed to express blood clotting protein factor IX was originally manufactured at Children's GMP, LLC, at St. Jude. So, while a later development has become an approved treatment in the US and Europe, the original intent was to create a proof-of-principle for establishing gene therapy programs in low- and middle-income countries (LMICs) and to help move this treatment option to countries that may not have the resources to develop and support this technology on their own. That work continues as St. Jude and the World Federation of Hemophilia (WFH) collaborated on an international gene therapy clinical trial for older adolescents and adults with hemophilia B. About 75% of hemophilia B (factor IX deficiency) patients live in LMICs with extremely limited access to factor IX concentrate for treatment. Nickhill Bhakta, MD, Global Pediatric Medicine led an interesting cost-effective analysis comparing factor replacement and gene therapy.

New Neuroblastoma Antibody Partner

Last summer, Renaissance Pharma Ltd exclusively licensed the rights to commercialize a monoclonal antibody designed to treat neuroblastoma in developed countries. This antibody, known as hu14.18K322A, was obtained from Lexigen (now part of Merck KGaA) in 2008. It was made in our GMP facility and clinically tested for treating neuroblastoma. Merck agreed to exclusively license their rights in this antibody to St. Jude in 2017 so we could seek a commercial partner for further development. An earlier 2018 partnership was prematurely terminated in 2020; and work continues to find a way to deliver this therapy to low- and middle-income countries (LMIC).

Patient Impact

Through the process of technology licensing, research initiated at St. Jude has contributed to several pending and approved therapies and diagnostics that are improving the lives of our own patients as well as the general population. The following table summarizes the impact of our biggest successes so far:

	Technology	Indication	Patient Impact
Partnered, Not Yet FDA Approved	XSCID Gene Therapy	X-SCID, known as “Bubble Boy,” disease	49 clinical trial participants (16@StJude)
	WHO/St. Jude Factor IX Gene Therapy for older adolescents and adults	Hemophilia B in Low/Middle Income Countries (LMIC)	9 patients (1@StJude)
Experimental, Unpartnered	CAR T-Cell Gene Therapy (Cancer)	B-AML/MDS, ALL/ T-ALL, BPDCN, CLL, NHL, Solid Tumors	60 clinical trial participants (48@StJude)
	Respiratory Syncytial Virus Vaccine (SeVRSV)	Human Parainfluenza Virus type 1 and RSV	21 clinical trial participants (21@StJude)
Partnered, FDA Approved	Factor VIII Gene Therapy: Roctavian	Hemophilia A	219 participants enrolled in Biomarin’s clinical trial (2022). BioMarin projects 2,500 of the 6,500 US patients will be eligible. <10 patients treated since FDA approval (11/12/22); 50 patients projected globally by
	Factor IX Gene Therapy: Hemgenix	Hemophilia B	79 clinical trial participants (5@StJude); 300 patients eligible (UK); of the 860 (US), ~150 will be treated
	PD-1/LAG-3 combo: Opdualag	Unresectable or Metastatic Melanoma	12,000+/yr. (FDA approval 3/2022 (Age 12+))
	CAR T-Cell therapies: Kymriah, Abecma, Breyanzi	8 FDA approved cancer indications	3000+ treated with Kymriah, Abecma, or Breyanzi (2022), projected to grow to 15,000+ by 2026
Formerly Partnered, Expired IP	Plasmid Rescue System (aka “Reverse Genetics”)	Influenza vaccine production	100+ Million doses/yr.; used for the UK’s childhood immunization program; & animal vaccines
	TPMT SNP Detection	Diagnostic (thiopurine drug tolerance)	500,000+ yr. in the US, 1:300 are severely sensitive to thiopurine drugs; ~10% have lower than normal tolerance
	CD-19 Antibody	Diagnostic (B-cell detection)	5,000,000+ yr.
	ALK Detection	Diagnostic (ALK+ cancers)	500,000+ yr.
	ALK Inhibitors: Xalkori, Zykadia, Alunbrig	8 FDA approved cancer indications	40,000 global/15,000 US yr.; for ALK+ non-small cell lung cancer (NSCLC) (Approved in 2021 for children w/anaplastic large cell lymphoma, the patient population the gene was discovered in, here in 1993)

(Also, the Lomir Snuggle line and Bel-art Labs Flomi micropipette filter are impactful research tools off-patent, but still sold.)

Office Activities and New Patents Issued

Since 1995, the Office of Technology Licensing (OTL) has promoted the development of research discoveries made at St. Jude into products that benefit our patients and the public, and in FY2023, the OTL negotiated or processed more than 1200 agreements. All St. Jude employees have a risk-free opportunity to have their inventions or reagents considered for patenting and/or licensing by submitting invention disclosure forms to the Office of Technology Licensing. Employees can fill out and submit the simple disclosure form available at https://sjcrh.sharepoint.com/sites/technology-licensing In FY 2023, 12 US Patents issued, and first Patent "Inventor" mugs were distributed to John Easton at St. Jude, and two others now at Stanford for the issuance of US 11,643,682. The total gross income from licensing for the year was over $35 Million, with over 100 inventors receiving over $10 Million of that total. Licensing income is shared with inventors and creators of licensed materials, who receive between 30-50% of net income produced by their inventions. Success stories of products developed through these activities can be found at http://bit.ly/1rNlewW.

Patent #	Title	Inventions	Inventors
11,673,937	Expanding immune cells	SJ-03-0018	Dario Campana, Chihaya Imai
11,684,664	Employing immunogenic fusion proteins	SJ-10-0028	Elaine Tuomanen, Elizabeth R Mann
9,511,092 10,774,309 10,829,737	(All related to NK Cell Chimeric Receptors)	SJ-13-0002	Dario Campana, Yu-Hsiang Chang
11,419,920	Factor VIII sequences	SJ-13-0003	Andrew M. Davidoff, (Amit Nathwani), (Jerry McIntosh), (Edward Tuddenham)
11,560,548	Immune cells expressing membrane-bound interleukin 15 (mbIL15)	SJ-14-0025	Dario Campana, David R Shook, Masaru Imamura
11,446,308	Prevention and treatment of hearing loss	SJ-14-0028	Kip Guy, Tal Teitz, Jian Zuo, Taosheng Chen, Jie Fang, Jaeki Min, Asli Goktug
11,390,658	Anti-CD7 chimeric antigen receptor	SJ-15-0020	Wing Leung, Rafijul Bari
11,547,709	Treating disorders associated with castor	SJ-17-0031	Suzanne Jackowski Rock, Charles O.Rock, Chitra Subramanian, Mi-Kyung Yun, Jiuyu Liu, Richard Lee, Rajendra Tangallapally, Lalit Kumar Sharma, Anne V. Edwards, (Robert Zamboni), (T. Jagadeeswar Reddy)
11,643,682	Method for nucleic acid amplification	SJ-18-0003	John Easton, (Veronica Gonzalez-Pena), (Charles Gawad)
11,406,690	Adeno-associated virus factor VIII vectors	SJ-21-0002	Andrew M. Davidoff, (Amit Nathwani), Peter Cameron Colosi), (Jenny McIntosh), (Edward Tuddenham)

Field Trip

On December 13, we toured Le Bonheur's newest facilities and equipment, which featured conversations with: Dr. Trey Eubanks, interim President; Dr. Rush Waller, CMO; and Blake Tyler, Senior Project Manager, Turner Construction.

Contact Us

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