



OFFICE OF TECHNOLOGY LICENSING

INTELLECTUAL PROPERTY NEWSLETTER

2023 Issue

Sign up for our newsletter:

<https://bit.ly/3nFAnmU>

FY2022 Licensing Activities

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. This is accomplished primarily through patenting and licensing. Success stories of products developed through these activities can be found at <http://bit.ly/1rNlewW>. In fiscal year 2022, the OTL completed more than 1,200 agreements and received 37 invention disclosures. The OTL received \$30 million in license income, with over \$9 million allocated to individuals whose inventions and materials generated this income.

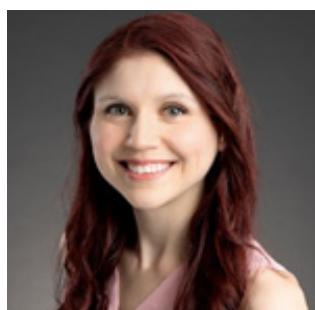
Other activities this past FY included:

- St. Jude signed onto amicus briefs supporting Supreme Court review of two decisions by the Court of Appeals for the Federal Circuit which threaten to narrow the scope of patent protection for biotechnology inventions.
- We resolved a sublicensing dispute involving Hemgenix, a Factor IX gene therapy vector utilizing St. Jude patent rights that was recently approved by the FDA.
- The FDA approved Opdualag, a combination therapy for melanoma that includes a LAG-3 antibody exclusively licensed to Bristol Myers Squibb, which is covered under patent rights co-owned by Johns Hopkins University (JHU).
- Biomarin's Hemophilia A gene therapy, Roctavian™, was conditionally approved in Europe pending follow-up data confirming durability of response. Patented improvements incorporated into Roctavian™ are co-owned with University College London (UCL).
- An external audit of a license generating significant income resulted in an adjustment favorable to St. Jude.
- St. Jude exclusively licensed the development of a cancer therapeutic that degrades GSPT1.
- St. Jude continues to receive royalty payments from three CD19 CAR products currently on the market: Kymriah® sold by Novartis, Breyanzi® and Abecma® sold by BMS; until patent rights covering these therapies expire.
- The OTL welcomed two new employees in 2022, read more about them below.

New Faces



Danielle Coatney an Administrative Specialist in the Office of Technology Licensing. She is a life-long Memphis resident and graduate of Southwest Tennessee Community college with an Associate's degree in Accounting. She also attended both The University of Memphis and Christian Brothers University, with a focus on MIS (Management, Information Systems). Her interests have always been to be part of a team and she enjoys her supporting role. She has worked as an Executive assistant, in HR and Accounts Payable, and in the healthcare, compliance, hospitality, logistics and information technology sectors. While a Tech Transfer novice, she finds it an exciting field and has found her background very useful in this position. She has also participated in several St. Jude events in the past including completing 5 St. Jude races, and this year for the first time- cheering for the 2022 Memphis Marathon Weekend racers from the campus cheer station as an employee (which she says was, "Amazing!"). Danielle noted that while the ongoing construction will make the already sizable campus even more impressive and maybe challenging to navigate, she really appreciates the warm and welcoming environment that St. Jude has cultivated and encouraged through its focus on diversity and wellness/support. In her free time, she raises butterflies and judges barbecue.



Jessica Hughes is a Licensing Assistant in the Office of Technology Licensing. She was born in Berkeley, CA and raised in Peachtree City, GA. She graduated from the Georgia Institute of Technology with a Bachelor's degree in Biology before joining a structural biology lab at Texas A&M University as a Research Assistant. In the fall of 2019, Jessica brought her skills and experience in protein purification to St. Jude when she joined J. Paul Taylor's lab in the Department of Cell and Molecular Biology. She first learned about the field of Tech Transfer as a participant in the 2019 Memphis Scipreneur Challenge. Eager to learn more, she returned in 2021 and claimed the top prize with her business plan for MetaSense. In July of 2022, she joined the OTL team. Jessica dove headfirst into an audit of all active license agreements and has already brought numerous agreements into compliance, recouping thousands in unpaid

royalties and fees, and ensuring every dollar was allocated correctly. You may interact with her when setting up confidentiality, data transfer or materials transfer agreements. Excited to help guide discoveries from the bench to the bedside, Jessica is looking forward to working with you to patent and promote your inventions. You may run into her walking around our beautiful campus or exercising in the Living Well Fitness Center. In her free time, she enjoys spending time with her family, listening to podcasts and cooking.

Sign up for our newsletter: <https://bit.ly/3nFAnmU>

Dysfunctional Lysosomal System Research Licensed for Neurodegenerative Disease may also hold Promise for Cancer Treatments: Patent rights for using PPCA and Neurominidase to treat neurodegenerative diseases were licensed in 2015, but additional fields with significant potential remain available.



The d'Azzo Lab: Alessandra d'Azzo, PhD (center), (clockwise, starting lower left) Diantha van de Viekkert, Leigh Fremuth, PhD, Elida Gomero, Yvan Campos, Jason A. Weesner, PhD, Huimin Hu, PhD.

Dr. Alessandra d'Azzo's research programs at St. Jude Children's Research Hospital explore the role of the lysosomal system in cellular metabolism and in diseases associated with lysosomal dysfunction, collectively known as lysosomal storage diseases (LSDs). LSDs are catastrophic, neurodegenerative childhood disorders with complex pathological manifestations, affecting all organs, including the nervous system. Understanding the molecular bases underlying LSD pathogenesis is key for the development and implementation of effective therapies for these diseases and other related adult conditions.

The lysosome is the primary digestive system within cells, ensuring the homeostatic balance between synthesis and breakdown of macromolecules. When lysosomes cannot properly exert their degradative function, undigested or unprocessed materials accumulate within cells or are abnormally released extracellularly, which ultimately affect cell survival and the integrity of the extracellular environment. A dysfunctional lysosomal system has been implicated in pathogenic cascades leading to neurodegeneration and cancer metastasis. Dr. d'Azzo's lab has thoroughly dissected some of the mechanisms and pathways downstream of specific lysosomal defects, broadening the understanding of the role of these vital organelles in pediatric and adult diseases.

The work of the d'Azzo lab centers on the study of three lysosomal enzymes, each of which is essential for proper lysosomal degradation of multiple cellular constituents:

- Protective Protein/Cathepsin A (PPCA)
- b-Galactosidase (b-GAL)
- Neuraminidase 1 (NEU1)

These enzymes form a high molecular weight lysosomal multienzyme complex (LMC), a configuration required for their mutual stability in lysosomes and acquisition of full enzymatic activity. Three genetically distinct, human neurodegenerative LSDs result from single or combined deficiency of these enzymes:

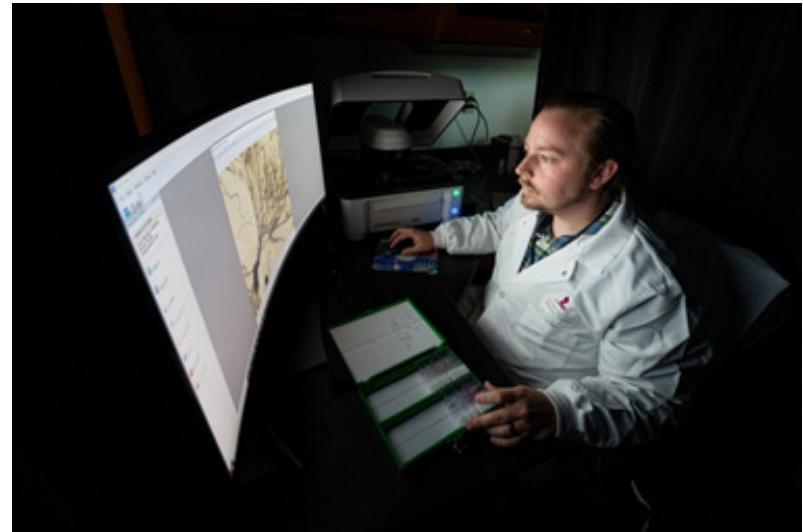
- Galactosialidosis (primary defect in PPCA, secondary deficiency of NEU1 and b-GAL)
- GM1-gangliosidosis (primary defect in b-GAL)
- Sialidosis (primary defect in NEU1)

Investigating the biological mechanisms downstream of genetic defects in PPCA, b-GAL, and NEU1 has enabled Dr. d'Azzo's group to identify paralleled pathogenic cascades that also occur in common adult diseases, while simultaneously developing new drugs and therapies for LSD patients that could in principle be applied to other debilitating or difficult-to-treat disorders.

In 2013, Dr. d'Azzo and members of her group, filed an invention patent outlining how lysosomal exocytosis activity profiles could be used for the prognosis and diagnosis of the various pathological states of cancer, chemotherapy resistance and dementia associated with Alzheimer's disease. Additionally, the patented invention included methods using NEU1 and NEU1 auxiliary protein (PPCA) to treat cancer and Alzheimer's disease. While the neurodegenerative fields were subsequently licensed for further development by industry, we are now seeking partners to develop cancer treatments and diagnostics.

The Licensing Approach is Two-Fold

We want to license this patent to companies who will develop diagnostic tests to predict chemotherapy resistance, cancer aggressiveness, and disease prognosis. In addition, we want to license the patent to companies who seek to improve current cancer treatments by developing new therapeutics that target NEU1, LAMP1, PPCA and/or lysosomal exocytosis, and will help prevent metastasis or improve targeted cytotoxicity of chemotherapies. Addressable cancers include different types of sarcomas (rhabdomyosarcoma, Ewing's sarcoma), leukemias (acute lymphoblastic leukemia), lymphoma, melanoma, breast cancer, colon cancer, lung cancer, bladder cancer, pancreatic cancer, ovarian cancer, prostate cancer, brain tumors, and bone cancer.



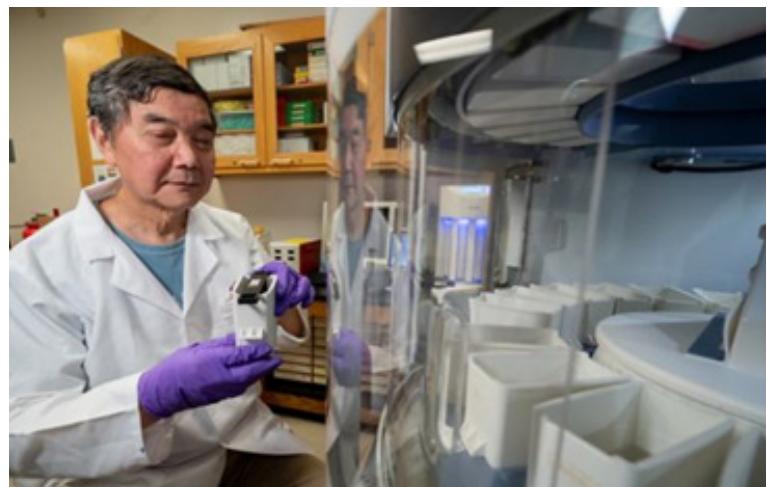
A variety of approaches—ex vivo gene therapy, AAV-mediated in vivo gene therapy, enzyme replacement therapy, small molecule/drug therapy—can be used to restore or enhance enzyme function and aid the development of effective therapies for pediatric and adult diseases affecting the lysosomal system. These ventures could lead to new therapeutic classes, with multiple generations and numerous treatments.

Intellectual Property and Publications Related to the Cancer Aspects

- Issued US 9,399,791; 9,840,727; 10,533,208; and published pending 2020/0087704.
- Issued/Allowed patents in Europe, Canada, Australia, and Japan as well.
- "Haploinsufficiency of the lysosomal sialidase NEU1 results in a model of pleomorphic rhabdomyosarcoma in mice," https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9489700/pdf/42003_2022_Article_3968.pdf
- "Lysosomes and Cancer Progression: A Malignant Liaison," <https://pubmed.ncbi.nlm.nih.gov/33718382/>
- "Regulated lysosomal exocytosis mediates cancer progression" <https://pubmed.ncbi.nlm.nih.gov/26824057/>
- "Excessive exosome release is the pathogenic pathway linking a lysosomal deficiency to generalized fibrosis," <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6636989/pdf/aav3270.pdf>
- "MYC competes with MiT/TFE in regulating lysosomal biogenesis and autophagy through an epigenetic rheostat," https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6689058/pdf/41467_2019_Article_11568.pdf
- "Preclinical Enzyme Replacement Therapy with a Recombinant β-Galactosidase-Lectin Fusion for CNS Delivery and Treatment of GM1-Gangliosidosis," <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9406850/pdf/cells-11-02579.pdf>
- "AAV-mediated gene therapy for galactosialidosis: A long-term safety and efficacy study," <https://pubmed.ncbi.nlm.nih.gov/34901309/>

Key Developmental Assets Include

Generation and characterization of knockout and transgenic mice (A Neu1 KO mouse was generated and characterized in early 2000); correction of affected mice by transplantation with transgenic overexpressing or retrovirally transduced bone marrow; expression and regulation of normal and mutant enzymes in prokaryotic/eukaryotic cell systems; and crystal structure determination of overexpressed proteins.



Want to Know More?

If you have an interest in licensing this technology for the development of cancer diagnosis and treatments, contact or office today by phone or email:

chad.riggs@stjude.org

New Patents Issued

The table below lists the patents granted to St. Jude in FY2022. Inventors receiving their first patent receive a special commemorative mug from the OTL.

Patent No.	Disclosure Title	Inventor
11,103,597	Spacer for Gene Therapy Vectors	John Gray
11,207,396	YLN for Cardiac Protection	Elaine Tuomanen, Carlos Orihuela, Armand Brown
11,083,725	Treating Flu with Metabolic Drugs	Martine Roussel, Paul Thomas, Heather Smallwood, Marie Morfouace
11,268,158	Gene Therapy Vector Safety Test	Brian Sorrentino, Sheng (Albert) Zhou
11,116,757	DCN1 Inhibitors	K. Guy, Brenda Schulman, Jaeki Min, Daniel Scott, Jared Hammill, et al.
11,331,373	Gene Therapy for Hearing Loss	Tetsuji Yamashita, Fei Zheng, Wanda Layman, Jian Zuo
11,298,343	Ulk1 modulators to treat thalassemia	Mitchell Weiss, Christophe Lechauve, Mondira Kundu
11,371,095	CHANGSeq	Shengdar Tsai, Cicera Lazzarotto
11,237,168	FRET Assay for G3BP1 and G3BP2 Inhibitors	Taosheng Chen

We Moved

The Office of Technology licensing is now located in the K or 595 building in the K1450 suite. You may choose to come and see us; or as always, we are happy to come to you to discuss your invention in person or arrange a virtual meeting.



We Celebrated Technology Transfer Professionals Day December 12, 2022

This year, as in previous years on December 12th, we celebrated Technology Transfer Professionals Day. This year we handed out some plushie microbes to those who successfully completed a technology transfer/IP trivia contest, along with some other items for those who just stopped by to speak or ask questions. We had plenty of newsletters on hand and were able to introduce our new Licensing Assistant, Jessie Hughes, who is pictured (at right) at the table we set up in the Inspiration4 Advanced Research Center.



Spring BioTN Scipreneur Challenge

The Scipreneur Challenge is an entrepreneurship-based competition organized by the BioTN Academic Alliance. It takes place annually and offers university students and postdoctoral fellows from Tennessee's premier research institutions hands-on experience in commercialization of research and entrepreneurship. Find out more here: <https://www.biotsncipreneur.com/>

Customer Survey

Be on the lookout for an upcoming survey about how we can better work with you to live our St. Jude values daily to turn your research into products that benefit patients and the greater public!

Contact Us

OTL staff contacts	Title	Extension	Email address
Scott Elmer, JD	Director	2756	scott.elmer@stjude.org
Shawn Hawkins	Associate Director	2751	shawn.hawkins@stjude.org
Esther Allay	Senior Licensing Associate	4700	esther.allay@stjude.org
Chad Riggs	Senior Marketing Associate	3866	chad.riggs@stjude.org
Regina McKinney	Coordinator, Departmental Finance	5354	regina.mckinney@stjude.org
Jessica Hughes	Licensing Assistant	6465	jessica.hughes@stjude.org
Danielle Coatney	Administrative Specialist	2342	danielle.coatney@stjude.org