

Tomas Björklund  
Molecular Neuromodulation  
MultiPark: Multidisciplinary research on neurodegenerative diseases  
LTH Profile Area: Engineering Health

**Type of address: Visiting address.**

Sölvegatan 19, BMC A10  
Rm BMC A1048  
221 84  
Lund  
Sweden

**Type of address: Postal address.**

Box 117  
22100  
Lund  
Sweden

**Email:** tomas.bjorklund@med.lu.se

**Mobile:** +46462226836

**Phone:** +46462226836



## Research

Are you intrigued by the brain and its complexity, as well as by new technologies and the amazing developments in biotechnology? Then my research group may be for you. My team and I are at the forefront of biotechnology and molecular biology, aiming to treat disorders of the human brain. Our main focus is on developing advanced therapeutical medical products (ATMPs), such as cell and gene therapy for Parkinson's disease. We are also working to treat one of the most devastating disorders of the human brain: glioblastomas, or brain tumors. The team combines in silico modeling using advanced machine learning and AI with molecular biology to tailor synthetic vectors to accurately target the cells that need treatment. This will enable us to find treatments and, in the long term, to develop cures for very complex disorders. To ensure that the treatments we develop are feasible to bring to the clinic, we are using human model systems to develop and validate our new therapies. These include stem cell-based organoids, 3D organoids grown in vitro derived from patient tumors, as well as primary tumors from patients. By combining these cell systems with spatial sequencing, we can map and model exactly where the new viruses go and how they act in the human brain.

### About me as an individual

I see myself as both a researcher and an inventor. I love to invent new tools and come up with new ideas that will give us completely new possibilities, making things possible that were previously seen as nearly impossible. We take available techniques and change them all the time to achieve something completely new. In my research group, we work very closely together. Everyone is part of the team and has close proximity to me. I have an open-door policy where we meet every day and work closely on projects. I'm driven by curiosity and will never stop wanting to learn new things. I have a passion for medicine, molecular biology, mathematics, machine learning, and the computation of large data. I'm a visual person who works a lot with pictures and how we can interpret them to learn the underlying biology. We depend on what's called computer vision to perform our spatial sequencing and to interpret how our new viruses work. We build new instruments and new microscopes as well. So, in my research group, there's space for all kinds of researchers. Medical doctors, biologists, and engineers are all very welcome.

## Qualifications

Neurobiology, Docent, Faculty of Medicine

Award Date: 2016 Aug 12

Neurobiology, PhD in Medical Science, Gene therapy by enzyme replacement for Parkinson's disease – Optimization of continuous DOPA delivery and development of a candidate vector for clinical application, Faculty of Medicine

2004 Sept 1 → 2009 Dec 4

Award Date: 2009 Dec 4

## Employment

**Research team manager, Professor**

Molecular Neuromodulation

Lund University

Lund, Sweden

2011 Jul 1 → present

**Member of Strategic Research Area**

MultiPark: Multidisciplinary research on neurodegenerative diseases  
Lund University  
Lund, Sweden  
2011 Jan 1 → present

#### **Profile area member**

LTH Profile Area: Engineering Health  
Lund University  
Sweden  
2022 Jun 28 → present

## **Research outputs**

### **GDNF overexpression in astrocytes enhances branching and partially preserves hippocampal function in an Alzheimer's rat model**

Vidal Escobedo, A. A., Peralta, F., Morel, G. R., Avallone, M., Björklund, T., Reggiani, P. C. & Pardo, J., 2025 Jun 2, In: Scientific Reports. 15, 1, p. 1-16 19284.

### **Administration of a barcoded AAV capsid library to the putamen of non-human primates identifies variants with efficient retrograde transport**

Dzhashiashvili, Y., McBride, J. L., Fabyanic, E., Huang, X., Kelly, B. M., Walton-Gibbs, G. D., Vemireddi, V., Wicks, J., Nayal, M., Hippen, A. A., Yu, Z., Raman, P., Ramsburg, E., Davidsson, M., Engel, E. A. & Björklund, T., 2025, (Accepted/In press) In: Molecular Therapy.

### **TARGET-seq: Linking single-cell transcriptomics of human dopaminergic neurons with their target specificity**

Fiorenzano, A., Storm, P., Sozzi, E., Bruzelius, A., Corsi, S., Kajtez, J., Mudannayake, J., Nelander, J., Mattsson, B., Åkerblom, M., Björklund, T., Björklund, A. & Parmar, M., 2024 Nov 19, In: Proceedings of the National Academy of Sciences of the United States of America. 121, 47, p. 1-12 e2410331121.

### **Lineage tracing of stem cell-derived dopamine grafts in a Parkinson's model reveals shared origin of all graft-derived cells**

Storm, P., Zhang, Y., Nilsson, F., Fiorenzano, A., Krausse, N., Åkerblom, M., Davidsson, M., Yuan, J., Kirkeby, A., Björklund, T. & Parmar, M., 2024 Oct 18, In: Science Advances. 10, 42, p. 1-14 eadn3057.

### **Preventive cognitive protection based on AAV9 overexpression of IGF1 in hippocampal astrocytes**

Peralta, F., Escobedo, A. A. V., Hanotte, J. L., Avallone, M., Björklund, T., Reggiani, P. C. & Pardo, J., 2024 Oct, In: Neurobiology of Disease. 200, 106612.

### **Identification and validation of novel engineered AAV capsid variants targeting human glia**

Giacomoni, J., Åkerblom, M., Habekost, M., Fiorenzano, A., Kajtez, J., Davidsson, M., Parmar, M. & Björklund, T., 2024, In: Frontiers in Neuroscience. 18, 1435212.

### **Visualizing Arc protein dynamics and localization in the mammalian brain using AAV-mediated in situ gene labeling**

Avallone, M., Pardo, J., Mergiya, T. F., Rajova, J., Räsänen, A., Davidsson, M., Åkerblom, M., Quintino, L., Kumar, D., Bramham, C. R. & Björklund, T., 2023 Jun 15, In: Frontiers in Molecular Neuroscience. 16, 1140785.

### **Deconvolution of spatial sequencing provides accurate characterization of hESC-derived DA transplants in vivo.**

Rájová, J., Davidsson, M., Avallone, M., Hartnor, M., Aldrin-Kirk, P., Cardoso, T., Nolbrant, S., Mollbrink, A., Storm, P., Heuer, A., Parmar, M. & Björklund, T., 2023 Jun 8, In: Molecular Therapy - Methods and Clinical Development. 29, p. 381-394

### **Mutant huntingtin expression in the hypothalamus promotes ventral striatal neuropathology**

Soylu Kucharz, R., Adlesic, N., Davidsson, M., Björklund, T., Björkqvist, M. & Petersén, Å., 2023 Mar 4, bioRxiv.

### **A novel two-factor monosynaptic TRIO tracing method for assessment of circuit integration of hESC-derived dopamine transplants**

Aldrin-Kirk, P., Åkerblom, M., Cardoso, T., Nolbrant, S., Adler, A. F., Liu, X., Heuer, A., Davidsson, M., Parmar, M. & Björklund, T., 2022 Jan 11, In: Stem Cell Reports. 17, 1, p. 159-172 14 p.

**In vivo conversion of dopamine neurons in mouse models of Parkinson's disease - a future approach for regenerative therapy?**

Parmar, M., Björklund, A. & Björklund, T., 2021 Oct 1, In: Current Opinion in Genetics & Development. 70, 0, p. 76-82

**FRET-Based Screening Identifies p38 MAPK and PKC Inhibition as Targets for Prevention of Seeded  $\alpha$ -Synuclein Aggregation**

Svanbergsson, A., Ek, F., Martinsson, I., Rodo, J., Liu, D., Brandi, E., Haikal, C., Torres-Garcia, L., Li, W., Gouras, G., Olsson, R., Björklund, T. & Li, J.-Y., 2021, In: Neurotherapeutics. 18, 3, p. 1692-1709

**Next-Generation Gene Therapy for Parkinson's Disease Using Engineered Viral Vectors**

Björklund, T. & Davidsson, M., 2021, In: Journal of Parkinson's Disease. 11, s2, p. S209-S217

**AAV Production Everywhere: A Simple, Fast, and Reliable Protocol for In-house AAV Vector Production Based on Chloroform Extraction**

Negrini, M., Wang, G., Heuer, A., Björklund, T. & Davidsson, M., 2020, In: Current Protocols in Neuroscience. 93, 1, p. e103

**A systematic capsid evolution approach performed in vivo for the design of AAV vectors with tailored properties and tropism**

Davidsson, M., Wang, G., Aldrin-Kirk, P., Cardoso, T., Nolbrant, S., Hartnor, M., Mudannayake, J., Parmar, M. & Björklund, T., 2019 Dec 26, In: Proceedings of the National Academy of Sciences of the United States of America. 116, 52, p. 27053-27062 10 p.

**Practical Considerations for the Use of DREADD and Other Chemogenetic Receptors to Regulate Neuronal Activity in the Mammalian Brain**

Aldrin-Kirk, P. & Björklund, T., 2019 Jan 1, In: Methods in molecular biology (Clifton, N.J.). 1937, p. 59-87 29 p.

**Seeding of protein aggregation causes cognitive impairment in rat model of cortical synucleinopathy**

Espa, E., Clemensson, E. K. H., Luk, K. C., Heuer, A., Björklund, T. & Cenci, M. A., 2019, In: Movement Disorders. 34, 11, p. 1699-1710

**Vector-mediated l-3,4-dihydroxyphenylalanine delivery reverses motor impairments in a primate model of Parkinson's disease**

Rosenblad, C., Li, Q., Pioli, E. Y., Dovero, S., Antunes, A. S. L. M., Agúndez, L., Bardelli, M., Linden, R. M., Henckaerts, E., Björklund, A., Bezaud, E. & Björklund, T., 2019, In: Brain : a journal of neurology. p. 2402-2416

**A novel adeno-associated virus capsid with enhanced neurotropism corrects a lysosomal transmembrane enzyme deficiency**

Tordo, J., O'Leary, C., Antunes, A. S. L. M., Palomar, N., Aldrin-Kirk, P., Basche, M., Bennett, A., D'Souza, Z., Gleitz, H., Godwin, A., Holley, R. J., Parker, H., Liao, A. Y., Rouse, P., Youshani, A. S., Dridi, L., Martins, C., Levade, T., Stacey, K. B. & Davis, D. M. & 11 others, Dyer, A., Clément, N., Björklund, T., Ali, R. R., Agbandje-McKenna, M., Rahim, A. A., Pshezhetsky, A., Waddington, S. N., Linden, R. M., Bigger, B. W. & Henckaerts, E., 2018 Jul 1, In: Brain. 141, 7, p. 2014-2031 18 p.

**Molecular barcoding of viral vectors enables mapping and optimization of mRNA trans-splicing**

Davidsson, M., Díaz-Fernández, P., Torroba, M., Schwich, O. D., Aldrin-Kirk, P., Quintino, L., Heuer, A., Wang, G., Lundberg, C. & Björklund, T., 2018 May 1, In: RNA. 24, 5, p. 673-687 15 p.

**Chemogenetic modulation of cholinergic interneurons reveals their regulating role on the direct and indirect output pathways from the striatum**

Aldrin-Kirk, P., Heuer, A., Ottosson, D., Davidsson, M., Mattsson, B. & Björklund, T., 2018 Jan, In: Neurobiology of Disease. 109, p. 148-162 109.

**Repairing the brain: Gene therapy**

Björklund, T., 2018, In: *Journal of Parkinson's Disease*. 8, s1, p. S123-S130

**A novel process of viral vector barcoding and library preparation enables high-diversity library generation and recombination-free paired-end sequencing**

Davidsson, M., Diaz-Fernandez, P., Schwich, O. D., Torroba, M., Wang, G. & Björklund, T., 2016 Nov 22, In: *Scientific Reports*. 6, 37563.

**Identification of multiple QTLs linked to neuropathology in the engrailed-1 heterozygous mouse model of Parkinson's disease**

Kurowska, Z., Jewett, M., Brattås, P. L., Jimenez, I., Kenéz, X., Björklund, T., Nordström, U., Brundin, P. & Swanberg, M., 2016 Aug 23, In: *Scientific Reports*. 6, 31701.

**DREADD Modulation of Transplanted DA Neurons Reveals a Novel Parkinsonian Dyskinesia Mechanism Mediated by the Serotonin 5-HT<sub>6</sub> Receptor**

Aldrin-Kirk, P., Heuer, A., Wang, G., Mattsson, B., Lundblad, M., Parmar, M. & Björklund, T., 2016 Jun 1, In: *Neuron*. 90, 5, p. 955-968 14 p.

**Cellular Barcoding Links B-1a B Cell Potential to a Fetal Hematopoietic Stem Cell State at the Single-Cell Level**

Kristiansen, T. A., Jaensson Gyllenbäck, E., Zriwil, A., Björklund, T., Daniel, J. A., Sitnicka, E., Soneji, S., Bryder, D. & Yuan, J., 2016, In: *Immunity*. 45, 2, p. 346-357 12 p.

**Expression of Multiple Functional RNAs or Proteins from One Viral Vector.**

Björklund, T., 2016, In: *Methods in Molecular Biology*. 1382, p. 41-56

**Direct evidence of Parkinson pathology spread from the gastrointestinal tract to the brain in rats.**

Holmqvist, S., Chutna, O., Bousset, L., Aldrin-Kirk, P., Li, W., Björklund, T., Wang, Z.-Y., Roybon, L., Melki, R. & Li, J.-Y., 2014, In: *Acta Neuropathologica*. 128, 6, p. 805-820

**Novel AAV-Based Rat Model of Forebrain Synucleinopathy Shows Extensive Pathologies and Progressive Loss of Cholinergic Interneurons.**

Aldrin-Kirk, P., Davidsson, M., Holmqvist, S., Li, J.-Y. & Björklund, T., 2014, In: *PLoS ONE*. 9, 7, e100869.

**A novel  $\alpha$ -synuclein-GFP mouse model displays progressive motor impairment, olfactory dysfunction and accumulation of  $\alpha$ -synuclein-GFP.**

Hansen, C., Björklund, T., Petit, G., Lundblad, M., Murmu, R., Brundin, P. & Li, J.-Y., 2013, In: *Neurobiology of Disease*. 56C, April,30, p. 145-155

**Continuous DOPA synthesis from a single AAV: dosing and efficacy in models of Parkinson's disease.**

Cederfjäll, E., Nilsson, N., Sahin, G., Chu, Y., Nikitidou, E., Björklund, T., Kordower, J. H. & Kirik, D., 2013, In: *Scientific Reports*. 3, 2157.

**Design of a Single AAV Vector for Coexpression of TH and GCH1 to Establish Continuous DOPA Synthesis in a Rat Model of Parkinson's Disease.**

Cederfjäll, E., Sahin, G., Kirik, D. & Björklund, T., 2012, In: *Molecular Therapy*. 20, 7, p. 1315-1326

**Dysregulated dopamine storage increases the vulnerability to alpha-synuclein in nigral neurons**

Ulusoy, A., Björklund, T., Buck, K. & Kirik, D., 2012, In: *Neurobiology of Disease*. 47, 3, p. 367-377

**Gene therapy for Parkinson's disease shows promise.**

Björklund, A. & Björklund, T., 2011, In: *Science Translational Medicine*. 3, 79, p. 79ed1

**Mutant huntingtin causes metabolic imbalance by disruption of hypothalamic neurocircuits.**

Hult Lundh, S., Soyulu, R., Björklund, T., Belgardt, B. F., Mauer, J., Brüning, J. C., Kirik, D. & Petersén, Å., 2011, In: Cell Metabolism. 13, 4, p. 428-439

**A General Chemical Method to Regulate Protein Stability in the Mammalian Central Nervous System**

Iwamoto, M., Björklund, T., Lundberg, C., Kirik, D. & Wandless, T. J., 2010, In: Chemistry and Biology. 17, 9, p. 981-988

**Differential Transduction Following Basal Ganglia Administration of Distinct Pseudotyped AAV Capsid Serotypes in Nonhuman Primates**

Dodiya, H. B., Björklund, T., Stansell, J. I., Mandel, R. J., Kirik, D. & Kordower, J. H., 2010, In: Molecular Therapy. 18, 3, p. 579-587

**Gene therapy for dopamine replacement.**

Björklund, T., Cederfjäll, E. & Kirik, D., 2010, In: Progress in Brain Research. 184, p. 221-235

**Gene therapy for Parkinson's disease.**

Björklund, T. & Kordower, J. H., 2010, In: Movement Disorders. 25 Suppl 1, p. S161-S173

**Optimized adeno-associated viral vector-mediated striatal DOPA delivery restores sensorimotor function and prevents dyskinesias in a model of advanced Parkinson's disease.**

Björklund, T., Carlsson, T., Cederfjäll, E., Carta, M. & Kirik, D., 2010, In: Brain. 133, Pt 2, p. 496-511

**Dose Optimization for Long-term rAAV-mediated RNA Interference in the Nigrostriatal Projection Neurons.**

Ulusoy, A., Sahin, G., Björklund, T., Aebischer, P. & Kirik, D., 2009, In: Molecular Therapy. 17, p. 1574-1584

**Gene therapy by enzyme replacement for Parkinson's disease Optimization of continuous DOPA delivery and development of a candidate vector for clinical application**

Björklund, T., 2009, Lund University. 204 p.

**Gene therapy for dopamine replacement in Parkinson's disease.**

Björklund, A., Björklund, T. & Kirik, D., 2009, In: Science Translational Medicine. 1, 2, p. 2ps2

**Optimization of continuous in vivo DOPA production and studies on ectopic DA synthesis using rAAV5 vectors in Parkinsonian rats**

Björklund, T., Hall, H., Breyse, N., Sonesson, C., Carlsson, T., Mandel, R. J., Carta, M. & Kirik, D., 2009, In: Journal of Neurochemistry. 111, 2, p. 355-367

**Positron Emission Tomography Imaging Demonstrates Correlation between Behavioral Recovery and Correction of Dopamine Neurotransmission after Gene Therapy**

Leriche, L., Björklund, T., Breyse, N., Besret, L., Gregoire, M.-C., Carlsson, T., Dolle, F., Mandel, R. J., Déglon, N., Hantraye, P. & Kirik, D., 2009, In: The Journal of Neuroscience. 29, 5, p. 1544-1553

**Scientific rationale for the development of gene therapy strategies for Parkinson's disease.**

Björklund, T. & Kirik, D., 2009, In: Biochimica et Biophysica Acta - Molecular Basis of Disease. 1792, 7, p. 703-713

**Applications of lentiviral vectors for biology and gene therapy of neurological disorders.**

Lundberg, C., Björklund, T., Carlsson, T., Jakobsson, J., Hantraye, P., Déglon, N. & Kirik, D., 2008, In: Current Gene Therapy. 8, 6, p. 461-473

**Future Cell- and Gene-Based Therapies for Parkinson's Disease**

Björklund, T., Morizane, A., Kirik, D. & Brundin, P., 2008, *Therapeutics of Parkinson's Disease and Other Movement Disorders*. Hallett, M. & Poewe, P. (eds.). John Wiley & Sons Inc., p. 145-156

#### **In vivo gene delivery for development of mammalian models for Parkinson's disease**

Ulusoy, A., Björklund, T., Hermening, S. & Kirik, D., 2008, In: *Experimental Neurology*. 209, 1, p. 89-100

#### **Long-term consequences of human alpha-synuclein overexpression in the primate ventral midbrain.**

Eslamboli, A., Romero-Ramos, M., Burger, C., Björklund, T., Muzyczka, N., Mandel, R. J., Baker, H., Ridley, R. M. & Kirik, D., 2007, In: *Brain*. 130, 3, p. 799-815

#### **Restoration of the striatal dopamine synthesis for Parkinson's disease: viral vector-mediated enzyme replacement strategy.**

Carlsson, T., Björklund, T. & Kirik, D., 2007, In: *Current Gene Therapy*. 7, 2, p. 109-120

#### **Morphometric and psychometric comparisons between non-substance-abusing patients with posttraumatic stress disorder and normal controls**

Emdad, R., Bonekamp, D., Sondergaard, H. P., Björklund, T., Agartz, I., Ingvar, M. & Theorell, T., 2006, In: *Psychotherapy and Psychosomatics*. 75, 2, p. 122-132

#### **Imaging in cell-based therapy for neurodegenerative diseases.**

Kirik, D., Breyse, N., Björklund, T., Besret, L. & Hantraye, P., 2005, In: *European Journal of Nuclear Medicine and Molecular Imaging*. 32, Suppl 2, p. S417-S434

## **Awards**

#### **Utveckling av artificiell intelligens för att kartlägga molekylära mekanismer i den mänskliga hjärnan vid Parkinsons sjukdom**

Björklund, T. (PI)

The Swedish Parkinson Foundation, Parkinsonfonden: SEK232,500.00

2025/11/05 → 2027/04/30