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The Miami Project: Current Initiatives to Restore Function After Spinal Cord Injury (SCI)

Overview

The **Miami Project to Cure Paralysis** at the University of Miami Miller School of Medicine conducts an extensive program of **research, clinical trials and translational initiatives** aimed at enabling people with spinal cord injuries (SCI) to regain function. Research spans **molecular and cellular therapies, neuroprotection, neuromodulation, brain–computer interfaces, nutrition and metabolism, pain relief, fertility, and lifestyle interventions**. An integrated recruitment platform (ONENESS) and collaborations with industry, including Neuralink, accelerate the translation of these efforts into clinical trials and patient-centred therapies. Below is a comprehensive summary of the project's current activities as of February 2026.

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1 Regenerative/Cellular Therapies and Neuroprotection

1.1 Schwann Cell Transplantation and Stem-Cell Approaches

- **Schwann cell therapy:** The Miami Project pioneered the use of **autologous Schwann-cell transplants**. After removal from a patient's own peripheral nerve, cells are expanded and surgically inserted into the injured spinal cord to **promote axonal regeneration and remyelination**. Early phase clinical trials demonstrated safety, and the project is preparing for **phase II trials**. Current efforts focus on improving survival and integration by delivering the cells within **biomimetic matrices**; a DoD-funded collaboration with **Gel4Med** uses a hydrogel to enhance Schwann-cell survival [1].
- **Stem-cell–derived oligodendrocytes:** Researchers are developing human stem cells into oligodendrocytes to replace lost myelinating cells and foster regrowth [2].
- **Chromaffin cell transplantation:** By transplanting chromaffin cells, which release endogenous pain-relieving peptides, the project explores a strategy to alleviate neuropathic pain [2].
- **Exosome therapies:** A 2024 DoD grant funds investigations of **Schwann-cell–derived exosomes** as a cell-free therapy to enhance regeneration and modulate inflammation [3].

1.2 High-Content Screening for Axon Regeneration

The neuroregeneration team uses **high-content screening** to identify drugs and genetic modifiers that stimulate axonal growth [4]. This large-scale screening informs the design of combination therapies and allows identification of promising compounds for translation to animal models.

1.3 Neuroprotection and Targeted Hypothermia

Immediately after injury, secondary cascades can worsen tissue damage. Miami Project researchers investigate **neuroprotective strategies** including **anti-inflammatory drugs** and **mild to moderate hypothermia** to reduce structural damage [5]. A current clinical trial (Systemic Hypothermia in Acute Cervical SCI) employs **intravascular temperature management** to induce hypothermia in newly

injured patients [6]. Parallel work explores **targeted temperature management** integrated with surgical decompression and cell-based therapies to maximise protection [7].

1.4 Traumatic Brain Injury and Neurodegenerative Disease

Research on **traumatic brain injury (TBI)** examines inflammatory changes and uses **mild to moderate hypothermia** to prevent post-traumatic epilepsy; trials also evaluate the oxygen-carrying blood supplement **Oxycyte** [8]. Lessons from acute injury are being applied to **neurodegenerative diseases**, where misfolded proteins lead to chronic damage [9].

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2 Neuromodulation and Neuroplasticity

2.1 Spinal Cord Stimulation (SCS)

The Miami Project is a leading centre for neuromodulation research. Scientists study **epidural stimulation (lumbosacral electrodes)**, **deep-brain stimulation**, and especially **transcutaneous spinal cord stimulation (tSCS)**. tSCS uses surface electrodes on the skin to deliver electrical pulses that **activate residual circuits and enhance voluntary control of muscles** [10]. Combined with intensive rehabilitation, SCS aims to improve walking, hand/arm function and autonomic functions.

The project participates in **Up-LIFT (Upper Limb and Inclusive Functional Transformation)**, a multinational clinical trial that pairs **transcutaneous stimulation** with upper-extremity rehabilitation. Early results show that participants with cervical SCI experienced **improvements in hand/arm strength and dexterity** [10]. Additional neuromodulation studies funded by the 2024 DoD grant include:

1. **Arm/hand function:** combining tSCS with brain-computer interfaces for precise activation of motor pools [3].
2. **Brain-signal–driven locomotor stimulation:** using cortical signals to trigger lumbar spinal circuits and improve walking [3].
3. **Vagal nerve stimulation for glycaemic control:** exploring transcutaneous vagus-nerve stimulation to improve autonomic regulation [3].

2.2 Intent-Driven Neuromodulation

Researchers like **Matija Milosevic** develop **brain-controlled neuromodulation** systems that decode a user's intent through non-invasive electroencephalography (EEG) and drive spinal stimulation at the appropriate moments. This **intent-driven neuromodulation** harnesses the remaining neural circuits to restore movement and has been demonstrated to restore voluntary limb control when paired with physical therapy [11]. Presentations at the 2026 "Science of Hope" open house highlighted these systems and showcased **quantitative sensory testing** and **spinal cord stimulation for hand and arm function**【668869895502461†L136-L177】.

2.3 Therapeutic BCI Neuromodulation

A key theme emerging from the 2025 **Bridging Minds and Machines** retreat is **therapeutic brain–computer interface (BCI) neuromodulation**. Miami Project investigators, such as **Abhishek Prasad** and **Jonathan Jagid**, are developing implantable BCIs that decode motor intent and drive spinal or peripheral stimulation in closed-loop fashion. These **wireless BCIs** aim to enable home use and have improved hand function and walking when combined with closed-loop spinal stimulation [12]. The

retreat also discussed **magnetoelectric nanoparticles** for wireless stimulation, ensuring that future neuroprosthetics could be miniaturised and less invasive [12].

2.4 Deep Brain Stimulation and Vagus-Nerve Stimulation

Deep-brain stimulation (DBS) of thalamic and mesencephalic nuclei is being investigated to restore postural control and locomotion. Additionally, **vagus-nerve stimulation (VNS)** is used for **targeted plasticity therapy**. The project runs a **five-year multicentre clinical trial** combining VNS with rehabilitation to improve upper-limb function after SCI. Early studies in animals showed that pairing vagus-nerve activation with movement triggers synaptic plasticity in the spinal cord and cortex; this approach is now being tested in humans [13].

2.5 Neuroplasticity and Rehabilitation

Beyond electrical stimulation, the neuroplasticity group studies how **rehabilitation and exercise** shape synaptic connections. By designing **task-specific training** and combining it with **pharmacologic or electrical interventions**, scientists aim to strengthen spared neural pathways [14]. The program also analyses how **passive exercise and stretching** mitigate spasticity and integrates neurophysiological measurements to personalise therapy [15].

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3 Brain–Computer Interfaces (BCIs) and Neuralink PRIME Trial

3.1 Neuralink PRIME Study and Human Implantations

In **January 2025** The Miami Project was selected as one of two U.S. sites for **Neuralink's PRIME trial**. The trial evaluates the **N1 implant**—a coin-sized device with ultrathin threads—and the **R1 surgical robot** capable of inserting these threads into the motor cortex [16]. The goal is to allow people with quadriplegia or ALS to **control computers and external devices using only their thoughts**.

In **June 2025**, a paralyzed U.S. veteran (RJ) became the **first patient** at the Miami Project to receive the Neuralink implant. After surgery performed by **Dr. Jonathan Jagid** and colleagues, RJ was able to control a computer and smartphone with thought, texting his wife from the recovery room [17]. This milestone demonstrates the potential of neural implants to restore autonomy and improve quality of life.

By **December 2025**, progress updates highlighted improvements in the PRIME study: the **threads are thinner than a hair**, the R1 robot uses **AI and computer vision** to avoid blood vessels, and the device provides stable, high-bandwidth brain signals. Panel discussions emphasised neuroethics and patient experiences [18]. Recruitment continues for participants with cervical SCI or ALS [19].

3.2 Other BCI Research

Besides Neuralink, the Miami Project collaborates with other groups to develop **implantable BCIs** for movement restoration, focusing on **stable, wireless systems** for at-home use [12]. Researchers also explore **non-invasive BCIs** (EEG-based) integrated with tSCS for restoring voluntary control [11]. The integration of BCIs with neuromodulation is a major thrust for future therapies.

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4 Nutrition, Metabolism and Exercise

4.1 Nutrition and Supplementation Studies

Nutrition researchers examine how **caloric intake and supplementation** influence recovery after SCI. Clinical studies combine **nutritional interventions** with physical rehabilitation and have found that **adequate calorie intake** significantly affects recovery, leading to improved outcomes [20]. Trials test supplements such as amino acids, creatine and vitamins to enhance muscle mass, reduce fatigue and support immune function.

4.2 Metabolic and Cardiovascular Health

Dr. Mark Nash and colleagues spent decades investigating **exercise and cardiometabolic risk** in SCI. They developed **exercise guidelines** and holistic wellness programs to combat obesity, diabetes and cardiovascular disease. Their research emphasises combining **neuromodulation with metabolic conditioning**, and continuing work involves **metabolic electrical stimulation** to mimic exercise by activating muscle contractions in paralyzed limbs [21]. Ongoing studies evaluate how **active and passive exercise** influences body composition, insulin sensitivity and autonomic function.

4.3 Lifestyle and Mindfulness Programs

The Miami Project promotes **lifestyle interventions**—physical activity, good nutrition, stress management and mindfulness—to improve overall health and function. They run programs to identify the best ways for people with SCI and their caregivers to integrate healthy behaviours into daily routines [22]. Clinical trials test educational modules designed to **mitigate early cardiovascular and endocrine health risks** in newly discharged patients [23].

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5 Pain Management, Sensory Research and Spasticity

5.1 Neuropathic Pain Therapies

Neuropathic pain is common after SCI. The Miami Project's **pain research group** studies the **cellular mechanisms of neuropathic pain** and seeks **cell-based and pharmacologic therapies** to relieve it [24]. They examine how spinal cord stimulation, vagus-nerve stimulation and **magnetoelectric nanoparticles** might alleviate pain [12]. Some projects use **bodily-illusion techniques** (e.g., virtual reality to manipulate perception) to manage pain【668869895502461†L136-L177】.

5.2 Sensory Testing and Quantification

Laboratories perform **quantitative sensory testing** to understand tactile, thermal and vibration thresholds in people with SCI. These measurements help evaluate the efficacy of neuromodulation and rehabilitation interventions and were showcased during the 2026 open house【668869895502461†L136-L177】.

5.3 Spasticity and Motor Control

Research on **spasticity** involves characterising abnormal muscle activity and testing medications, passive exercise and stretching to control spasms [15]. Detailed neurophysiological studies map excitability changes in spinal circuits to guide personalised treatments.

6 Male Fertility and Family Planning

The Miami Project houses a pioneering **male fertility program** led by Dr. **Nancy Brackett**. SCI can impair ejaculation and sperm motility. Researchers developed **penile vibratory stimulation** to induce ejaculation, and they provide techniques such as **electroejaculation** or **surgical retrieval** when needed. They discovered that **inflammatory proteins in semen** contribute to low sperm motility, prompting development of treatments to improve sperm quality [25]. The fertility clinic has enabled the birth of **more than 200 babies** to men with SCI [25]. Ongoing research explores sperm banking, assisted reproductive technologies and clinician education.

7 Clinical Trials, Recruitment and Infrastructure

7.1 Active Clinical Trials

The Miami Project maintains a large portfolio of clinical trials. Besides the trials mentioned above (Neuralink PRIME, systemic hypothermia, Up-LIFT), other examples include:

Trial focus	Purpose and status	Reference
SCI Registry (NACTN)	A registry to collect **data on natural recovery** to inform future trial design [26].	Data collection ongoing
Adaptive ocean activities	Study testing if adapted surfing improves psychosocial well-being and physical fitness in people with SCI [27].	Recruiting
Nerve transfers and reconstructive surgery	Examines the outcomes of upper-extremity nerve transfer surgeries for restoring hand and arm function [28].	Recruiting
Pain and cognition study	Investigates the interplay between chronic pain and cognitive impairment after SCI [29].	Recruiting
Body composition vs. pain	Evaluates whether changes in body composition influence neuropathic pain, addressing the role of obesity and metabolic health [29].	Recruiting
Education module for cardio-endocrine health	Tests an educational intervention to reduce early cardiovascular risks post discharge [23].	Recruiting
In vitro fertilization outcomes	Assesses semen quality and fertilization outcomes among men with SCI [29].	Recruiting

7.2 ONENESS Research Solution and Clinical Trial Recruitment

To accelerate recruitment, The Miami Project developed **ONENESS**, a platform that integrates electronic medical records from **UHealth** and **Jackson Health System**. It allows researchers to **match patients to clinical trials** based on injury characteristics and comorbidities. ONENESS provides de-identified data

for cohort analyses and can re-identify eligible participants for consent and enrolment [30] [31]. This system speeds up research and ensures representation of diverse patient populations.

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8 Knowledge Translation and Community Engagement

8.1 Open House and Educational Events

The Miami Project hosts annual open-house events, such as the **Science of Hope** (2026) and **Bridging Minds and Machines** (2025) gatherings. These events present research updates, invite participants to tour laboratories and highlight new findings—ranging from **regenerative strategies** and **intent-driven neuromodulation** to **gut-brain axis studies** and **pain management techniques** 【668869895502461†L136-L177】 [12].

8.2 Partnerships and Funding

The project collaborates with government agencies (DoD, NIH, VA), philanthropic donors and corporate partners such as **Neuralink** and **Gel4Med**. A 2024 DoD grant ($1.7 million) funds six projects on **drug screening, Schwann-cell exosomes, neuromodulation and biomarker diagnostics** [3]. Philanthropic contributions support infrastructure like the **Christine E. Lynn Rehabilitation Center**, opened in 2020, providing state-of-the-art rehabilitation and research space [32].

Conclusion

As of early 2026, The Miami Project to Cure Paralysis pursues a **multifaceted strategy** to help individuals with spinal cord injuries regain function. Efforts encompass **cellular therapies** (Schwann cells, stem cells, exosomes), **neuroprotection** and **hypothermia** protocols, **advanced neuromodulation** (tSCS, epidural stimulation, deep-brain and vagus-nerve stimulation), **brain–computer interfaces** (including Neuralink's PRIME trial), **nutrition and metabolic conditioning**, **pain management**, **fertility** services, and **comprehensive rehabilitation and lifestyle programs**. Clinical trials and the ONENESS recruitment platform ensure that discoveries translate quickly to patients. Through integration of engineering, biology and clinical sciences, the Miami Project continues to push the boundaries of neurorehabilitation and offers hope that people living with SCI can recover meaningful motor and autonomic functions.

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