MAKING THE IMPOSSIBLE POSSIBLE

CENTER FOR REGENERATIVE MEDICINE
Millions of people worldwide suffer from deadly diseases, chronic conditions and congenital disorders that today have no cure. Using currently available conventional medical practices, health care workers often can only treat the symptoms of patients whose lives are shortened or permanently altered by heart failure, Alzheimer’s disease, spinal-cord injuries, diabetes, and myriad other afflictions.

The rise of Regenerative Medicine is transcending traditional treatment limitations and transforming health care.

WITH BENEFACCTOR SUPPORT, WE ARE HARNESSING NEW DISCOVERIES ABOUT THE BODY’S OWN HEALING POWERS.

Mayo Clinic’s Center for Regenerative Medicine physicians and researchers are developing next-generation therapies and surgical procedures to finally defeat the most feared diseases and cure the most intractable conditions.
REVOLUTIONIZING MEDICINE

Mayo Clinic — the world’s most trusted name in medical research, patient care and education — leads the nation in the number of solid organ and bone marrow transplants performed annually. Through its Regenerative Medicine initiative, Mayo Clinic is building on that success to address unmet needs by replacing, rejuvenating, and regenerating cells, tissues, and organs in patients’ bodies to ensure structural and functional repair.

This revolution in health care requires the support of visionary benefactors committed to transforming the future of medicine. Through benefactor generosity, Mayo Clinic will endure as the premier destination at the vanguard of patient care. And the Center for Regenerative Medicine will stand at the forefront in the research and practice of definitive medical and surgical solutions for diseases and conditions that for too long have been considered incurable.

The diffusion of this new knowledge and clinical practice will be profound, improving worldwide standards of care, invigorating education across the globe, and eventually extending healthy lifespans for people around the world.

HEALING FROM WITHIN

At a time when millions around the globe suffer from pandemics that have no cure, the world stands on the threshold of a new age in health care.

Conventional medical standards and practices often fail to address the root causes of chronic conditions such as heart disease, cancer, and diabetes. With its potential restorative powers, Regenerative Medicine is transforming health care by addressing their root causes, offering targeted preventive and curative treatments.
> MAYO CLINIC REGENERATIVE MEDICINE PROJECTS
SPANN THE SPECTRUM:

- **ACCELERATED REGENERATIVE MEDICINE CLINICAL TRIALS**
  These ongoing trials are specifically developed for patients with neurodegenerative diseases, heart failure, peripheral vascular disease, congenital heart disease, and kidney disease.

- **GROWING NEW ORGANS**
  Using a patient’s own cells, whole new organs, such as the lung, are being reconstructed. And because the cells start with the patient, rejection isn’t an issue, which ends the need for a lifetime regimen of immunosuppressant drugs.

- **CONSTRUCTING SCAFFOLDS**
  Using donor tissue and biodegradable synthetics, researchers are building bioscaffolds to construct new organs and support regenerative outcomes.

- **DEVELOPING BIOLOGICAL HEART VALVES**
  After cells are removed from a donor heart — a process called decellularization — the cell-free tissue scaffold that remains is populated with cells derived from the patient. These specially engineered cells regrow within the scaffold, creating a new, patient-specific heart valve that would replace the patient’s damaged valve.

- **DEVELOPING SMART STEM CELLS**
  This innovation guides adult stem cells, isolated from the patient’s bone marrow or fat, to become another tissue, for example new heart-like tissue or new bone. Through this technique, we have successfully treated patients with heart failure following a heart attack.

- **BIOENGINEERING STEM CELLS**
  One method takes skin cells called fibroblasts and reprograms them into induced pluripotent stem (iPS) cells, which can differentiate into virtually any tissue in the body.

- **DEVELOPING INSULIN-PRODUCING CELLS**
  One technique first converts a patient’s skin or blood cells into iPS cells in the laboratory to produce new glucose-responsive, insulin-producing cells. Once fully optimized, such cells may enable a novel therapy for diabetes.

- **DEVELOPING PATIENT-SPECIFIC LIVER CELL TRANSPLANTATION**
  With this approach, researchers convert patient cells into iPS cells, then into liver-like cells. During the process, gene therapy corrects the underlying defect that caused the disease. Researchers envision transplanting the cells into a bioengineered liver, where they can grow into fully functioning, patient-specific adult liver cells that could be transplanted back into the patient to regenerate the liver.

- **REBUILDING LIMBS**
  Researchers are developing models to study stem cell repopulation of a limb from which all the cells have been removed. Doctors also are reconstructing several hand and facial anomalies, such as those of the nose and ear.
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> A NEW VISION FOR HEALTH CARE
The medical implications of this work are limitless. We can now imagine providing new blood cells for patients with leukemia, healthy neurons for those afflicted by stroke, Alzheimer’s, or Parkinson’s, restorative pancreatic cells for people with diabetes, stem cells trained to become new heart tissue, and much more. Where we’re going:

**VALVULAR HEART DISEASE**
- **Current Treatment:** Surgery or valve replacement
- **Future Treatment:** Populate a scaffold using patient’s own cells to build a patient-specific valve

**LUNG FAILURE**
- **Current Treatment:** Transplant organ from donor
- **Future Treatment:** Grow lung in lab using patient’s own cells

**PARALYSIS FROM TRAUMA**
- **Current Treatment:** No current treatment
- **Future Treatment:** Regrow nerves to restore function and sensation

**LIVER DISEASE**
- **Current Treatment:** Transplant organ from donor
- **Future Treatment:** Use remaining healthy liver cells to build a patient-specific bioartificial liver

**AMYOTROPHIC LATERAL SCLEROSIS (ALS, OR LOU GEHRIG’S DISEASE)**
- **Current Treatment:** No current treatment
- **Future Treatment:** Apply stem cells to restore neural function

**HEART FAILURE**
- **Current Treatment:** Implant mechanical device to assist damaged heart
- **Future Treatment:** Inject stem cells harvested from patient to heal damaged tissue

**DIABETES**
- **Current Treatment:** Insulin maintenance
- **Future Treatment:** Gene and cell therapy to generate functional beta cells, critical to insulin regulation

**OSTEONECROSIS OF THE HIP**
- **Current Treatment:** Total hip replacement
- **Future Treatment:** Hip decompression in which progenitor cells taken from patient’s bone marrow are delivered to hipbone to restore function

**TRANSPLANTATION**
- **Current Treatment:** Transplant organ from donor
- **Future Treatment:** Build a new organ from tissue harvested from the patient’s skin
WHAT ROLE DO STEM CELLS PLAY IN REGENERATIVE MEDICINE?

Through a process called differentiation, stem cells have the ability to develop into many types of cells, such as heart cells, brain cells and lung cells. Stem cells are a key component of Regenerative Medicine, as they open the door to new clinical applications that can heal the body from within.

At Mayo Clinic, Regenerative Medicine teams are studying a variety of stem cells, especially natural mesenchymal stem cells, bioengineered iPS cells and various specialized tissue progenitor cells, which are more specific than stem cells but retain the ability to differentiate into specific types of cells. Each type has unique qualities, with some being more versatile than others.

How Mayo Clinic teams acquire and refine stem cell products is revolutionizing the field. Stems cells are derived from various sources, including bone marrow, skin, blood, and fat. In fact, many regenerative therapies under development at Mayo Clinic begin with a patient’s own cells, which we program to display unique features to treat the patient’s specific disease. A major advantage of these cells is the immune system won’t mount an attack (as they do with traditional transplant) because the cells originate with the patient.
VISIONARY BENEFACTORS ARE CATALYSTS TO THE FUTURE OF MEDICINE

Benefactors of the Center of Regenerative Medicine are co-visionaries who help make the once unimaginable a reality. They help fuel pioneering medical research, world-class patient-centered care, and unrivaled educational programs.

As government continues to reduce funding for research, industry grows increasingly reluctant to fund high-risk, high-reward work that offers no guarantee of profits. But with your help, Mayo Clinic will fast-track the translation of innovations and discoveries into medical practice. And because Regenerative Medicine places a premium on solving the most serious and intractable medical problems today, benefactors will be contributing to discoveries that could immediately improve medical practice and patients’ lives.

Catalyzed through the Center for Regenerative Medicine, an initiative designated as a strategic priority by the Mayo Clinic Board of Governors, the world’s finest teams of scientists, engineers, and physicians are spearheading state-of-the-art Regenerative Medicine discovery. With your support, the Center for Regenerative Medicine will drive advances developed at Mayo Clinic nationally and internationally.
Regenerative Medicine at Mayo Clinic harnesses its collective knowledge, resources, and skills to teach the body to heal from within. This unprecedented science offers patients hope and definitive solutions for devastating diseases and conditions. This top strategic priority at Mayo Clinic charts a new course in health care by developing tomorrow’s curative therapies and launching groundbreaking surgical procedures.

The pandemic of chronic diseases continues to spread as conventional medical standards and practices often fail to address the root causes of major health conditions. Newfound knowledge instilled through Regenerative Medicine offers innovative strategies for replacing, renewing, and restoring the structure and function of organs, tissues, and cells in patients’ bodies.

Unlike any other medical approach, Regenerative Medicine transcends the confines of traditional treatments to transform health care by developing cures for patients with limited or no options. Because Regenerative Medicine is the forefront of health care, we ask our benefactors to serve as co-visionaries who imagine the unimaginable.