*Dream. Discover.* Cure.

Groundbreaking research, including innovative stem and cellular therapies,
to combat cancer, blood diseases and other life-threatening disorders.

# Extending the Promise of Stem Cell Research

This year, one in 350 children under 18 will be diagnosed with cancer. In 1975, the cure rate was only 20 percent. Through innovative clinical and basic research, the cure rate of childhood cancer now exceeds 70 percent. While this progress continues to amaze us, one of the most promising effects of this research is its useful application to the treatment of adult cancer and other adult diseases.

One important area of study beginning to yield results is stem cell research. Stem cell therapy utilizing bone marrow, peripheral blood or cord blood has provided cures for childhood and adult cancer, blood disorders and immune diseases that were previously thought to be lethal. Current stem cell research is bearing real promise in each of these clinical disorders and additional conditions such as heart disease, diabetes, neurodegenerative diseases and others.

For over 25 years, Dr. Mitchell Cairo, Chief, Division of Pediatric Blood and Marrow Transplantation, and Professor of Pediatrics, Medicine and Pathology at Columbia University, has led these internationally groundbreaking research initiatives in childhood cancer, blood disorders and immune deficiencies. The work Dr. Cairo is doing today with childhood cancers is also believed to have real potential in the search for the treatment and cure of adult cancers and life-threatening diseases.

Since 2007, a fundraising effort called “Dreaming for Discovery and Cure” has been mounted by the people who have been profoundly touched by the science and compassion provided by Dr. Cairo and his team. These people include family and friends of children who have battled these diseases, philanthropists, and members of the medical and scientific community of Columbia University and the Morgan Stanley Children’s Hospital of NewYork-Presbyterian. We are now united in providing the resources to enable this necessary research to flourish and grow.

By bringing your support and making financial commitments, you can help more children and adults win their battle with cancer and other lethal conditions. Financial contributions are used principally to fund the researchers and fellows on Dr. Cairo’s team at Columbia University.

# The Road to Discovery

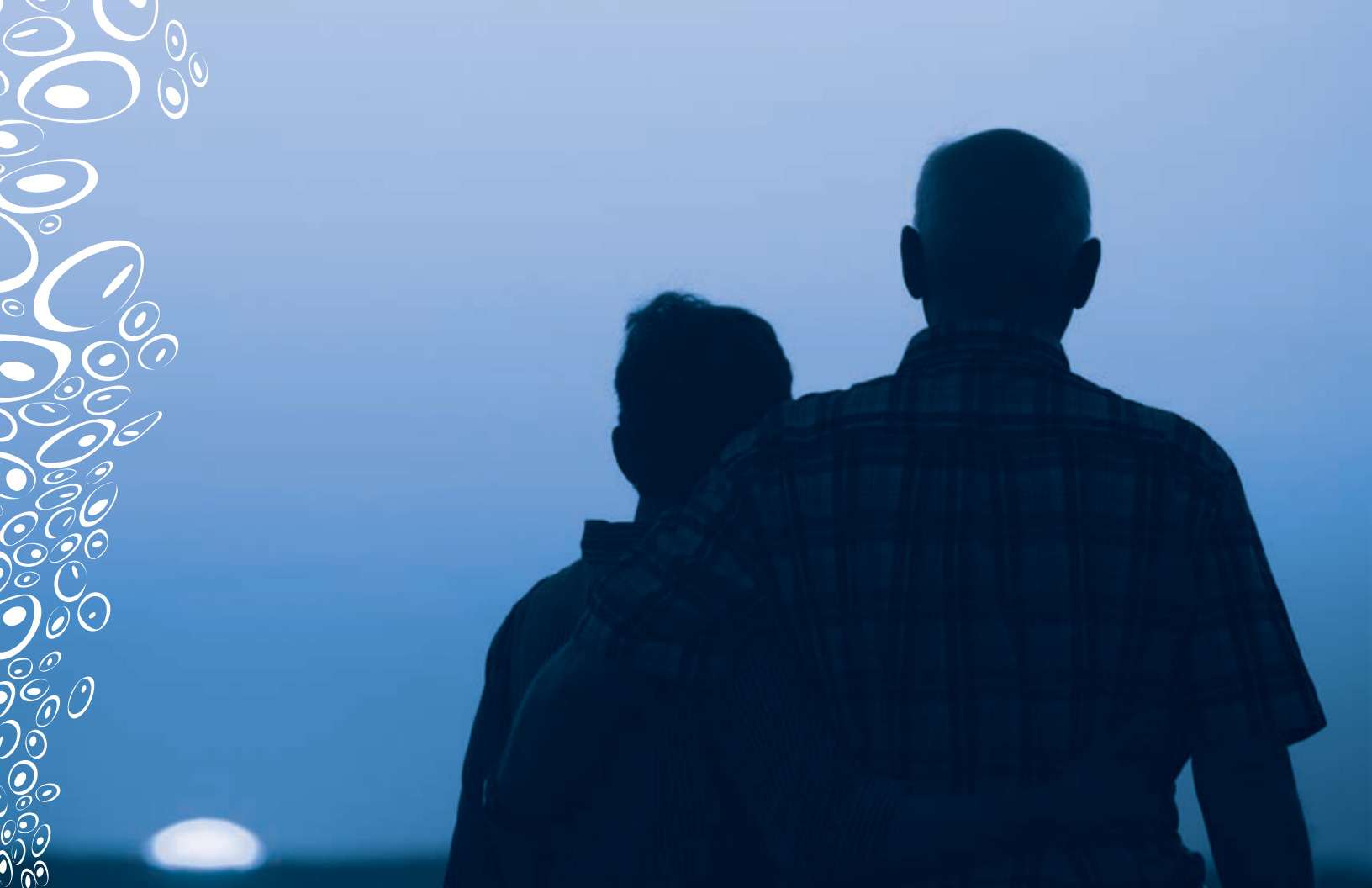
**We feel it is important for our current and future supporters to know about the breakthroughs we have already made and the promising therapies on the horizon.**

**With your support, we can accelerate these efforts. The following highlights are but a few of the ways in which we can achieve our dream of discovery and cure:**

# Targeted Cellular and Antibody Cancer Immunotherapy

## Immune (Natural Killer) Cells

Expanding and activating unique populations of immune cells (natural killer cells) is an innovative new strategy to attack chemotherapy-resistant cancer cells. We have successfully developed techniques to expand and activate natural killer cells from both cord blood and peripheral blood. We have also engineered these natural killer cells to express certain receptors on their cell surface to enhance and promote their ability to kill cancer cells. We are developing approaches that will further expand and specialize these natural killer immune cells to specifically target and kill hematological cancers and solid tumors. Further studies are also in progress to engineer tumor cells to make them more susceptible to killing by natural killer cells. As tumor cells become resistant to chemotherapy, alternative approaches are required to circumvent chemotherapy resistance and kill the tumor cells through different mechanisms.



## Discovery of the Unique Properties of Cord Blood and Stem Cells

Our laboratory continues to unravel the clues of the unique properties of cord blood and stem cells by genetics and proteomics. We have determined and compared the genetic signature patterns and examined the unique gene expression profiles and protein expression of several populations of immune cells and stem cells in adult peripheral blood versus cord blood.

We compared the gene expression profiling in adult peripheral and cord blood immune cells after stimulation and found several genes significantly amplified in peripheral versus cord blood, including cytokine and cytokine receptor genes and immunoregulatory genes. Analysis of the cord blood and adult peripheral blood immune cellular proteins (proteomics) demonstrated both over- and under-expression of specific proteins in the respective immune cell populations. These results of the differential expression of some of these genes and the global proteomic differences between cord and adult peripheral blood immune cells may provide insights into the differences in their respective immune function.

## Targeted Therapy Utilizing Antibodies

Our research utilizing antibodies for tumor-targeted therapy in children with hematological cancers (Leukemias and Lymphomas) has deservedly received national acclaim. This type of research has been a cornerstone of the ongoing work at the Morgan Stanley Children's Hospital of New York-Presbyterian at Columbia University.

## Reduced-Intensity Conditioning Treatment Prior to Stem Cell Transplantation

We have developed a successful clinical program in children with cancer and other life-threatening blood and immune system disorders. In these clinical trials we are investigating the feasibility and efficacy of a reduced-intensity conditioning treatment regimen prior to an allogeneic stem cell transplant from a matched sibling donor or matched unrelated cord blood or adult donor. This approach is designed to reduce serious complications from standard high-intensity conditioning treatment and to maximize effectiveness after the stem cell transplant.

This clinical and research approach has been successfully utilized in over 70 children and adolescents to date, with a significant reduction in the acute side effects compared to standard high-intensity conditioning. Furthermore, this research has yielded superior results in preventing the child's cancer or blood and immune system disorder from ever returning or becoming more severe after transplantation.

## International Collaboration

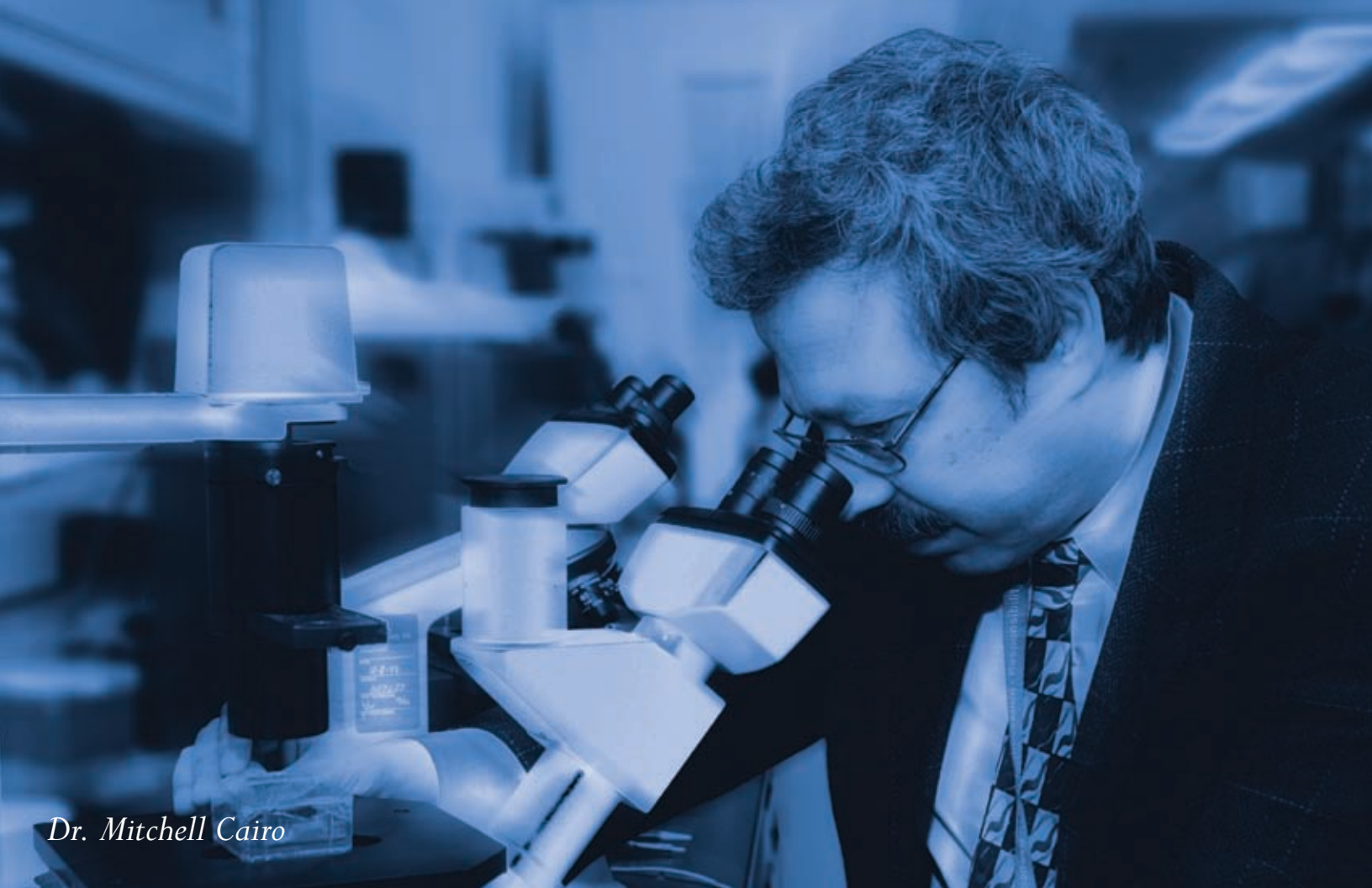
We have led an international effort to investigate the treatment of childhood B-cell non-Hodgkin lymphoma. This clinical research trial involved three international pediatric cancer research groups in nine countries. This research has resulted in cure rates of 80 percent for advanced disease, 90 percent for intermediate-risk disease and 99 percent for low-risk disease. Using the chemotherapy backbone from this research, our group is leading a national study that adds immuno-targeted therapy for childhood B-cell non-Hodgkin lymphoma.

# Hope for the Future:
## Utilization of Stem Cells for Tissue Regeneration

### Cord Blood Regenerative Therapy

A source of stem cells has been recently identified in cord blood. Current research in our laboratory suggests that cord blood stem cells may have the ability to develop to become cells of various tissue lineages. Isolated cord blood cells express substantial levels of genes that denote the molecular signature of primitive stem cells. Recent studies have demonstrated that these cells are capable of improving the blood circulation in organs and tissues affected by stroke, and they can generate other tissues, including bone, cartilage, muscle, liver and nerve cells.

Our laboratory is investigating the basic mechanisms of cord blood stem cell development and devising methods to expand specific cord blood stem cell populations in sufficient numbers for transplantation for the treatment of both hematopoietic and non-hematopoietic diseases for both children and adults.



*Dr. Mitchell Cairo*

Please support our continuing efforts.
Donations can be made online at ***dream-discover-cure.org***
or by mail to:

**Patricia Seraphin, Divisional Administrator**
**Division of Pediatric BMT**
**Columbia University Medical Center**
**3959 Broadway, CHC 10-03**
**New York, NY 10032-3784**

Make out donation checks to **The Trustees of Columbia University**
(Note *Pediatric BMT Program* on memo line)

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Learn more at ***dream-discover-cure.org***

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