Scientific research is a complex endeavor, one that often eludes common understanding. But at Fred Hutchinson Cancer Research Center, the goal of our work is quite clear: to eliminate cancer and other life-threatening diseases. In other words, our research is about you, your health and the health of your loved ones. In this annual report, we feature a number of our most recent and significant scientific discoveries that directly improve medical treatment, cancer detection and disease prevention—research discoveries for health, for life.
MESSAGE FROM THE PRESIDENT AND DIRECTOR

Research in pursuit of the greatest of human blessings

“A WISE MAN SHOULD CONSIDER THAT HEALTH IS THE GREATEST OF HUMAN BLESSINGS, AND LEARN HOW BY HIS OWN THOUGHT TO DERIVE BENEFIT FROM HIS ILLNESSES.”

—HIPPOCRATES, THE FATHER OF MEDICINE

Hippocrates’ words, though written 24 centuries ago, capture the essence of Fred Hutchinson Cancer Research Center: scientific study in the pursuit of improved human health. Our mission—to eliminate cancer and related diseases as causes of human suffering and death through research of the highest standards—is ambitious to be sure. But what endeavor could be more important than improving human health?

Some of the best minds in biomedical research have been drawn to the Hutchinson Center to fulfill this mission. And, as you’ll read in this annual report, they have made many discoveries that have a direct impact on people’s health. These breakthroughs may even touch your life or those of your family and friends.

As a comprehensive cancer center, we study cancer and other diseases on several different fronts—prevention, detection and treatment. In this report, you’ll read about the diverse work by our public health scientists, clinical researchers and basic laboratory scientists. Here are a few highlights:

• The Hutchinson Center’s pioneering efforts in bone marrow transplantation have spawned an entire field of cancer research known as immunotherapy. By harnessing the power of our natural immune system, our researchers are using it with great success, not only to treat leukemia and other blood cancers, but also skin, ovarian, breast, colon and kidney cancers.

• The Center is a leader in the discovery of biomarkers: trace molecules in our blood that can signal the earliest stages of cancer, when it can be treated most successfully. Our scientists have already developed a biomarker blood test that can predict whether a patient’s leukemia will return after treatment. They’ve identified biomarkers for lung, breast, ovarian and prostate cancers. And most recently they’ve discovered a new class of biomarkers—called microRNAs—that have great promise.

• During the last decade, our researchers have become leaders in infectious disease research and vaccine development. The Center is an international hub for research on HIV/AIDS and the testing of vaccine candidates. We also boast some of the world’s most respected pandemic researchers, who build statistical models to predict how infectious disease may spread and be controlled, from swine flu to tuberculosis.

• The Center is home to one of the first, largest and most successful programs devoted to cancer prevention. Many of the disease prevention tips that you’ve read about over the years have come from these talented researchers. They have discovered the scientific underpinnings that explain how exercise, diet and other lifestyle factors can reduce the risk of cancer and other diseases.

Taken individually and as a group, the discoveries in this report represent tremendous progress toward our mission of eliminating cancer and related diseases. Clearly, a goal of this magnitude demands hard work, scientific excellence, breakthrough creativity—all found in abundance at the Hutchinson Center—and significant resources. With your help, we will continue to have an impact on that “greatest of human blessings,” your health.

DR. LEE HARTWELL
President and Director
The amazing cancer-killing immune system

A person’s immune system is truly an amazing sentinel, quickly spotting trouble and doing away with it. It starts with the skin, which keeps most invaders at bay. It continues with complex cells produced deep in the bone marrow that attack and remember unwanted guests.

As effective as it is, the immune system can be overwhelmed by highly specialized enemies such as cancer cells. But what if we could harness the power of the immune system? Could it fight more effectively? Could it beat cancer?

These are some of the questions that drive the work of many scientists at the Hutchinson Center, the epicenter of a field of research known as adoptive immunotherapy. The focus of their research is rare cancer-fighting T-cells found in the blood, which are extracted and multiplied in the lab, and then transplanted into the body. By amassing these armies of T-cells—augmented to find and kill cancer cells—researchers hope to develop a new generation of cancer treatments with better results and far fewer side effects.

Already, our research has shown that adoptive T-cell therapy holds great promise for treating melanoma, an often fatal form of skin cancer. The potential for adoptive T-cell therapy is so strong, our scientists are working to apply it to ovarian, breast, colon and kidney cancers.
CANCER RESEARCH

Tumor paint brings new light to cancer surgery

Treating brain cancer is one of the most challenging undertakings in medicine. Conventional treatments don’t work because a protective barrier prevents nearly all particles from entering the brain, including chemotherapy agents. That means surgeons have to cut into the brain to remove the cancer. But under the naked eye, normal brain cells look identical to tumor cells. Cut too much, the patient may suffer irrevocable damage. Cut too little, the cancer is likely to return.

At the Hutchinson Center—in collaboration with Seattle Children’s and the University of Washington—researchers have found a way to make brain cancer cells as conspicuous as a glowing television in a dark room. This new tool—Chlorotoxin:Cy5.5—is an agent that binds to brain cancer cells and lights them up, making them much easier to see and remove. Nicknamed tumor paint, it’s also showing great potential beyond its ability to light up brain cancer cells.

Researchers are working to develop nanoparticles coated with tumor paint to directly deliver therapeutic drugs to cancer cells, which would spare a patient the painful effects of full-body chemotherapy and radiation.

Tumor paint also shows great promise as an effective noninvasive screening tool for early detection of skin, cervical, esophageal, colon and lung cancers. And it may become an invaluable tool to help detect breast, prostate and testicular cancers at an early stage.

Finding the keys to early detection

Like a fire snuffed out while it’s just a spark, cancer poses less danger if detected early. That’s why our researchers are so determined to pinpoint telltale features within our bodies that signal the earliest stages of diseases—the first wisps of smoke from a potentially catastrophic fire.

Scientists have discovered in recent years that molecules in our blood, known as biomarkers, hold critical information about everything from our risk for diseases to how well our bodies will respond to certain therapies. Continued progress in discovering and decoding these biomarkers will give physicians increasingly powerful tools to find, control and extinguish a wide range of cancers and other diseases.

Already our researchers have developed a blood test that can predict whether leukemia will return after treatment. Another test that can spot lung cancer long before symptoms appear, when cure rates are highest, is in development. They’ve also identified proteins that could improve screening for difficult-to-diagnose ovarian and pancreatic cancers, and predict a woman’s long-term chances of surviving breast cancer.

Scientists at the Center are poised to make new breakthroughs thanks to their recent discovery of a new class of biomarker candidates, known as microRNAs, that are released by cancer cells and could more clearly indicate the presence of early stage tumors. They’re also inventing new methods to speed up the complex process of identifying potential biomarkers and determining their significance.
As difficult as it is to hear, “You’ve got cancer,” it’s even harder to learn that your cancer is no longer responding to treatment. Drug resistance is a major hurdle in chemotherapy and accounts for its failure to cure the majority of cancers.

Hutchinson Center physician-researchers are leading the way to understanding how tumor cells develop the ability to withstand an assault from chemotherapy drugs. They’ve found that cancer cells can do a genetic about-face, reversing the abnormalities that once made them vulnerable to treatment. Our scientists have zeroed in on how cancer cells repair their DNA and how this process interferes with chemotherapy. As they illuminate what causes instability in our genes—a hallmark of most cancers—and discover how our DNA responds to such damage, they’re getting closer to creating drugs that resensitize tumors to cancer therapies.

These researchers also aim to predict how a patient will respond to chemotherapy and tailor their approach for each person. Overcoming resistance to cancer drugs brings us one step closer to hearing those precious words: “You’re cured.”

Two factors are key to successful blood stem cell transplants for patients with leukemia and other blood diseases: matching and multiplication.

A transplant, which replaces the patient’s immune system, depends on the donor stem cells being as similar as possible to the patient’s. Having enough of those precious cells is critical for the transplant to swiftly grow a new immune system. Delays can mean death.

Our scientists are pioneering new techniques to rapidly increase the number of blood-forming stem cells in the lab to speed up the formation of the new immune system after transplantation. Their strategies are breaking down obstacles to important new therapies.

The researchers either enhance stem cells with a gene called HOXB4 or grow them on a special protein to quickly boost their numbers. The latter technique increases the number of cells by 150-fold, miles ahead of the best efforts of researchers elsewhere.

These quick-grow methods are opening the door for transplants using umbilical cord blood, which has some critical advantages over traditional bone marrow transplants: It is readily available and it doesn’t require as extremely close tissue-type matching. Cord blood’s disadvantage—it contains only one-tenth the number of stem cells as bone marrow—is being overcome with these breakthroughs. That’s hopeful news for patients who can’t find a conventional donor, especially people of color or mixed ethnicity.

The early clinical trial results are promising, which may open the door to this lifesaving treatment for a much larger pool of patients.

One step closer to “you’re cured”
Beyond cancer research

Pushing the boundaries of medical science

At the forefront of vaccine research

For most of us, it’s a regular part of a healthy lifestyle: visits to our doctors for vaccines, especially those that prevent deadly childhood diseases like measles and polio.

What if we could apply a similar technique to help stave off one of the world’s greatest public health menaces, HIV/AIDS?

As coordinators of the largest HIV vaccine clinical trials program on the planet, Hutchinson Center researchers are at the forefront of the world’s efforts to stop AIDS. In this endeavor, they are continually exploring the safety and effectiveness of more than a dozen vaccine candidates in diverse populations on four continents.

Scientists are still learning exactly what shape a successful HIV vaccine will take, and our investigators are exploring numerous options. An HIV vaccine may be successful in preventing infection in the first place. In another scenario, a vaccine may not prevent HIV infection but reduce the likelihood that an infected person will transmit the disease to someone else. Yet another possibility is that a vaccine may slow the process of infection, so that even if a person becomes infected with HIV, he or she will remain healthier longer.

Despite recognized challenges, our researchers continue to believe that a vaccine, combined with robust community education, represents the most promising weapon against new HIV infections.

GLOBAL COLLABORATION

The Hutchinson Center’s Vaccine and Infectious Disease Institute tackles global health issues by bringing together the talents and resources of people and institutions around the world. The Institute works to solve global problems by developing and implementing prevention strategies for HIV/AIDS, malaria, and the viruses and bacteria that can cause cancer.
Advances in medical science tend to happen in tiny increments—one small step forward at a time. But once in a while, researchers land upon a major discovery—a giant leap for human biology. That’s what happened when creative thinkers at the Hutchinson Center dreamed about prolonging life during extreme, life-threatening trauma. Could a person be saved after severe blood loss from a car accident or battlefield injury? Could someone experiencing a hemorrhage buy more time until he got to the operating room? Could these lives be saved if their “pause buttons” could be pushed until doctors arrived?

The answer appears to be pointing toward yes. The researchers who asked these questions have discovered a way to induce a state of reversible hibernation—a sort of “suspended animation,” if you will—in animal models. Using tiny amounts of inhaled or injected hydrogen sulfide, the researchers can temporarily dim metabolism, reducing the need for oxygen, and then revive the organism no worse for wear. Recently, the researchers have shown that this technique can dramatically increase survival after potentially lethal blood loss.

The next step is to see if reversible metabolic hibernation is viable for critically injured people. Our scientists believe they are close to fulfilling the technique’s potential to save lives threatened by severe blood loss, hypothermia, cardiac arrest, stroke and similar bodily injuries.

Forecasting infections, from swine flu to smallpox

Predicting potential pandemics is an intricate science, and Hutchinson Center researchers are leading efforts to weave the many interrelated factors into clear courses of action for public health officials.

The Center is part of a national network that builds statistical models to project how infectious diseases—from swine flu to SARS to smallpox—might spread. Their analysis gives authorities the critical guidance they need to best combat new pathogens.

Pandemics emerge every three or four decades, with the potential to spread across the entire planet.
If you’ve ever gaped at the rows of vitamins and supplements at your neighborhood drug store or loaded up your grocery cart somewhat uncertain of your nutritional choices, you know the confusion of trying to keep a healthy diet. Headlines and advertisements tout magic bullets, often with little or no evidence to back them up.

That confusion—as well as the need for solid scientific evidence—drives our researchers to study the many ways we can affect our health through dietary choices. Like you, they want to know if the $20 billion spent annually on dietary supplements by Americans does any good. And could what we eat affect our health in ways we don’t yet know?

Studying dietary patterns, exercise and other lifestyle decisions are cornerstones of the comprehensive cancer research done at the Hutchinson Center, home to one of the first and largest cancer prevention programs in the world.

One recent study at the Center—the largest of its kind in women—tracked long-term multivitamin use. The scientists were surprised to find such supplements did not lower the risk of the most common cancers, nor did they have any effect on heart disease.

Another study found that men who eat heart-healthy diets are also doing their prostates a favor. Men who consumed lots of vegetables and lean protein—but not much fat or red meat—significantly reduced their risk of symptomatic benign enlargement of the prostate, a bothersome condition that affects about half of all men by the time they reach 50 and nearly all men by age 70.

YOGA’S HEALTHY HABIT

REGULAR TIME ON THE YOGA MAT APPEARS TO HAVE A DIETARY ADVANTAGE OVER OTHER PHYSICAL ACTIVITIES, SUCH AS WALKING OR RUNNING. OUR RESEARCHERS HAVE FOUND THAT YOGA PRACTICE ENCOURAGES MINDFUL EATING THAT KEEPS WEIGHT IN CHECK OVER THE LONG TERM.
Exercise habits for optimal health

It may go without saying that exercise is good for us. But how much do we need to maintain good health and increase our chances of preventing disease?

Thanks to many Hutchinson Center studies, we have some specific answers to help guide us. Among the most important recent findings, our researchers have shown that 45 minutes of exercise five days a week helps postmenopausal women reduce unhealthy belly fat and lower hormones that can contribute to cancer. Another study showed that exercise six days a week lowers the risk of colon cancer in men.

The Hutchinson Center’s success in studies that help us understand the interplay of physical activity and diet on cancer prevention has made it a world leader in the field. Recently, one of our most prominent researchers was named to a federal committee to develop the nation’s first exercise recommendations for people of all ages. Akin to the federal dietary guidelines, the new Physical Activity Guidelines for Americans recommends two and one-half hours a week of moderate aerobic exercise—such as brisk walking—for adults.

Soon, our researchers will complete an ambitious, five-year initiative aimed at reducing obesity-related cancer deaths in the United States. Examining obesity, sedentary behavior and cancer risk, the TREC initiative (Transdisciplinary Research on Energetics and Cancer) promises to provide more answers we can use to guide our exercise habits for optimal health.
Hormone therapy and women’s health

The surprising news from the Hutchinson Center-based Women’s Health Initiative made headlines around the world: Combined hormone replacement therapy (estrogen plus progestin) increased a woman’s risk of breast cancer and heart disease, clearly outweighing the benefits of hormone replacement for managing the symptoms of menopause. Use of hormone therapy immediately declined. Shortly thereafter, breast cancer in the United States quickly dropped.

The hypothesis that this was a cause-and-effect relationship was controversial. Some medical experts thought the decrease in breast cancer was too rapid to be a real effect. Others thought a reduction in U.S. mammography rates during the same period was responsible for the decline in cancers.

Hutchinson Center researchers stepped in to find an answer. These same scientists were on the team that discovered the risks of hormone replacement therapy, the landmark finding of the Women’s Health Initiative—the most far-reaching study ever devoted to women’s health.

They concluded that, indeed, the reduction in combined hormone therapy use was primarily related to the decrease in breast cancer incidence. The team also found that women who stayed on therapy longer than five years doubled their subsequent breast cancer risk each year.

These and numerous other findings from the 15-year Women’s Health Initiative have had significant impact on disease prevention and medical treatment for women.
Thank you for joining us in our mission to eliminate cancer and related diseases as causes of suffering and death. Private donations like yours are essential for allowing Fred Hutchinson Cancer Research Center to rapidly respond to novel research opportunities that often lead to important medical breakthroughs.

Financial support from our donors enables us to attract and retain the world’s top scientists, provide our researchers with the state-of-the-art technology needed to advance their work, and launch innovative pilot projects to explore new ways to eliminate cancer and other life-threatening diseases. Private gifts also leverage significant additional investment by allowing investigators to successfully compete for prestigious foundation grants that do not cover the full cost of research.

The many accomplishments that keep the Hutchinson Center at the forefront of biomedical research could not be achieved without your generous gifts. Thank you.
At Fred Hutchinson Cancer Research Center, our interdisciplinary teams of world-renowned scientists and humanitarians work together to prevent, diagnose and treat cancer, HIV/AIDS and related diseases. Our researchers, including three Nobel laureates, bring a relentless pursuit and passion for health, knowledge and hope to their work and the world.

With scientific excellence that spans the full spectrum of cancer research, we are uniquely qualified not only to discover, but also to implement lifesaving breakthroughs. To achieve our goal of improving human health around the world, our scientists lead studies in the following areas: early detection and intervention, immunotherapy, tumor research, fundamental research, leukemia and lymphoma research, international research, prevention research, and childhood cancers.

In addition to our groundbreaking research, we also provide a range of support services for the patients and families who come to the Hutchinson Center for lifesaving treatment. Programs include the Pete Gross House and Hutch School, Cancer Information Service, the Long-Term Follow-Up Program as well as the Fred Hutchinson Cancer Research Center Survivorship Program, part of the LIVESTRONG™ Survivorship Center of Excellence Network, and the Cancer Prevention Clinic located at Seattle Cancer Care Alliance.
Seattle’s reputation as a leader in high technology and biotechnology and the allure of the region’s natural beauty attract the world’s best minds to Fred Hutchinson Cancer Research Center.

We draw inspiration from our diverse landscape—from rivers and ocean to mountains and forest.

At the Hutchinson Center, we live and breathe a life of science.