TRANSLATIONAL RESEARCH IN CANCER RESEARCH

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ABSTRACT

Translational research is basic research that uses in betterment of the patient health. It includes laboratory based research and research in human subjects, populations and communities. In past decades researcher and theirs researches have clearly focused on importance of the basic research in clinical improvement, human health, etc.

Implementation of translational research as a key component of drug development and clinical research is complex and involves patients in various ways. Thereby it imposes some new ethical, legal, logistical and management constrains. Moreover translational research may require highly sophisticated machines, specific imaging techniques, biochemistry laboratories and imposes other infrastructural prerequisites, some of which should be in the direct vicinity of the clinical trial site. The usefulness of data generated during monitoring of such clinical trials with biologic/mechanistic endpoints is highly dependent on the quality of the assays and the availability of sufficient numbers of samples to conduct valid analyses.

KEYWORDS: Translational Research, Clinical trial, Basic research, cancer, Cancer treatment.

BACKGROUND

Basic scientists play a key role in generating the research discoveries that are translated into applications that improve human health. A number of obstacles—scientific c, institutional, cultural, and policy—limit opportunities for basic scientists to conduct translational science and may slow the pace at which discoveries are translated into clinical applications. Researchers trained in basic science may face inadequate funding, resources, or infrastructure for developing translational research programs; insufficient experience with essential methods and techniques; complex regulatory requirements; or suboptimal recognition or reward for pursuing applied research that may stretch beyond the boundaries of their department and discipline. These challenges can limit professional interest in translating research discoveries and hamper the enterprise at a time when it should be expanding to capitalize on the explosion of basic science knowledge.

WHAT IS TRANSLATIONAL RESEARCH?

Translation refers to the application of the results of basic biomedical research to the practice of medicine. More specifically, it describes the process of converting discoveries made in the laboratory into clinical interventions that provide a direct benefit to human health. Laboratory discoveries are not typically made in a form ready for adoption by the clinician to treat patients; therefore, research doesn't end with the discovery in the laboratory. In fact, this constitutes the start on the development pathway leading to the creation of a treatment suitable for humans. Translational research includes two areas of translation. One is the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans. The second area of translation concerns research aimed at enhancing the adoption of best practices in the community.

The ultimate goal of translational biomedical research is to improve human health—an outcome that benefits all of society. But participating in translational science also has more direct and immediate rewards for individual investigators and the institutions that support their work. Three teams of panellists—paired as basic scientists and senior leaders from the same university—discussed these benefits from their respective vantage points.

To solve many of the biggest challenges in health care, it is absolutely essential that we have basic scientists working along with the clinical the last scientists. And it is essential that we have the public and the private sectors working together from the very outset. If you have a good idea that you want to try to translate…engage those industry partners as soon as possible in the process. All too often, investigators, whether they are in government or in academia, will wait until they have a solidified plan, a strategy, and then go seek funding from the industrial partner. Another equally important mistake is that industry is looked upon as only potential funders and not scientific collaborators. The most value industry can offer is unique expertise.

Translational cancer research aims to bring about rapid improvements in cancer outcomes by addressing much defined clinical problems. These include accelerating the development and testing of new drugs and diagnostics and the provision of tools that can assist in day-to-day clinical decision-making. Translational research's aims to improve clinical management in a relatively short time frame (typically under 5 years), it usually involves clinical studies and direct analysis of human tissue samples (eg. tumour biopsies), with less reliance on animal models or extensive in vitro studies.

TRANSLATIONAL RESEARCH PROCESSES AND PROGRESS

From the 1970s until the early 1990s, the mindset of basic cancer researchers was that cancer is so complex a process that a real solution cannot be found in our lifetimes, and that basic cancer research must remain aloof from the clinic," said John Glaspy, MD, Director of the Jonsson Comprehensive Care Center's Clinical Research Unit at UCLA. "Pursue pure, rigorous and non-

goal-encumbered science to advance the understanding for some future generation that might find practical application feasible. This became an ingrained mindset.

The development of translational research in recent years in treatment of disease, clinical trials, and public heath in given graph we can see progress in 10 years. Many researches in cancer issues with basic Research provide critical examples of the tools and practice of cancer treatment. They all focus on clinically meaningful studies that combine patient observations with smart experiments. The researchers hope these studies will facilitate conversion of individual and disease-specific insight into a collective understanding of emerging gene transfer platforms and their subsequent translation to the bedside.

There have been more than 1 million fewer cancer deaths since 1990 and 1991 for men and women, respectively. The number of cancer survivors continues to increase: the latest data show that 13.7 million U.S. survivors were alive on Jan. 1, 2012. In the past year, the U.S. Food and Drug Administration (FDA) approved 11 new drugs to treat a variety of cancers, three new uses for previously approved cancer drugs, and three new imaging technologies. More than 100 years of fundamental discoveries in immunology have now led to the development of anticancer immunotherapies that are yielding remarkable, long-lasting patient responses (American Association for Cancer Research's (AACR) Cancer Progress Report 2013).

RECENT CLINICAL SUCCESSES IN TRANSLATIONAL RESEARCH

Spectacular advancements have been made in basic research to characterize and understand the fundamental molecular underpinnings that drive cancer. These laboratory discoveries have the potential to completely transform our approach to cancer, but only when the basic molecular knowledge can be 'translated' into practical treatments. The molecular analysis of tumours has revealed significant variation in the pathways that drive tumour growth and metastasis. The discovery of genes linked directly to cancer and the molecular pathways these genes influence has allowed scientists to draw a more accurate road map of the nuances of cancer and its progression. Today's drug development efforts use this map to focus on targeted therapies that tackle cancer specific events with greater precision. Since the tide began to turn in the 90s, there's been plenty of evidence of the power of translational research. The development of breast cancer wonder drug trastuzumab (sold as Herceptin) is a famous example – the clinicians involved struggled for years to get funding for their research on the HER-2 gene, but today Herceptin, which inhibits the growth of cancerous cells, is one of the greatest success stories in cancer drug history.

Translational Research Example is IL-12 Therapy for Cancer. It Represents a heterodimer cytokine and promotes expansion and survival of preactivated T cells, CD4 and CD8 cells, tumour infiltrating lymphocytes and NK cells it directly stimulates production of interferon gamma and other cytokines known to produce anti-tumour effects. IL12 injection decreases tumour volume and improves survival. Translational work was possible due to strong ties with the pharmaceutical industry which supplied the recombinant IL-12 in pre-clinical studies [(3)].

Angiogenesis it is the process where blood vessels formation is carried out. In normal definition it is a process of development and growth of blood vessels. In this process transition of

tumours can to become progressively worse and to potentially result in death. Forty years ago, in 1971 Judah Folkman American medical scientist predicted that tumour growth is dependent on angiogenesis and that inhibiting this process might be a new strategy for cancer therapy (4, 8). This hypothesis formed the foundation of a new field of research that represents an excellent example of how a groundbreaking scientific discovery can be translated to yield benefits for patients. Today, antiangiogenic drugs are used to treat human cancers and retinal vascular diseases.

Herpes gene therapy for cancer with A Phase I/II, Open Label Study (with a sequential dose escalation stage followed by an expansion of a selected dose cohort), to Evaluate the Safety and Anti-Tumor Effects of NV-1020, Administered Repeatedly via Hepatic Artery Infusion Prior to Second-Line Chemotherapy, in Patients with Colorectal Adenocarcinoma Metastatic to Liver [(11)]

Discovery-driven translational research in breast cancer is moving steadily from the study of cell lines to the analysis of clinically relevant samples that, together with the ever increasing number of novel and powerful technologies available within genomics, proteomics and functional genomics, promise to have a major impact on the way breast cancer will be diagnosed, treated and monitored in the future. Here we present a brief report on long-term ongoing strategies at the Danish Centre for Translational Breast Cancer Research to search for markers for early detection and targets for therapeutic intervention, to identify signalling pathways affected in individual tumours, as well as to integrate multiplatform 'omic' data sets collected from tissue samples obtained from individual patients. The ultimate goal of this initiative is to coalesce knowledge-based complementary procedures into a systems biology approach to fight breast cancer.

With hypothesis of wide variety of clinical observations including mammography is less effective for women age 40–49 than it is for women age 50–59, randomized clinical trials and adjuvant chemotherapy is most effective for premenopausal women with positive lymph nodes, and there is a racial disparity in outcome. Research outcome was several possible explanations ranging from mechanical to biological that suggest the relapses avoided in the early years do not show up later. It proved that preventing systemic inflammation post surgery will prevent early relapses. This could be controlled by the surgical anesthesiologist's choice of analgesic drugs. Also research has identified triple negative breast cancer as the ideal subset with which to test this. This is successful, would be relatively easy to implement in developing as well as developed countries and would be an important translational result.

Another example of Translational control is an important strategy by which eukaryotic cells regulate gene expression. Translation is step in the flow of genetic information, and regulation at this level allows an immediate and rapid response to changes under physiological conditions. Because the processes of mRNA biogenesis, including transcription, splicing, and export to the cytoplasm, are time consuming, the use of pre-existing mRNAs via the control of translation is advantageous in many circumstances. A prime target of translational control is the initiation factor eIF4E, which recognizes the m7GpppN cap structure present at the 5′ end of all nuclear transcribed eukaryotic mRNAs.

Another example of patients with breast cancer patient with BRCA1 and BRAC2 mutations had a benefit of world class research and access to experimental therapies and clinical trial at Stanford which tests best practice with potential treatment standards for the future for breast

cancer therapy. The research proved better impact on patient before, during and after diagnosis with breast cancer. Research has showed chance of dogging cancer jumps to 73%, with an 8% chance of getting and surviving breast cancer and only 1 % chance of not surviving.

In North America, prostate cancer has become the most commonly diagnosed cancer in men. It is responsible for 4300 deaths each year in Canada alone (30). The key objective is to equip future researchers with the skills to work on the threshold between discovery and applied research. Whether new discoveries begin at the bedside or the bench, our overall goal is to understand and eventually conquer prostate cancer. The research concentrated on two of the most deadly aspects of prostate cancer. The first is early stage prostate cancer detection using nanotechnology in a non-invasive way. The second is the study of metastasis. Ninety percent of mortalities from prostate cancer are due to the escape of cancer cells from the prostate that spread to distant sites like the bones.

CONCLUSION

Over the last some decades, translational research has become an important aspect of cancer clinical research. This has been fostered by the development of new techniques of investigations of the tumour biology and the emergence of new families of potential anticancer agents. Basic science is the foundation of medical advancement. Investigators with a deep understanding of fundamental biology and the mechanisms of disease are essential for translating laboratory discoveries into new and improved health interventions, diagnostics, and treatments. Additional training, resources, and support would enable basic scientists to move their discoveries forward effectively and efficiently. Although significant strides have been made, more can be done to optimize basic scientists' participation in translational research.

The beauty of this approach is that it often results in getting effective treatments to patients as quickly as possible. It means focusing on the clinic in order to drive what happens in the lab, and vice versa: scientists look at diseases on a molecular level and develop tools for physicians to try in clinical trials, while clinicians make observations about the disease in humans that drive the scientists' efforts.

The research community should expand translational research training opportunities for basic researchers and trainees; facilitate their access to the funding, equipment, infrastructure, and other resources needed for translation; encourage and support collaboration between basic and clinical investigators across research disciplines and sectors; and recognize and reward basic scientists for the contributions that they make to this growing field. Implementing these recommendations will require action by research institutions and funders, scientific publishers, professional societies, and investigators themselves.

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