Executive Summary

This report provides the Food and Drug Administration's (FDA's) analysis of the pipeline problem -- the recent slowdown, instead of the expected acceleration, in innovative medical therapies reaching patients.

Today's revolution in biomedical science has raised new hope for the prevention, treatment, and cure of serious illnesses. However, there is growing concern that many of the new basic science discoveries made in recent years may not quickly yield more effective, more affordable, and safe medical products for patients. This is because the current medical product[1] development path is becoming increasingly challenging, inefficient, and costly. During the last several years, the number of new drug and biologic applications submitted to FDA has declined significantly; the number of innovative medical device applications has also decreased. In contrast, the costs of product development have soared over the last decade. Because of rising costs, innovators often concentrate their efforts on products with potentially high market return. Developing products targeted for important public health needs (e.g., counterterrorism), less common diseases, prevalent third world diseases, prevention indications, or individualized therapy is becoming increasingly challenging. In fact, with rising health care costs, there is now concern about how the nation can continue to pay even for existing therapies. If the costs and difficulties of medical product development continue to grow, innovation will continue to stagnate or decline, and the biomedical revolution may not deliver on its promise of better health.

What is the problem? In FDA's view, the applied sciences needed for medical product development have not kept pace with the tremendous advances in the basic sciences. The new science is not being used to guide the technology development process in the same way that it is accelerating the technology discovery process. For medical technology, performance is measured in terms of product safety and effectiveness. Not enough applied scientific work has been done to create new tools to get fundamentally better answers about how the safety and effectiveness of new products can be demonstrated, in faster time frames, with more certainty, and at lower costs. In many cases, developers have no choice but to use the tools and concepts of the last century to assess this century's candidates. As a result, the vast majority of investigational products that enter clinical trials fail. Often, product development programs must be abandoned after extensive investment of time and resources. This high failure rate drives up costs, and developers are forced to use the profits from a decreasing number of successful products to subsidize a growing number of expensive failures. Finally, the path to market even for successful candidates is long, costly, and inefficient, due in large part to the current reliance on cumbersome assessment methods.

A new product development toolkit -- containing powerful new scientific and technical methods such as animal or computer-based predictive models, biomarkers for safety and effectiveness, and new clinical evaluation techniques -- is urgently needed to improve predictability and efficiency along the critical path from laboratory concept to commercial product. We need superior product development science to address these challenges -- to ensure that basic discoveries turn into new and better medical treatments. We need to make the effort required to create better tools for developing medical technologies. And we need a knowledge base built not just on ideas from biomedical research, but on reliable insights into the pathway to patients.

The medical product development process is no longer able to keep pace with basic scientific innovation. Only a concerted effort to apply the new biomedical science to medical product development will succeed in modernizing the critical path.

Many accomplished scientists in academia, government, and industry are working on these challenges, and there has been much success in recent years. But the fact remains that the pace of this development work has not kept up with the rapid advances in product discovery. The result is a technological disconnect between discovery and the product development process -- the steps involved in turning new laboratory discoveries into

treatments that are safe and effective.

Although the FDA is just one participant in advancing development science, we have an important role to play. Because FDA's standards are often used to guide development programs, we need to make sure that our standard-setting process is informed by the best science, with the goal of promoting efficient development of safe and effective new medical treatments.

Because FDA is uniquely positioned to help identify the challenges to development, we need to work with the larger scientific community on developing solutions. Directed by Congress to promote and protect the public health, FDA is responsible for ensuring that safe and effective medical innovations are available to patients.[2] As part of its regulatory role, FDA must use available scientific knowledge to set product standards. During clinical testing, FDA scientists conduct ongoing reviews of emerging data on safety, efficacy, and product quality. Agency reviewers see the complete spectrum of successes and best practices during clinical trials, as well as the failures, slowdowns, barriers, and missed opportunities that occur during product development. When serious problems emerge in the development process or common problems continue to recur, FDA scientists attempt to address them by bringing them to the attention of the scientific community, or by conducting or collaborating on relevant research. As an example of such work, the Agency often makes guidance documents publicly available that summarize best practices in a development area and share FDA insights into specific issues or topics. Sponsors report that the availability of guidance documents has been shown to foster development and innovation in areas of therapeutic need, to improve the chances of initial success of a marketing application, and to shorten the time it takes to get safe and effective treatments to patients. But much more needs to be done.

The product development problems we are seeing today can be addressed, in part, through an aggressive, collaborative effort to create a new generation of performance standards and predictive tools. The new tools will match and move forward new scientific innovations and will build on knowledge delivered by recent advances in science, such as bioinformatics, genomics, imaging technologies, and materials science.

FDA is planning an initiative that will identify and prioritize (1) the most pressing development problems and (2) the areas that provide the greatest opportunities for rapid improvement and public health benefits. This will be done for all three dimensions along the critical path -- safety assessment, evaluation of medical utility, and product industrialization. It is critical that we enlist all relevant stakeholders in this effort. We will work together to identify the most important challenges by creating a Critical Path Opportunity List. Concurrently, FDA will refocus its internal efforts to ensure that we are working on the most important problems and intensify our support of key projects.

Through scientific research focused on these challenges, we can improve the process for getting new and better treatments to patients. Directing research not only to new medical breakthroughs, but also to breakthrough tools for developing new treatments, is an essential step in providing patients with more timely, affordable, and predictable access to new therapies. We are confident that, with effective collaboration among government, academia, and the private sector, these goals can be achieved.