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Waiting for medicine's black swans

Over a decade has passed since the medical world quivered with anticipation at the completion of the Human Genome Project. For the most part, though, those heady days have been replaced by the sobering realization that the path from knowledge to product is riddled with potholes.

Time, tight budgets and delivery complications have emerged as major ruts in the drive toward the pot of therapeutic gold that was promised for the end of road.

The mapping of the human genome "was proclaimed as the day cancer would be solved. ... We were learning the language with which God created life," highly-acclaimed geneticist Michael Hayden, professor of medical genetics at the University of British Columbia and Canada Research Chair in Human Genetics and Molecular Medicine, said during a topical lecture at the American Association for the Advancement of Science's (AAAS) annual meeting.

While the project has "deepened our understanding of disease development, much of that promise has not yet been fulfilled."

But it hasn't all been for naught, Hayden told delegates. Although widespread use of genetic sequencing in patient-specific diagnostics may still be a distant dream, the project itself may nevertheless ultimately yield major benefits for the general population, he told delegates.

Pinpointing a genetic mutation that is linked to a disease such as osteoporosis may be the first step toward developing a treatment, he argued. The next step is proving that blocking a receptor or antagonizing an enzyme generates a clinical effect.

Hayden said the field of genetics is now grappling with "black swans" or unexpected developments that could ultimately have consequences for the health care system. (Editor's note: The proposition is clearly based on the philosophic musings of Nassim Nicolas Taleb, professor of risk engineering at the Polytechnic Institute at New York University and the architect of "black swan theory," which holds that unpredictable, unexpected events often result in enormous outcomes).

For example, Hayden noted that 13% of emergency room admissions at the Vancouver General Hospital were caused by adverse drug reactions. But the Canadian Pharmacogenomics Network for Drug Safety, which has been logging case records and DNA samples from across Canada for five years, is now drawing conclusions about which population groups may have an adverse reaction to a drug.

Such knowledge will help to close the ever-widening gap between the vast amount of money that is being poured into drug research and the much smaller number of drugs that are now being approved, he added.

Therapeutic solutions, though, remain a reach.

One of the problems is finding sound delivery methods, William Beck, professor of pharmacology and molecular genetics professor at the University of Illinois at Chicago, told a separate genetics session at the AAAS gathering.

One possible solution was presented by Dr. Anil K. Sood, professor of gynecologic oncology in the Division of Surgery at the University of Texas MD Anderson Cancer in Houston. Sood's research with mouse models of ovarian and colorectal cancer indicated that high-density lipoprotein nanoparticles (so-called 'good' cholesterol) could be used to deliver small interfering RNAs (siRNAs) to specific gene targets.

Such novel carriers for siRNAs are needed if they are to reach a tumour intact, said Beck, while asserting that "we're entering into a genomic era. … It's an incredibly exciting time." — Sabrina Doyle, Vancouver, BC

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