"and better protection for the individual." Any centralized system would make the nation's medical records a hostage to a change in government.

Kari Stefansson believes, however, that the idea of a distributed database is a phoney concept. "In a virtual world, [the distributed database] is false security. It could be less secure because there are more points of access and transmission of data [between the nodes]."

Fridleifsdottir says that there will "probably" be a third bill, judging from the written responses to the second draft. This is confirmed by Thodir Haraldsson, the chief ministry of health lawyer involved with the drafting of the bill. He says that it will "almost certainly" be a further revision that goes before parliament but he could not comment on the changes that might be included.

John Hodgson

Millennium collaborates with leading clinical centers

In mid-August, Millennium Pharmaceutical (Cambridge, MA) added two major clinical partners to its already extensive array of genomic technologies and alliances. The agreements, with the University of Pittsburgh Medical Center (UPMC) Health System at the University of Pittsburgh (Pittsburgh, PA) and the MD Anderson Cancer Center (Houston, TX), are nonexclusive, but they do give Millennium access to large numbers of tissue samples from patients with cancer and other diseases.

Millennium and the two institutes have agreed not to discuss either the scale of the tissue banking operations or the financial exchanges. "We didn't want to get into the quantification aspects," says Steven Holtzman, Millennium's chief business development officer. However, Millennium's two collaborators represent clinical outreach to large patient numbers—the UPMC health system alone caters to 120,000 in-patient admissions and 1.5 million out patients.

The collaborations involve Millennium in genetic and biochemical characterization of tissue samples gathered and held by the clinical institutions. According to Holtzman, it is the quality that stems from the institute-wide basis of clinically annotated samples that is important. "The clinical investigators are of high quality and [within a single institution] there is consistency in characterizing the samples." he says. Furthermore, he argues that the direct involvement of both institutes in patient care was important. "They are not just providers of specimens."

The discussions that lead to the two collaborations started around two years ago when Millennium "went shopping" for clinical collaborators. Jordan Gutterman, professor of medicine at MD Anderson firmly believes that academia and industry need to come together. "We have a lot of [clinical] material" he explains, "and they have access to the most advanced molecular diagnostic technology."

The Anderson-Millennium collaboration will focus initially on breast, ovarian, and thoracic cancers and, Gutterman hopes, will lead to gene discovery, early diagnostic methods, and approaches for monitoring the progress of patients undergoing treatment. "The main motivation [for Anderson] is to advance scientific understanding," says Gutterman, "and to be at the forefront of molecular diagnosis." There is a provision for the cancer center to benefit through royalties on drugs and diagnostic methods but the agreement is not driven by it.

In the gene-discovery efforts, Millennium will use differential gene expression analysis and single nucleotide polymorphism analysis in tissue samples not only to explore disease related genes and potential drug development targets but also those that make tumors sensitive or resistant to a range of treatments. MD Anderson currently runs over 700 clinical trials and part of the tissue resource at MD Anderson, says Gutterman, is a series of banks differentiated by therapeutic regimen.

Developing a range of early diagnostics may be where the most immediate impacts of a large-scale molecular analysis of diseased tissue could be felt.

Gutterman feels that the possibility of developing a range of early diagnostics may be where the most immediate impacts of a large-scale molecular analysis of diseased tissue could be felt. "In cervical and breast cancer, where pap smear and mammography are standard practice, treatments are frequently effective," he says. "But pancreatic cancer is very fatal simply because we can't diagnose the disease early." He says that the collaboration will seek to identify serum-based and other accessible markers of disease: "You don't want to have to do a biopsy every time," he explains.

One of the people at the core of the UPMC collaboration is Michael Becich, director of the urologic pathobiology laboratory at UPMC. Since its foundation in 1992, he and his collaborators have built the Western Pennsylvania Genitourinary Tissue Bank into a sizeable resource containing largely prostate tissue. Becich believes that the collaboration with Millennium gives the center three years to demonstrate how these pilot efforts can be upgraded to provide a significant resource for health care. The availability of substantial funding from the deal will mean that the necessary infrastructure for a professional 7-day, 24-hour tissue-acquisition service can be put in place, he says. The genitourinary bank will serve as a model for similar banks now being built by UPMC for bladder, kidney, cardiovascular, and normal tissues, says Becich.

One of the major issues in the use of large-scale tissue banking resources concerns patient data privacy. In both the Anderson and UPMC collaborations, Millennium feels that it addressing this adequately. The clinical record keeping is clearly separated from the molecular analysis that Millennium undertake. "We never get personal identification information," says Millennium's Holtzman. "Therefore there is never an issue of connecting our biological information with the patient."

"We are very careful in our use of named samples," confirms Gutterman. Another element of data security, he says, is that the tissue banking and the clinical records at MD Anderson are still dispersed in the specialist departments that deal with cancers of different organs. He does expect, however, that as the molecular analysis proceeds, there will be a greater centralization of anonymized information.

Michael Becich at UPMC has pioneered generalized consent procedures. He distinguishes three kinds of patient consent and the consequences for the use of the tissue samples. The first two types are where explicit patient consent has been obtained either prospectively or retrospectively for the use of tissue in broad-ranging studies. The clinical annotation of such anonymized and coded tissue samples when they reach collaborators like Millennium can be extensive, encompassing relevant medical history, demographic information, disease staging, treatment descriptions and outcomes, and a number of other parameters. However, where explicit consent has not been given—as for historical samples not used in primary diagnosis (e.g., the IRB-exempt tissues)—the annotation would be restricted to the tissue type and the nature of the disease.

John Hodgson