

In this issue Dr. Samuel Broder, Director of the National Cancer Institute (NCI) provides a historical overview of the funding pattern for Research Project Grants, with special emphasis placed on the traditional ROI Grants. His article, which inaugurates the "Public Issues" category in the journal, follows immediately.

During the past few years we have been witnessing a true explosion of knowledge in the basic biomedical sciences, including molecular oncology. Not only have cellular protooncogenes been described and isolated, they have also been found to be etiologically involved in human malignancies. Examples are elucidations of the role of the *c-myc* oncogene in Burkitt's lymphomas and in high grade lymphomas of patients with AIDS, of *c-abl* in chronic myelogenous leukemia and Philadelphia chromosome-positive acute lymphocytic leukemia, and of *bcl-2* in follicular lymphoma. The specific rearrangements in these oncogene loci serve as very useful tumor markers to help physicians to establish the diagnosis and the prognosis of human neoplasms, to monitor the progression of the neoplasm and the success of therapy, and to detect minimal residual disease by using DNA amplification methods. Thus, the discoveries of specific gene rearrangements in human neoplasms have resulted not only in a better understanding of the molecular mechanisms involved in the pathogenesis of the neoplasms but also in the development of procedures that are having an important impact on patient care. The recent discovery of the "antioncogenes" or cancer suppressor genes is also having a major impact on our understanding of the molecular basis of human cancer. Mutations or deletions of suppressor genes or candidate suppressor genes have been found to be involved in cancers such as retinoblastoma, Wilms' tumor, and colon carcinoma. Functional deletions of this class of genes may play a critical role in the pathogenesis of some of the most common tumors in humans, such as lung, breast, and gastrointestinal cancer.

While our understanding of the molecular basis of human cancer is making considerable progress, the situation of federal funding for the biomedical sciences in general and for cancer research in particular is worsening considerably. A large number of grants with high priority scores and of high merit are not funded. For example in 1987, 39.7% of approved grants were funded by NCI; in 1989, only 25.1% of approved grants were funded. In extremely competitive areas of cancer research such as molecular oncology, scoring in the top 20% is no assurance of receiving funding. In fact, the National Cancer Institute predicts that in 1990 only grants in the 18.0 percentile may be funded. The situation regarding the other Institutes of NIH is no better. I am aware of many cancer investigators who do not know whether they will be funded although they obtained priority scores in the top 15 percentile. This situation is having extremely disruptive and demoralizing effects on the scientific community and particularly on the bright young investigators who realize that doing first class scientific work is not sufficient to assure support for their laboratories.

Because of this situation, many promising young investigators are likely to be forced out of the biomedical sciences, with a catastrophic impact on future basic biomedical research in this country. The lack of stability in funding is disruptive not only for the present (and maybe future) young generation of biomedical scientists, but also for the biomedical research community at large, including cancer researchers. In 1987, 1061 competing grants were funded by NCI; in 1989 only 728 competing grants were funded. These figures indicate that a sizable fraction of cancer researchers are unable to maintain support for their research. This means that many of their laboratories will cease to function, with considerable loss of qualified personnel and expertise. It also means that in order to be assured of funding, the successful grantees must spend an ever increasing fraction of valuable research time revising, polishing, and resubmitting grant proposals.

Another area in which the present budgetary situation is having a major negative impact is education. Training grants are harder to get and are constantly cut below amounts recommended by the study sections. Lack of funding for students and postdoctoral fellows, coupled with reduced funding for their research advisors and senior colleagues, will reduce the biomedical research force of the near future, perhaps irretrievably.

This country is justly proud of its uniquely productive and creative scientific establishment. However, at the very time that the opportunities for cancer research and the translation of that research to the bedside are greatest, federal support of the biomedical research establishment is diminishing. Under these circumstances, the best young minds in the country are not choosing careers in biomedical research and the peer review system that has been the strength of the National Institutes of Health is becoming increasingly demoralized. The resources needed to maintain this system will be far less costly than those required to rebuild it five or ten years from now. During this crisis, if the present policy of this Administration concerning support for the biomedical sciences continues, it is not difficult to predict that the United States will lose its preeminent position in the biomedical sciences, with major negative consequences in areas ranging from patient care to the pharmaceutical and biotechnology industries.

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