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Funding More NIH Research Grants

Proposals of a multidisciplinary group of biomedical scientists

H. George Mandel

Biomedical scientists are acutely aware of the growing inadequacy of financial support for research. Proposals to the National Institutes of Health (NIH) that are highly rated by peer review and that a few years ago would have been funded are now without support. In constant dollars, NIH appropriations for competing research projects (*1*) have actually gone down since 1979. The number of eligible applications submitted and recommended for payment by study sections has been growing steadily, but the number of awards has remained unchanged or has declined (Fig. 1).

The country's capacity for biomedical research, which has been built during many years of encouragement and support from the federal government, and which has been dramatically effective in improving our understanding of the basis of many human diseases and the design of rational treatment, is rapidly deteriorating. At the present time we lack the program stability needed to continue to attract and retain capable young scientists in biomedical research, and on-again-off-again funding will dissuade many scientists from research pursuits.

To maintain our capacity in biomedical research, which has become one of the country's greatest resources, and to provide the stability and diversity essential to it, federal appropriations for biomedical research must be increased. For fiscal 1982 it would have required an additional $300 million (the total NIH appropriation was about $3.6 billion) to fully fund, for 1 year, 50 percent of the approved competing grant applications (*2*). There could be no better investment in the health of our nation.

Until this fiscal goal can be attained, some measures are required to avoid serious damage to our hopes of progress. A letter to *Science* (*3*) expressed the concern of the Association for Medical School Pharmacology about the future of our biomedical research capacity. Under the present procedure for awarding the available funds, many excellent research projects are being terminated or cannot

Members of the group are Irwin Fridovich, president of the American Society of Biological Biochemists (ASBC); Lowell M. Greenbaum, secretary of the Association for Medical School Pharmacology (AMSP); Harold F. Hardman, president of the American Society for Pharmacology and Experimental Therapeutics (ASPET); H. George Mandel, chairman of a subcommittee of ASPET on NIH funding procedures and policies; Alan H. Mehler, chairman of ASBC's ad hoc Committee on Research Support; Gerald C. Mueller, president of the American Association for Cancer Research; Walter C. Randall, president of the American Physiological Society; Dante G. Scarpelli, president of the American Association of Pathologists; Frank G. Standaert, president of AMSP; William J. Whelan, president of the Association of Medical School Departments of Biochemistry; and Julius S. Youngner, president of the Association of Medical School Microbiology Chairmen. The opinions expressed do not necessarily reflect those of the membership of these organizations. John F. Sherman, vice-president of the Association of American Medical Colleges and formerly deputy director of NIH, attended the preliminary meeting as a resource person.

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be initiated. The selection process that worked well when appropriations were adequate to permit most meritorious projects to be funded is no longer suitable, because the budgeting situation has changed so drastically. In the letter a number of temporary devices were proposed to permit the support of a larger number of scientific programs and investigators, with the average award somewhat reduced, until appropriations become adequate for full utilization of our nation's research resources.

That letter attracted considerable attention, and many members of the scientific community agreed on the urgency of the problem and a need for immediate action. A similar letter from the Association of Medical School Microbiology Chairmen (*4*), endorsement by the Association of Medical School Departments of Biochemistry, and a resolution from the Board of Directors of the American Association for Cancer Research prompted meetings of elected officers of several biomedical associations on 9 and 10 November 1982 in Washington, D.C.

The group agreed on the general principle that measures should be implemented at once, on a temporary basis, to permit some redistribution of available research funds in order to maintain a maximum diversity of research of high quality, and to provide continuity for research groups that would otherwise have to be disbanded. The participants recognize that the mechanisms proposed for stretching research dollars are far from simple, and that not every scientist would be enthusiastic about a redistribution of existing funds at a time of such severe curtailment. However, many investigators have expressed a willingness to forego a fraction of their individual research support (coupled with a corresponding limitation in research objectives) if such a sacrifice will make possible a greater diversity of biomedical research carried out by a larger segment of the scientific community. It must be recognized that reduction in the size of a grant in no way implies that these grants have been funded excessively in the past; a corresponding curtailment of the expected scientific efforts would have to accompany any decrease in the funds awarded. The National Science Foundation has had considerable experience with partial funding of grant applications, and is finding it workable. All funded research must be of high quality, and the extent of any budget reduction must be monitored by NIH to ensure viability of the remaining project.

In general, the views expressed in the AMSP communication (*3*) were reaffirmed. The group believes that the top 50 percent of applications approved by peer review should be funded, even if necessarily less than fully. A series of specific means to that end were discussed during a subsequent meeting of the entire group with James B. Wyngaarden, director of NIH.

Summary. Because of the prospect of a serious decline in the nation's biomedical research capacity owing to diminished federal appropriations, temporary measures should be initiated promptly by the National Institutes of Health to preserve the stability of resources and diversity of research required for future productivity. It is recommended that the available funds be distributed in such a way as to permit some support for 50 percent of competing grant applications approved by the National Institutes of Health study sections. Measures proposed for consideration are a sliding scale for funding, a greater across-the-board reduction, a limit on support for an individual laboratory, and a review of indirect costs.

1) A sliding-scale approach, based on the present peer review system and priority score concept, appears to offer a workable and effective procedure, especially if used in conjunction with additional means of redistributing funds. Special consideration obviously is required when the budget for a project consists mainly of costly components that cannot be trimmed or partly supported by some other source. Clearly, it is necessary to insure that sufficient funds remain available for the investigator to achieve reasonable research goals.

Scientists are aware that for most projects the only present alternative to the sliding scale is the absolute cut-off. Thus, large numbers of excellent scientific proposals to which peer review groups have assigned priority scores very close to those of projects being fully funded receive no funds at all. Indeed, such small differences in scores result from chance rather than merit.

Table 1, based on data for 1982 (*2*), illustrates the application of a sliding-scale model to each of the institutes. The mean award rate in effect during the already lean years 1977 to 1981 has been used as the guide. For several institutes the maximum budget reductions in the model appear quite steep, but such cuts affect only a limited number of grants, which otherwise would remain totally unfunded. Scientists who choose to accept these reduced awards would thereby be given an opportunity to continue to contribute to knowledge, and the highly meritorious priority rating received from peer review would justify the expenditure of federal funds. Moreover, the most serious curtailments can be lessened if alternative mechanisms are applied in addition to some sliding-scale option, as for example by spreading the reduction over a larger number of awards, or eliminating certain expenditures. In the particular model provided as an example, the number of awards for competing projects would increase by 924 or 1616, depending on whether the lower or higher award rate bracketing

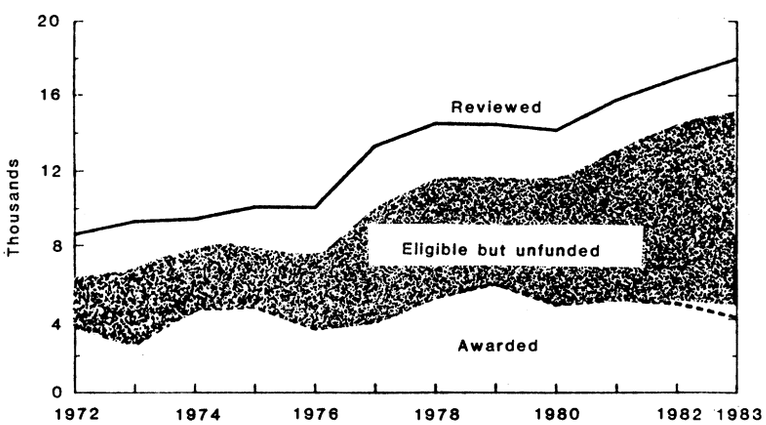

Fig. 1. Number of competing research-project applications to NIH reviewed, eligible, and granted, fiscal years 1972 to 1983. The dashed line for 1982 and 1983 represents estimates based on the budget. Subsequently it became possible to fund 244 additional grants for 1982, for a total of 5027. The larger estimate for 1983 is based on the recently passed congressional continuing resolution which superseded the presidential budget for 1983; it is expected to permit the funding of about 4900 awards. [Data supplied by Extramural Trends, Statistics, and Analysis Branch, Division of Research Grants, National Institutes of Health]

the 5-year mean rate is selected. It should be noted that, in either case, only applications with very desirable priority scores (usually better than 220) are being proposed for funding.

2) An across-the-board reduction in the size of new grants, and renegotiation of all existing grants at the time of renewal, could be effective if applied uniformly. As with the sliding scale, it is assumed that reductions of 20 to 40 percent offer a feasible means of supporting a greater diversity of research. In the past year, small across-the-board cuts have been made by some of the institutes, but greater reductions than those currently in effect will be required in order to produce the desired number of research grants. Again, other options could be combined with this one.

An alternative to across-the-board reductions would be a progressive reduction, very large grants being reduced by a somewhat greater percentage than smaller grants, in the expectation that laboratories with the heaviest support would be able to withstand a somewhat greater budget curtailment.

3) A limit on the total financial support for an individual laboratory would be another means of spreading the distribution of available dollars. This requires analysis of the total governmental and other funds available to and needed by a laboratory, and implies understanding the fiscal structure of the laboratory unit. Special scrutiny is needed before awarding multiple grants to a principal investigator. Such a funding limitation would have to be handled with great care so as not to compromise excellent laboratory programs that function best with large sums going to one principal investigator.

4) An amplification factor can frequently be demonstrated when research teams share major research resources with great efficiency. However, large programs funded by contracts and various umbrella instruments should be evaluated specifically to insure that the quality and quantity of research achieved match the productivity of smaller projects initiated by individual investigators and reviewed with close scrutiny by study sections. A relatively small percentage reduction in the funds for large contracts may permit the funding of several additional grants.

5) The ever-increasing indirect costs of research are further restricting the funds that remain for paying direct costs. Considerable economies can be effected by elimination of unnecessary duplication of accounting and reporting procedures. Further examination of this question should be undertaken.

The participants in these preliminary discussions have agreed to pursue these questions with colleagues and to continue as a group to seek the necessary reforms. They urge other biomedical organizations to join in these efforts. Scientists should express themselves directly through their professional organizations to their colleagues, the National Institutes of Health, and their representatives in Congress. The development and implementation of a long-range national biomedical science policy are essential at this time.

Table 1. Number of competing research-project applications budgeted by the NIH institutes for fiscal year 1982 and number that could have been funded from identical total budgets with the operation of a sliding scale. The italicized figures are the preliminary award rates for fiscal 1982 (subject to later adjustments). The award rates selected as examples bracket the mean rate of fiscal years 1977 to 1981. In this particular sliding-scale model each of the graded budgetary reduction steps was set to include one-tenth of the total number of grants that would be funded given the specified award rate, ranked by priority score. No funding cut was applied to grants in the top decile of priority scores, and the maximum reduction affected only the lowest fundable decile. For example, at the National Institute of Allergy and Infectious Diseases, with a 35 percent award rate the 50 grants in the top decile would be paid in full and grants ranked in positions 451 to 50 would be reduced by 48.4 percent. [Data supplied by the Statistics and Analysis Branch, Division of Research Grants, National Institutes of Health]

Institute*	Award rates (% of applications funded)		Reduction in size of grants (%)		Number of grants		Limiting priority score‡
	Mean, 1977–1981	1982†	Mean	Maximum	Total	Increase	
Aging		*31.2*			149		204
	39.5	35	11.5	21.6	167	18	212
		40	23.4	43.1	191	42	222
Allergy		*26.3*			377		162
	37.2	35	24.8	48.4	501	124	178
		40	33.2	64.0	572	195	189
Arthritis		*30.8*			610		181
	44.1	40	25.7	49.7	793	183	202
		45	32.6	63.5	892	282	214
Cancer		*29.7*			740		186
	40.0	35	27.4	53.4	873	133	198
		40	37.1	70.7	998	258	210
Dental		*39.1*			107		201
	42.3	40	4.4	8.1	110	3	203
		45	14.3	26.7	123	16	208
Environmental		*34.8*			94		227
	44.8	40	22.0	39.1	108	14	239
		45	34.4	59.8	122	28	255
Eye		*45.2*			252		201
	57.9	50	17.4	33.1	279	27	208
General		*37.6*			828		177
	47.2	45	21.5	41.9	990	162	190
		50	28.0	54.3	1101	273	201
Child		*32.7*			409		188
	39.8	35	8.7	16.6	438	29	193
		40	19.0	36.6	500	91	201
Heart		*35.8*			721		195
	44.4	40	14.3	25.7	805	84	207
		45	21.8	40.2	906	185	222
Neurology		*34.7*			496		182
	47.1	45	26.4	47.7	643	147	207
		50	33.4	60.6	715	219	222
Total	Lower target rate					924	
	Higher target rate					1616	

*More complete identification: Institute on Aging; Institute of Allergy and Infectious Diseases; Institute of Arthritis, Metabolism, and Digestive Diseases; Cancer Institute; Institute of Dental Research; Institute of Environmental Health Sciences; Eye Institute; Institute of General Medical Sciences; Institute of Child Health and Human Development; Heart, Lung, and Blood Institute; Institute of Neurological and Communicative Disorders and Stroke. †Subsequently 244 additional awards (total for all institutes) were made. ‡Estimates based on the assumption that funding proceeded strictly in order of priority ranking.

References and Notes

1. The term "competing applications" (or projects) refers to new proposals or renewal requests, in contrast to continuing projects for which a previous funding commitment has been made.
2. Calculated from data supplied by the Statistics and Analysis Branch, Division of Research Grants, National Institutes of Health.
3. E. S. Vesell and H. G. Mandel, *Science* **215**, 1026 (1982).
4. J. S. Youngner and K. I. Berns, *ibid.* **216**, 798 (1982).