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EDITORIAL

NIH, Science, and Baseball: Time for Reform?

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Last fall I was reflecting on the state of science and the funding rate at the National Institutes of Health. Baseball was winding down for most teams, while again the World Series featured two teams from the east coast, while teams in the middle of America were again amazingly absent. There are all kinds of reasons why these teams are not as competitive, but in the end it comes down to money and components like market share. Yet unlike other professional sports in America, where salary caps have been used to level the playing field and to make small market teams more competitive, no such cap exists in baseball. While major league baseball has tried revenue-leveling plans (a luxury tax), in the end the wealthier teams get the better (higher-priced) players and the less-wealthy teams get to develop the players who end up going to the wealthier teams. The end result is diminished revenue for one set of teams as fans just stop showing up to the ballpark. Quite the opposite occurs for the wealthier teams as the fans come in droves to watch their stars come out at night. So what in the world does this have to do with science?

Well, many see baseball as a pure game. There are dimensions for the diamond, but every field is unique beyond the actual diamond. There is no time limit for the game, something unique in nearly all professional sports. There is a one-on-one component as there is the constant battle between the hitter and the pitcher. Yet despite this very individual aspect of the game, baseball is a team sport in which team work is essential for success. To me, academic science is a pure pursuit, but like baseball it contains a number of polar opposites, somewhat like what Hegel described in his version of the dialectic theory.

Science is a pursuit that requires a tremendous amount of personal drive and utilization of one's intellect. Meanwhile, despite this individual effort, we work in a "team" environment, sharing our thoughts and work with others through publications and interactions at scientific congresses as well as other outlets that provide for exchange of ideas. We collaborate on projects with colleagues, maximizing the potential for success by bringing many different talents to bear on the project. Similar to baseball being a game where singles and doubles win games, science is a pursuit where all of our collective progress on a particular topic is additive and that is what often shifts our understanding of the underlying biology of a particular problem. Just like a home run is exciting and gets the fans cheering for more, big significant discoveries in science are also exciting. But in the end, like in baseball, it is the summation of incremental successes that move a field forward. As an industry colleague has routinely noted, academic scientists often work on their own time scale, yet we all work within the time frame of our grants. So many of the attributes of baseball are seen in science, but again, so are many of the disparities.

So how does NIH fit into this paradigm? Simply put, certain institutions and laboratories continue to get rich, while others seek the equivalent of science life support. Institutions on the right and left coasts have more faculty, more "stars", and ultimately more infrastructure to support an enhanced research enterprise. As in baseball, this deepens the divide between the haves and the have-nots. Those of us at institutions in the middle of America who succeed, can transition to the coasts, like a rising star in baseball. Hence, the ultimate impact is a reduction in the small market institutions' capacity to compete as they lose

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their intellectual infrastructure. This reduces the institutional ability to compete for grants, while enhancing the ability of the large market institutions.

In the end, NIH must reform how it allocates funds. While baseball has avoided the dreaded salary cap, is it time for NIH to institute an institutional and investigator grant dollar cap? If so, would this cap help to redistribute funds, permitting small market institutions to be in a better position to compete for grants and ultimately build infrastructure and retain "star" faculty? This would force institutions to triage grants internally, rather than the submission-in-mass process that currently exists, thereby reducing the load of already overworked study sections. If a cap is not the answer, what are other options?

In an abbreviated letter published in *The Scientist* (23(4):18, 2009), I briefly laid out a radical new funding method for the NIH. My proposed model rewards successful scientists across the country and across disciplines with a single, lifetime grant. The grant is a single award on the order of $15 million and the investigator's institution would be required to invest the principal of the grant in various investments to provide a safe, constant source of income from the investment. In doing so, the investigator can only use the investment income from the grant, which in most years would be between $500,000 and $750,000. Because our institutions use and rely on a federal subsidy called indirect costs (F&A), an additional $5 million is given to the institution to invest, with the investment income used as the indirect costs payment. Again, neither party can use the principal, which means upon retirement of the scientist, the money then becomes available for another investigator at another institution, in short a sustainable means of funding biomedical science efforts in the US. The catch is that any investigator receiving one of these awards is not permitted to apply for any other federal funding, but rather must use the investment income provided to fund their laboratory. Because nearly all institutions in America have endowments that are invested and managed locally, the overall infrastructure exists within academia and within research institutes to implement this model.

What are the advantages? Because NIH study sections appear to fund safe science and repeatedly demonstrate risk aversion, reducing the likelihood that riskier projects are funded, one clear advantage to this radical funding vehicle is a shift in the aversion to risk. We all know that risk is equal to a potential for high yield, which in science speak translates into discoveries. By eliminating the need of a scientist to secure grant funding for every idea, my proposal promotes an environment in which risk aversion is low, a polar opposite to what we currently have in place. An additional advantage is an elimination of the money raising aspects of academic science. Academic scientists spend upwards to 30–40% of their time chasing money in one form or another. Eliminating this activity will enhance the overall quality of science as investigators put more time into their creative efforts, thereby increasing the likelihood of progress and novel discoveries. Another advantage is promoting a stable work environment for students, post-doctoral fellows, and technical staff. This more-stable environment includes more time devoted by the investigator to interacting with each individual in the laboratory, enhancing the overall training of the next generation of scientists. Lastly, by taking more seasoned and experienced scientists out of the normal R01 and R21 funding mechanisms, the success rate for junior faculty will increase, ensuring a vibrant research community across disciplines and providing a sustainable scientific base for the US.

Of course there are disadvantages to this program as well. Scientist could become rather lazy and reduce their efforts in the field. While this could occur with some individuals, I doubt it would be too common of an occurrence. A 5-year review process, in which investigators would be required to provide an update on their progress, primarily by demonstrating the number and quality of publications, would mitigate these concerns. For individuals with 5–7 R01 grants in their laboratories, the amount of money provided is insufficient to run one of these so-called mega-labs, which often resemble a small biotech company in its management structure rather than an academic laboratory. Hence, there is a clear disadvantage for scientists who manage one of these mega-labs as they would have to potentially reduce staff commensurate with a reduction in financial resources. However, more importantly, market fluctuations could cause a temporary reduction in investment income and portfolio value. To minimize this risk, investigators will have to save in good years to buffer against the down years in the market, however we all know that rapid loses in the market are also followed by rapid gains. Again, while there are undoubtedly other disadvantages, I will limit my discussion to these.

Hence, if NIH would be willing to fund 500–1,000 of these grants per year for the next 5–10 years, there would be a tremendous reduction in the individuals competing in the traditional grant cycles. Risk aversion would be significantly reduced, enhancing the ability of scientists to study problems that frankly have limited chance of being funded in today's environment. By freeing up investigators' time, we are enhancing their ability to focus on projects and to formulate new, exciting ideas to test. Overall, this new model eliminates many of the problems associated with our current system and for those who qualify, it would produce a more stable and rewarding career. I believe that this model offers a sustainable system that will reward success while promoting risk, yet ensuring that funds would be available now and in the future to enhance the likelihood of success for our younger generation of scientists and provide the US with the capacity to continue our leadership in biomedical research.