

## NURTURING MULTI-DISCIPLINARY NUTRITIONAL SCIENCES

### ON THE EVE OF THE 21<sup>ST</sup> CENTURY

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The University of Missouri (MU) implemented an outstanding idea in the mid-1980's that fostered life sciences research and set the stage to make MU more competitive in the 21<sup>st</sup> century. Then Dean Max Lennon of the College of Agriculture led three colleges—Agriculture, Home Economics, and Veterinary Medicine—to propose to the state legislature a program entitled “Food for the 21<sup>st</sup> Century” (Lipner, 1991). This program was to stimulate innovative research for improved food, fiber, nutrition and health in the 21<sup>st</sup> century, and it was envisioned to increase incrementally to \$8 million of new funds that would foster research in several vital areas. This support has now brought our teams of researchers to national recognition in Plant Molecular Biology, Animal Reproduction, Nutritional Sciences, and Food, Feeds & Natural Products. The addition of new funds to the program by the state ceased in 1991, at about \$4.5 million per year of recurring funds.

I was recruited to become the Nutritional Sciences cluster leader in 1990, about four years after its initial funding. In my recruitment, I was sold on the idea by the success of two clusters in the initial years, by the excitement of implementing multi-disciplinary, team-based research at universities as a means to reinvigorate the institution as well as its research, and by the opportunity to build an aggressive, future-focused program in nutrition. My nearly ten years at Missouri has reinforced my enthusiasm for this team motif for multi-disciplinary research, but it has also given me gray hair as I've struggled to implement team-based research within the traditional structure of a university. My task today is (1) to review the Food for the 21<sup>st</sup> Century team-based approach to multi-disciplinary research by describing several key aspects of the Nutritional Sciences Program, (2) to review several approaches that we have used to successfully implement our programs, and (3) to discuss several key impediments to implementing team-based research in the traditional structure of a university. My hope is that this presentation will highlight important roadblocks, often inherent in university administration, that can otherwise burden teams to the point that they cannot succeed. My wish is thus to help eliminate these administrative roadblocks so that multi-disciplinary and multi-university research teams will be successful.

## **Food for the 21<sup>st</sup> Century Nutritional Sciences at the University of Missouri**

The Food for the 21<sup>st</sup> Century clusters at the University of Missouri are comprised of regular faculty from various departments plus new hires of faculty for the Food for the 21<sup>st</sup> Century program. The program generally provides full salary support for new faculty with recruitment packages that include recurring technical support and supply funds. These faculty become regular members in one or more specific departments. Initially, Food for the 21<sup>st</sup> Century faculty were generally 100-percent research but today they are key academic faculty that participate fully in all aspects of university life. Cluster leaders manage the program funds and faculty to achieve the objectives of their program, in consultation with advisory committees, deans and department chairs. A key aspect is that the cluster leaders are the decision-makers for use of cluster funds so that these valuable program funds can be used effectively to promote research and not simply to shore-up weaknesses in traditional programs. A second key aspect from the beginning was regular review of these programs by external review teams of prominent scientists in the discipline of the cluster. This enhances visibility of our program and provides immediate feedback and gives confidence in the direction of these programs. The success of the Food for the 21<sup>st</sup> Century program at MU can be measured by: the top-five ranking of the Plant Sciences Cluster by the National Science Foundation; the top-five ranking of the Animal Reproduction Cluster by the U.S. Department of Agriculture; and the top-20 ranking of Nutritional Sciences by the recent Gorman report. To sum it up, the Food for the 21<sup>st</sup> Century program provided an infusion of new funds at a key time that allowed MU to take advantage of the explosion of new molecular biology knowledge and new biotechnology tools.

Food for the 21<sup>st</sup> Century Nutritional Sciences today has 25 faculty (including three 100-percent-funded faculty and three partially-funded faculty) in 10 departments and in five colleges including the research reactor. The objectives are (1) to employ the newest technology and knowledge to the study of nutrition in order to better understand the underlying molecular roles for nutrients in health and disease, and (2) to train students—undergraduate, graduate and postdoctoral—for Nutritional Sciences education and research in the 21st century. To accomplish these objectives we have used the 10 programs. These include the grant strengthening program, investing in fellowships for graduate students and for undergraduate students in summer research, providing core facilities for the faculty to learn and use cell culture and molecular biology techniques, funding outside speakers for our seminar series and a week-long spring lecture series on nutrition, and sponsoring our fall poster session. Rounding out these programs are outside program review in four-year intervals, and mini-sabbatical opportunities for researchers to learn new techniques quickly by visiting other investigators. The result has

been that outside funding by Food for the 21<sup>st</sup> Century Nutritional Sciences principal investigators has increased to \$2.3 million in 1998; the graduate program has been revitalized; and Nutritional Sciences on campus is now regarded as being on the same playing field as the other strong life sciences programs and departments.

### **Tools for Teams to Achieve their Goals**

How did the Food for the 21<sup>st</sup> Century program nurture Nutritional Sciences at MU? I was charged with leading campus Nutritional Sciences to become a nationally-recognized research program. It didn't take long to realize that the short time and relatively modest funds precluded the long-term broad-front approach that gave rise to traditional strong research programs and departments such as those at Cornell, Wisconsin and Davis. Thus, to gain national recognition, we needed to concentrate our efforts in selected areas of emphasis. We chose "molecular mineral nutrition" because we had a core strength in that area, because MU already had a tradition and national reputation in this area, and because new developments in molecular biology suggested strong future returns in this area. A second area of emphasis in "lipids, membranes and signal transduction" was chosen because the newly hired faculty were concentrated in the areas of membrane and cell nutrition, because they complemented a number of existing faculty in that area, and because nutrient modulation of signal transduction offers high potential as an important mechanism by which diet and nutrients modulate disease as opposed to health. These choices of emphasis areas also reflected consideration of disciplinary strengths present in adjacent states so that the impact of competition was minimized. This concentration of effort was not supported by some department chairs, who remained entrenched and demanded faculty in all traditional areas. Key administrative mentors—deans who actively supported our goals—were necessary to achieve the refocusing of our resources into these emphasis areas.

A second tool that teams can use, because of their flexibility, is to take advantage of negative situations to achieve needed change. In 1991, the university was again in a phase of examining its degree programs for degree-granting productivity. More than 80 programs were listed as targets for elimination, including Nutrition. The initial membership of the Food for the 21<sup>st</sup> Century Cluster was chosen by interest and self-selection, leading to a large membership. Within the group, there was a much smaller group that actively participated, contributed, and needed the program because Nutrition was central to their discipline and research. The evolution of Nutrition on campus, however, was held back from real change by the larger group. To remove Nutrition from the elimination list, we prepared a justification that required that members participate actively in the program; membership in the graduate program dropped from 40 faculty to 11 faculty whose interest in Nutrition was

sufficiently central to their goals. With this decrease in the denominator, multi-disciplinary Nutrition began to prosper on campus.

Nutrition was not prospering because of the overlapping interests of traditional programs versus multi-disciplinary programs. Chairs rightly wanted credit for students, courses taught, and degrees. So they smiled support but blocked more substantial activity like teaching of needed modern core courses in Nutritional Sciences. A multi-disciplinary “area” program in Nutrition had existed, unfunded, on campus since 1966 but was clearly secondary to departmentally-based degree programs. This area program did have the ability to grant M.S. and Ph.D. degrees in Nutrition, and had a series of courses on the books. The flexibility of the team approach again came to the rescue. The Food for the 21<sup>st</sup> Century faculty decided to begin teaching a multi-disciplinary graduate core under existing listed courses. The result was a solidified graduate program that was one of five programs at MU that doubled between 1992 and 1997 when overall MU graduate enrollment dropped by 21.6%. Today, the course contents now match with their titles, and we have a graduate handbook, a unified graduate exam program, and an active graduate student association. A recent outside review panel indicated that we were one of the top-12 programs in the country offering graduate education in Nutritional Sciences.

A third tool that we have used to make multi-disciplinary teams effective is to match programs with goals. Too often, the team programs in a university setting must be parallel to existing institutional programs. A major goal of the program is to increase extramural research funding. Our initial attempts with funding mini seed-money grants, locally reviewed, found lots of takers, but had little linked outcome in terms of publications and extramural grants. The principal investigators simply used these funds to augment their approach to satisfying departmental demands. Thus a “Strengthening Grant” program was initiated in 1993 to provide supplemental funds to principal investigators who had submitted an unsuccessful application to National Institutes of Health or USDA with the goal of funding additional research to strengthen the proposal for resubmission. This program thus rewards only faculty who submit national extramural grants—the goal of interest here—and it uses national peer review to provide input for improvement. The Strengthening Grant application is a 1-page form requiring 3 inches of text outlining how the proposed plan will strengthen the application, plus the department chair’s signature so that he or she knows that Food for the 21<sup>st</sup> Century is investing in this faculty member. My office generally approves the grant in one day! There is no need for campus review panels, and no need for new approvals for animal care, radioisotopes, human subjects, recombinant DNA, etc., and the time that principal investigators must invest in redundant grant writing is minimal.

We've also used a similar approach, matching our program to the external goal, in our fall poster session program. This early September event uses abstract forms that are replicates of forms used for abstract submission to our national meeting (due in November), and so faculty can use the event as a reporting mechanism for summer research by their students and postdoctoral fellows and get draft abstracts and posters prepared several months ahead of the deadlines. In summary, university administration of multi-disciplinary teams at MU has allowed Nutritional Sciences to take advantage of the flexibility of the team approach to match its programs with goals of increased national presence at meetings, and goals of increased submission and funding of national extramural research grants.

### **Impediments to Team-Based Research**

I hope by now that my enthusiasm for the team approach in general and for Food for the 21<sup>st</sup> Century at Missouri, in particular, is coming through. Time alone constrains me to stop at this point and to turn to discussion of why the team approach is not always successful at a university.

A recent book by Robbins and Finley (1995), provocatively entitled *Why Teams Don't Work*, provides a safe outline for a still-active Cluster Leader to discuss this topic. These authors grouped reasons that teams often fail into the fourteen categories. All fourteen are relevant to large universities in the Midwest as well as on the coasts. Especially relevant to this conference's interest in multi-disciplinary and multi-university research, they argue that teams are often implemented for the wrong reasons, that the organization often is not committed to the team idea, that team members are often not rewarded for their team work, that organizational procedures often are incompatible with team functions, and that teams and team members are often not given the right tools for the assigned task.

Under confused goals and bleary vision, Robbins and Finley suggest that organizational "leadership has foisted a bill of goods on the team." Teams are often implemented for the wrong reasons, perhaps because it's the current thing to do rather than because there is a short-term, solvable problem requiring effort from several diverse components of their organization. Another reason for failure may be because the team has a vision but the administration does not share in that vision. Today especially, clear goals and vision are required for implementation of a team with true potential for success. I would like to carry this argument further by suggesting that for teams to succeed, it takes vision and courage by the administration, rather than reliance on democratic processes, to set and support goals and vision for the teams that they send off into the rough seas of university policies, procedures and politics.

A “toxic team culture” can sentence a team to failure in an organization or set of organizations. Traditional units and unit administrators in these organizations likely will feel threatened when teams are first introduced, and they will often erect barriers to the multi-disciplinary effort. Our failure to implement a multi-disciplinary core graduate curriculum in Nutrition for more than 25 years is but one example. In today’s world of politically-correct behavior, administrative mentors of team activities should be especially vigilant in watching out for *glass* barriers to team-based activities. If an organization does not really commit to teams, say Robbins and Finley, then teams are doomed to failure.

A key category in this discussion is rewards. The reward structure for team members must make them feel safe to do their team jobs. This means that their performance expectations and rewards must be aligned with the objectives and goals. Robbins and Finley suggest that teams fail because “people are rewarded for the wrong things,” and thus team as well as individual efforts must be rewarded. Interesting, these authors further indicate that some experts even view individual merit reward systems as counterproductive to a team environment. Whatever the case, this viewpoint stresses the need to carefully consider and then rework the reward structure when a university decides to use a team approach.

When I quoted, “The team is at the mercy of an employee handbook from hell,” at this conference, it drew considerable chuckles. The discussion turned serious, however, as we discussed the demands on faculty researchers' time today. My number one concern here is with the expansion of non-productive paperwork, meetings, reports, etc. that intrude on the time that team members have for their team-based responsibilities as well as other responsibilities. As a cluster leader, I see my faculty struggling to find solid chunks of time for the important thinking, grant writing and research that are major goals for them, their team, and the university. This load is often doubled or tripled when separate reports are required from different primary units. Something has to give when new team responsibilities are assigned; reduction of process activities that do not contribute to the endpoint productivity of an institution is one way to empower multi-disciplinary teams.

In my mind, the #1 reason teams fail at universities is that they are not given the tools to do the assigned task. Robbins and Finley nicely summarize this: “The team has been sent to do battle with a slingshot.” To take advantage of the strengths of a team approach, my suggestion is to put the funds and team in the hands of the team leader and then get out of the way. Micro-management of a team inhibits the synergistic mixing of ideas and talents that is key ingredient making teams such a powerful approach to solving discrete, short-term problems.

## Summary

In the above three sections, I have tried to outline why the Food for the 21<sup>st</sup> Century program at the University of Missouri has been successful in nurturing multi-disciplinary Nutritional Sciences. I think it is clear that the Food for the 21<sup>st</sup> Century program is a novel and unique Missouri idea that fosters multi-disciplinary research. This team approach has empowered Nutritional Sciences to become one of the top-12 programs in the country, and we have higher expectations. This strengthening has occurred largely because of the flexibility engendered by a team approach. Important tools for our success include: selecting a discrete set of emphasis areas in which to invest; using situations and systems that are advantageous to flexible teams; and using programs that match with the goals of our program. This clearly shows that teams can work in a university setting. Conventional structure at a university, however, may block the effectiveness of teams, and thus is something that administrators must recognize and adjust if their teams are to be successful. In particular, the university must commit to teams, pick goals with vision and courage, and reward team efforts for teams to be successful.

So, am I suggesting that this is beyond the grasp of universities today? My view is enthusiastically just the opposite. I believe that multi-disciplinary approaches offer an experimental way for peaceful transitions which in turn allow disciplines and universities to evolve. The individual colleges within Oxford and Cambridge have not been successful by remaining behind their sandstone and limestone walls for more than 400 years, but rather, they have succeeded by expanding beyond those walls in interesting, collaborative efforts that permit these institutions to evolve. Multi-disciplinary and multi-university approaches will provide new solutions and new discoveries that will keep our institutions vibrant, if we will only empower these teams and get out of the way.

## References

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