President's Section

Maintain the Basic Sciences: A Plea from a Clinical Professor

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Two recent incidents rekindled my position related to basic sciences in the curriculum. The first was a letter inviting me to share a few words of encouragement with a "young group of deeply committed, spirited (clinical) faculty who had been putting forth an incredible effort to restructure curricula so students would be better prepared to survive as paradigms continue to shift." The letter went on to bemoan how these efforts continue to be "severely hampered by deeply entrenched basic science faculty (yes - even including some Deans), who continue to circle their wagons around outdated (basic science) curricula." The second incident occurred in a meeting with a first-year professional student who wanted to discuss the curriculum with me. "I simply don't see relevance of this information they've been teaching in physical chemistry to pharmacy practice," she observed. As a clinician who cares for patients with diabetes, I turned to my files and retrieved two articles — one from *Nature* entitled "Monomeric insulins obtained by protein engineering and their medical implications" (1) and another from *Protein Engineering,* which describes the physical chemical characteristics of new, soluble, prolonged-acting insulin analogs in development(2). "You see, these characteristics will determine the onset, action and duration of response to products which are designed to more closely mimic the physiologic release of endogenous insulin." I explained to the student. I pointed to sections of the article which would not have been intelligible to me had I not had a background in physical chemistry. Although 1 do not consider myself conversant in the concepts, that knowledge had given me access to this clinically relevant literature and a way to think about the products that differs from other health professionals. Those of us in the clinical sciences sometimes minimize the importance of the basic sciences and, from time to time, I have overheard basic scientists denigrating the academic rigor of clinical courses. "We are in the business of educating, not training," they may sniff. I suggest that the differences in the types of basic science courses taught to pharmacy students *vis a vis* other health professionals —specifically medical students — give our graduates unique thinking skills and approaches to clinical problems which will maintain their value within the health care system over time.

"Each time you take a course which differs from that of your medical school compatriots, celebrate," I advised students in an orientation to pharmacy course. Although you must be clinically competent and be able to communicate effectively with other health care professionals, our objective is not to create a "mini doc." Because there is a projected overabundance of physicians and nurses, we will not need surrogate practitioners in the future. In fact, the successful worker will be shaped something like a "T." He or she will have a broad range of skills—perhaps overlapping with those of other health practitioners—but will also have in-depth expertise which is unique. To that end, we must design curricula that provide our students with a breadth of knowledge, thinking, and problem-solving skills that will give them the flexibility they will need to move into a broad range of unimagined opportunities over their career lives. At the same time, we must assure that they have enough depth in certain basic and applied sciences to give them access to the literature describing new and emerging scientific discoveries and the ability to integrate these into their practices. Finally, we must continue to offer courses that maintain the unique perspective and expertise of the pharmacist in the health care system. I hearken back to the papers of the Commission to Implement Change in Pharmaceutical Education(3). Although that group urged faculty to "examine, analyze and revise as appropriate, their doctor of pharmacy curriculums to assure that they are based on and reflect the philosophy of pharmaceutical care," they also pointed to the necessity of a strong science base: "The outcomes of drug therapy are manifestations of physical, chemical, biological, and psychosocial interactions within human systems...The provision of pharmaceutical care to patients

requires an understanding of the chemistry of drug entities, the delivery characteristics of dosage formulations, the disposition of drugs within the body, and the physiologic and pharmacologic outcomes of drugs' interactions with the biologic organism. What makes pharmacists unique among health care providers is a detailed and comprehensive understanding of the implications of these physical, chemical and biological interactions on the outcomes of drugs therapy."

What kinds of science knowledge and competencies make a pharmacist different? Here are a few examples. The natural and quick ability to think about a new drug from a chemical and physical chemical perspective and to use this knowledge to predict similarities with and differences from other drugs in the same therapeutic class; the ability to immediately assess the implications of a product formulation on patient compliance, drug administration, and drug action; the ability to scan a list of drugs prescribed by a physician group and identify potential patterns of misuse; the ability to review a drug profile in the context of the patient's physiologic status and predict adverse and therapeutic consequences, the ability to predict potential chemical incompatibilities in a parenteral drug order; the ability to assess the potential benefit and cost impact of emerging biotechnology agents in the context of other therapeutic modalities; the ability to evaluate drug delivery systems for efficiency and safety; and the ability to help patients and providers wind their way through the pharmacy benefit maze to achieve therapeutic outcomes within the constraints of the health benefit plan. The list could go on. But those of us in practice know that our intrinsic value lies in our ability to approach the same clinical or health care delivery situation from a unique perspective and that it is this contribution that is key to our successful collaboration with other members of the health care system.

To be sure, the plaintive wail of the student or the concerns expressed by faculty I described above should not be ignored. The compartmentalized nature of most of our curriculums and the methods we use to teach does not help students see the complex interplay between scientific principles and the clinical care of patients. Further, even if the basic sciences and clinical courses were taught concurrently, there could be no assurances that the student could make the connection between the two disciplines. Can we? Many of us in practice take our intrinsic science knowledge for granted and fail to appreciate its importance and relevance to our day to day thinking and reading. Similarly, many basic science faculty continue to illustrate principles with drugs rarely used in contemporary clinical practice. If making the links is not easy for us, it must be impossible for students. Thus, all of us — clinicians and basic science faculty alike—are obligated to be more collaborative to make these more evident to our students. We can begin by following the lead of our colleagues who have made the connections between our disciplines more apparent through the design of integrated courses, addition of clinical correlations, and the incorporation of back to basics sessions in clinical coursework. By working together to redesign our curriculums, we increase the probability of creating a flexible, broadly based practitioner who has the skill and credibility to provide pharmaceutical care because he or she is both clinically and scientifically competent.

References

(1) Brange, J. *et al.,* Monomoeric insulins obtained by protein engineering and their medical implications, *Nature,* **333,** 679-682(1988).

(2) Markussen, J. *et at.,* Soluble, prolonged-acting insulin derivatives. II. Degree of protraction and crystallizability of insulins substituted in positions A17, B8, B13, B27 and B30, *Protein Engineering,* **1**, 215-225(1987).

(3) The Papers of the Commission to Implement Change in Pharmaceutical Education. American Association of Colleges of Pharmacy, Alexandria Virginia. 1994; *see also Am. J. Pharm. Educ.,* **57**, 366-399(1993).