MEDICAL LABORATORY TECHNOLOGY PROGRAM AT KING FAISAL UNIVERSITY: A 10-YEAR EXPERIENCE

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This paper documents the evolution of the Medical Laboratory Technology (MLT) program established in 1989 (1408/1409 H) at the College of Medicine and Medical Sciences, King Faisal University. The rationale, objectives, the general outline of the program as well as methods of instruction and evaluation are discussed. The internship period and future plans are also addressed. Two hundred and seventy (270) students had been enrolled in the program since its inception until September 2000. Ten batches (138 graduates) have already successfully graduated. One hundred and fifteen (83.3%) graduated technologists are employed in the different health sectors and educational institutions in the Kingdom.

Key Words: Medical Laboratory Technology, training, curriculum.

INTRODUCTION

On recognizing the importance of medical laboratory technology and its impact on the health services of Saudi Arabia, King Faisal University (KFU) developed a medical laboratory technology program allied to the college of medicine and medical sciences in 1989. The purpose of this program was to train Saudi nationals in clinical laboratory science. The laboratory professional plays a vital role in the diagnosis and treatment of patients. Although the profession of medical laboratory technology is a young one, it has acquired a unique body of knowledge and practice. Students intending to pursue a career in medical laboratory technology need to understand their critical role in the health care team. Graduates of this program at KFU receive a Bachelor’s degree (B.Sc.) in Medical Laboratory Technology at the end of their course and are eligible to work as medical laboratory technologists in the clinical laboratories of the various hospitals and health centers in the Kingdom. Both students and institutional employers have been enthusiastic about the programme.
RATIONALE
The health goal of the Kingdom is to provide effective and comprehensive health care for all its citizens. The Kingdom has gone to great lengths to establish hospitals and clinics and to train physicians. The optimal use of these facilities depends on the availability of a variety of allied health professionals to provide essential health care services. In the Kingdom, the work of the medical laboratory technologists is done almost exclusively by expatriate staff.

In keeping with the Kingdom’s policy of introducing Saudi nationals into the health services, the training of medical technologists had to start early for the graduates to enter the service as soon as feasible.

The colleges of medicine in the Kingdom are in the best position to initiate programs in medical laboratory technology, since many of the resources needed for these programs are already available there.

OBJECTIVES
The main objectives of the MLT program are: (1) To train competent clinical laboratory personnel to meet present and future needs in primary, secondary, and tertiary health care and research centers in the Kingdom. (2) To collaborate with the Ministry of Health, other institutions and colleges in the Kingdom engaged in medical laboratory education for the purpose of improving the quality of training provided in the Kingdom to the highest possible standards. (3) To implement effective programs of continuing education for medical laboratory technologists. (4) To encourage and prepare medical laboratory technology graduates for the external certifying examinations and postgraduate programs to improve their standard and expand their horizon.

STUDENTS AND FACULTY
Students applying to the program must be high school graduates. To be accepted they must have had a high school certificate examination score of eighty five percent (85%) and above, and must have passed a written admission test and a personal interview. Since its inception, a total of 270 students have been enrolled and one hundred and thirty eight (138) students have successfully graduated from the program (Figures 1 and 2). As can be seen in figure 2, the number of graduates in 1994, almost twice that of the preceding and succeeding years, is accounted for by the fact that because of the semester system, two batches had graduated within the year. The percentage of student attrition mostly for family reasons, (eg, marriage and/or transfer to other areas of the Kingdom) has been low. Faculty involved in the training MLT students include MLT staff and faculty members, including demonstrators, lecturers, assistant professors, associate professors and professors of other departments like pathology, biochemistry, microbiology etc. Other personnel involved in training these students include laboratory consultants, laboratory supervisors and medical technologists in the various laboratories of different teaching hospitals.

OBSTACLES
Some of the problems encountered in the evaluation of the programme have been the negative attitude, misunderstanding and misconception of students’ families of the meaning and nature of work of the medical laboratory technologist. This problem was however, overcome when the importance of medical technology and its impact on health services was explained. The main emphasis of the medical laboratory technology program is on hospital training. The limited number of places for training in hospital laboratories has restricted the student intake. Moreover, besides interfering with
the clinical laboratory services for patients, the quality of training would be affected by the presence of large number of students in the laboratories. Until September 2001, the program was exclusively for females.

CURRICULUM STRUCTURE
The MLT program is a 4+1 year ($2\frac{1}{2} + 1\frac{1}{2}$ curriculum of study), resembling the 2+2 curriculum adopted by a number of schools. The first two and a half years, “preprofessional years” in the MLT program include courses stated in Table 1. During the four years of college, the students take Islamic culture courses. As the language of instruction is English, MLT students also take courses in both general and scientific English, needed for the improvement of their language and the understanding of the new terminology. These courses are conducted at the college of medicine with an average of 1-3 lectures a week for each course, one to two laboratory practical sessions a week for the
courses with a practical component, and also an average of one tutorial per week. The professional phase of this program begins in the second semester of third year through the fourth year. The courses and training in this phase provide students with theoretical background and relevant laboratory skills, with an emphasis on the practical training aspects of medical laboratory technology. The didactic lecture component describes the basic theoretical knowledge of the subject, while the laboratory component emphasizes the techniques used.

During the first semester in year three, students work on simulated patients’ specimens. They are expected to grasp the principles, procedures, methodology and interpretation of all practical tests. The training during the final three semesters consists of structured rotations through the laboratories of King Fahd Hospital of the University and affiliated clinical laboratories of other teaching hospitals in the Eastern Province. The training is done in two blocks of varied length. The first block comprises three long rotations of 10 weeks each, and three short ones of eight weeks each in the second block (Table 2).

During this phase, students work full time in the different hospital laboratories and rotate through all the disciplines of the clinical laboratory. The proposed curriculum is designed to train a generalist who is capable of dealing with all aspects of laboratory practice rather than a specialist whose expertise is predominantly in one area. The adaptability of the generalist to work in multiple areas will ensure that there is always someone to do the work. This is the preferred training by many technologists.\(^1\)

### Table 2: Second Semester of third year and fourth year courses (56 weeks)

| Course Title                  | Clinical Rotations (weeks) |
|------------------------------|----------------------------|
| Blood Bank II                | 10                         |
| Clinical Chemistry III       | 10                         |
| Clinical Microbiology & Parasitology III | 10             |
| Clinical Immunology & Serology II | 8                       |
| Hematology II                | 8                          |
| Histopathology II            | 8                          |
| Examinations                 | 2                          |

Course grades are determined on the basis of a written examination, a comprehensive practical examination and in most of the courses particularly those of the professional phase, an oral examination. The oral examinations are usually conducted in the presence of external examiners from other universities or health institutions in the Kingdom. Besides the comprehensive final examinations at the end of the courses, there is continuous assessment of the students during each
Table 3: New Curriculum for all levels

| Level                      | Course                                                                 |
|----------------------------|------------------------------------------------------------------------|
| Level one                  | English, Islamic culture I & II, Biology, General and Organic Chemistry, Physics and Mathematics, Medical Instrumentation. |
| Level two                  | First term: Islamic culture III, English language, Anatomy, Biochemistry, Analytical Chemistry, Dynamics of Health, Human Genetics. Second term: Islamic culture IV, Haematology I, Physiology, Clinical Chemistry, Microbiology and Parasitology. |
| Level three                | First term: Immunology & Serology, Clinical Chemistry, Haematology II, Microbiology & Parasitology, Histopathology, Blood Bank. |
| Level three (second term) & Level four (Clinical Rotations) | Clinical Chemistry, Clinical Microbiology and Parasitology, Blood Bank, Haematology. Immunology and Serology, Histopathology, Biostatistics, Laboratory management. |

course. In addition to the practical examinations at the end of each course, students must pass a two-part final certifying examination at the end of the four years, one after the long rotations, and another after the short rotations.

A revised curriculum recently submitted for approval, with a change in the number of credit hours for some courses, includes new courses such as medical genetics and laboratory management (Table 3).

**INTERNSHIP PERIOD**

At KFU, students must go through an additional year as laboratory interns before they are eligible to work as qualified medical laboratory technologists.

The main objective of this training period is to consolidate the theoretical and practical knowledge of the graduates and refine the skills gained previously. It also provides an opportunity to explore their areas of interest and career choices as well as an “on the job training”. The graduates rotate through the laboratories of the various hospitals of the Eastern Province subject to availability of space. The rotations were previously for four months each according to the following options: Hematology and Blood Banking or Microbiology and Serology with either Clinical Chemistry or Histotechnology. Special evaluation forms that assess the essential attributes of a medical laboratory technologist are used to monitor and evaluate the interns throughout the period. The criteria used for assessment include technical skills, judgement, reliability, responsibility, safety, knowledge, punctuality, and professional attitude. Both King Abdul Aziz University and King Saud University MLT programs have internship training. The Department of MLT, College of Applied Medical Sciences implemented a modified internship training (as from year 2000) to include all laboratory disciplines instead of the three structured rotations mentioned above. The new training will include the six major laboratory sections: Clinical Chemistry, Microbiology, Blood Banking, Hematology, Serology/Immunology, and Histopathology/Cytology. Each rotation will be of two months duration. This system was adopted to overcome the problem of laboratory space, cope with the increasing number of students and graduates, and expand the training options for interns.

**DISCUSSION**

During the past ten years, we have witnessed the evolution and progress of the MLT program at King Faisal University. The MLT program at KFU in contrast to other medical technology programs in the Kingdom and abroad has some unique features. At KFU, students enter the MLT program after high school and spend four years in an
inclusive curriculum to obtain a Bachelor’s degree in medical laboratory technology. They also work an additional year as laboratory interns before being eligible to work as qualified laboratory technologists.

The graduates with this structured curriculum and internship training are competent in all areas of laboratory practice, because the program is based on a comprehensive approach. Though there are different educational programs and formats of curricula for medical laboratory technology they all have the common requirements for a baccalaureate degree, and supervised practical training. For comparison they are briefly: (1) 2+2 program (similar to KFUs program), where the students take the required science prerequisites and are given general education during the first two years (preprofessional courses), then complete the last two years with lectures, and practical training and laboratory experience in a clinical setting (professional years). (2) 3+1 program which is college-based, offers the basic science and general education. In this structure, students take these courses during the first 3 years, and spend the last year in an affiliated hospital to acquire practical laboratory experience. (3) In the 4+1 program, the student must already have a baccalaureate degree in a discipline such as biology. She/he is given and additional year of training in lectures and practical experience. Students in this program are given a post baccalaureate certificate upon completion. (4) The integrated program is similar to the 2+2 program. In this, students take clinical laboratory science courses throughout the first three years along with other basic science and general education courses. During their senior year, these students complete the program with clinical laboratory practical and didactic courses. Many of these programs do not have an internship year. The other type of program is the clinical laboratory technician / medical laboratory technician program, mostly based in a community college or junior college. The first year of study is spent in science and general education courses and the second, in clinical practicums. This is somewhat similar to the diploma programs in the Health Colleges or Health Institutes in the Kingdom, which are of 2-3½ years duration. The curriculum is constantly being evaluated and revised, for it is the concern of all educators to assess future needs, so that new areas of technology are incorporated in a timely and appropriate manner to prepare students and graduates to meet the challenges and demands of the 21st century.

It is the MLT department’s view that an intern trained in this manner is better equipped to meet the Kingdoms present and future expectation of the laboratory personnel, which is the ability to work in any laboratory. Many employers prefer that students have an internship training before employment and are pleased with many aspects of this approach. Developers and educators of MLT programs recognize the importance of a hands-on experience in preparing graduates to be productive effective workers upon completion of their studies. Another positive feature of offering internships is the opportunity to preview a potential employee for the laboratory.

Medical laboratory technology was introduced as a department within the context of the college of medicine and medical sciences. This discipline has grown from six students at its inception to the 138 successfully graduated within a decade of its existence. The MLT department is now part of the established Applied Medical Sciences College which includes Respiratory Therapy and Physiotherapy, a new department soon to open. The success of the MLT program is partly due to the collaboration with the Ministry of Health and the Armed Forces Medical Services. The training of the students in hospital laboratories belonging to these institutions has provided them with the
experience of the differing work environment, and also helped them to gain confidence.

The laboratories of the future years will pose great challenges as technology takes enormous strides forward at great speed, and the demand for competent technologists in the Kingdom increases. To meet these demands, the MLT training in the Kingdom will have to rise to the occasion and become more challenging. Recommendations have to be made for good coordination and communication among the various programs. There might be a need for the formation of a national society or a board for clinical laboratory science to ensure the same standards of education and training throughout the Kingdom, and that effective methods are formulated to monitor the performance and maintain high standards of work among laboratory professionals. It is also very important to encourage MLT graduates to acquire certification (licensing). One example of these certification examinations is the National Certification Examination for Laboratory Personnel (NCALP). This laboratory personnel licensure is mandatory for laboratory professionals in many parts of the United States. Licensure adds stature to the profession. Many of the KFU, MLT graduates have been keen to acquire certification and many have been successful. Many of our graduates have succeeded in passing the American National Certification Agency (NCA) examination for medical laboratory personnel at the first attempt. The NCA is a voluntary organization which conducts certification of medical laboratory personnel. The certification process is designed to provide and measure a standard of knowledge desirable for medical laboratory personnel. The percentage pass rate was 83.3%, which exceeds the percentage reported for United States institutions.

Recommendations for curriculum reform and change to include new courses will soon be implemented. Future plans also include: the implementation of a career development policy for these graduates once they are employed. This policy being considered by King Fahd Hospital of the University will assign well-defined job descriptions for the different strata of laboratory technologists and serve as a structure for promotion. Postgraduate training is very essential for these graduates to upgrade their knowledge, experience and career. King Faisal University will soon develop an MSc degree program in clinical laboratory science. The suggested program will include research, classroom instruction and laboratory service. After a lengthy debate, male students were accepted into the programme in September 2001. The results of the program are gratifying. Many of the graduated technologists are employed at different health sectors in senior positions as laboratory technologists and supervisors. Some have even obtained postgraduate degrees and joined academia to participate in MLT education. The reports and positive feedback of the employers are most encouraging.

Medical laboratory technology covers a broad area of knowledge and provides many opportunities for advancement. It is also a flexible profession, which allows one not only to progress in laboratory work, but also to branch off into other disciplines if desired e.g. medicine. It is a multidisciplinary field that provides students with laboratory skills as well as a foundation in science. It is also known as a career with a moderate to high job satisfaction rate. Further national research is necessary to identify the status of MLT programs in the Kingdom and the innovative methods that would enhance the stability and advancement of clinical laboratory science education.

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