University of Kansas Medical Center
Program Review – Reporting Year 2022

Program	CIP	Degree Level	Recommendation*	Notes**
Biochemistry And Molecular Biology	26.0210	M, D	**Continue**	
Cell Biology And Anatomy	26.0407	M, D	**Continue**	
Microbiology	26.0503	M, D	**Continue**	
Cancer Biology	26.0911	M, D	**Continue**	
Pharmacology	26.1001	M, D	**Continue**	
Toxicology	26.1004	M, D	**Continue**	

M= Masters; B=Bachelors; D= Doctorate

***Recommendation options are: Continue, Additional Review, Enhance, Discontinue**

****Notes are only required for programs that have a Recommendation other than "Continue"**

The Notes field should contain information on Academic Support Program, etc., as well as information on programs with designation other than "Continue."

University of Kansas Medical Center
2020-21 Program Review Report

Submitted January 28, 2022

Dr. Robert Klein
Vice Chancellor for Academic Affairs

Dr. Michael Werle
Dean of Postdoctoral Affairs and Graduate Studies

Dr. Matthew Schuette
Associate Director of Institutional Research

Contents

Institutional Overview

The University of Kansas Medical Center (KUMC) is an integral and unique component of the University of Kansas, composed of the Schools of Medicine, Nursing, Health Professions, and the Office of Postdoctoral Affairs and Graduate Studies. The Medical Center is a multi-faceted institution whose functions include education, research, patient care, and community engagement. Our primary clinical partner is The University of Kansas Health System, which provides students an exceptional clinical arena from which to train and learn. The University of Kansas Medical Center trains professionals to meet a wide range of healthcare needs in urban and rural Kansas, from the critical need for primary care and prevention to the urgent need for highly innovative and specialized clinical care. We produce medical scientists who are essential for basic and translational research, supplying the state's bioscience and biotech workforce and creating economic development. Our programs are comprehensive and maintain the high scholarship and academic excellence upon which the University's reputation is based.

Mission and Vision

In 2019, the University of Kansas Medical Center adopted a new strategic plan which states that our mission is "to improve lives and communities in Kansas and beyond through innovation in education, research and health care" and our vision is "to lead the nation in caring, healing, teaching and discovering." The plan is supported by three pillars, summarized below, with a strategic focus in each pillar placed on people, community, and value.

Education | Teaching. We will produce prepared graduates and new scientists through innovative and accredited programs. The Medical Center offers a full range of undergraduate, graduate, professional, postdoctoral, and continuing education programs to a diverse student and learner population. We value attracting and retaining high-quality educators in order to foster successful program growth and excellence. By leveraging technology, we can expand our educational impact and improve access to areas in the state with provider shortages. We support enhanced opportunities for interprofessional education, so that effective collaboration takes place between students and clinician educators, ultimately providing interprofessional healthcare as part of an integrated team focused on improving patient outcomes.

Research | Discovery. We will increase our research and innovation efforts, including a goal to grow funding from the National Institutes of Health (NIH) to $100M by 2026. The Medical Center strives to advance the health sciences through internationally recognized research programs in basic, clinical, and translational sciences, as well as drug discovery, health services research, and population health. We enable effective and efficient building of our research capacity including the recruitment, development and mentoring of faculty scientists. We will engage community partners to develop strong, research-focused relationships, as well as those wishing to endow aspects of the research enterprise. We see value in optimizing resources to support robust growth in NIH grant submissions and awards.

Healthcare | Caring and Healing. We will contribute to improved health in Kansas through innovative efforts to improve the state's national health rankings and by doubling clinical trial opportunities by 2026. The Medical Center provides exceptional patient care with a focus on quality care and

outcomes through hands-on student training, residency programs, affiliations with hospitals and clinics throughout the state, and using telehealth and student- and faculty-operated clinics to care for the underserved. We will model team-based approaches to clinical care, research and education. We can expand primary care in Kansas by improving the provider-to-population ratio and continued support for telehealth. We value growing and promoting translational research and leveraging key partnerships and innovative technologies to improve health throughout the state and region.

To realize this mission and vision, the University of Kanas Medical Center must have strong and viable academic programs. To ensure their quality and viability, the Medical Center is committed to periodic review, both internally at the department level and externally by appropriate accrediting agencies and the Kansas Board of Regents.

Periodic Review

Periodic review offers the opportunity to assess the strengths and concerns of Medical Center programs. To accomplish this, the following goals have been established:

1. Assess existing program strengths and concerns to enhance the quality and accessibility of academic and professional programs.

2. Identify and articulate academic program needs and campus priorities to augment institutional self-management.

3. Identify needs to reorganize academic programs, including modification, merger and discontinuance.

Due to the inherent professional nature of many of the programs at the Medical Center, such programs are reviewed and evaluated by an appropriate discipline-specific accrediting agency with site visits occurring on a schedule determined by the accreditation body. These reviews are rigorous and measure progress toward the program's stated mission, identify its strengths and weaknesses, and, if appropriate, state improvements necessary to meet national standards. Many accrediting bodies now require annual updates on benchmark data related to outcome minima.

Program Review Process

All degree programs at the University of Kansas Medical Center are accredited under the umbrella of the Higher Learning Commission (HLC), with the most recent Reaffirmation of Accreditation effective in 2015 for a full ten-year period. As mentioned above, most of our professional programs are accredited by a discipline-specific agency, viewed as a critical component for having a valid program in the eyes of students and employers. To take advantage of the activities associated with this type of accreditation, the Medical Center makes efforts to coordinate the Program Review year with site visits from the accrediting body.

Leading up to the Program Review year, programs are provided minima tables from KHEDS data, instructions related to the PR process, and the six Board of Regents criteria required to be

incorporated into the narratives. These criteria are to address:

- Centrality of the program to fulfilling the mission and role of the institution.
- The quality of the program as assessed by the strengths, productivity and qualifications of the faculty.
- The quality of the program as assessed by its curriculum and impact on students.
- Demonstrated student need and employer demand for the program.
- The service the program provides to the discipline, the university, and beyond.
- The program's cost-effectiveness.

The department may use information compiled during internal self-review, annual updates required by the accrediting body, and/or a self-study report produced for an accreditation site visit team. Data comes from centralized sources involving student, HR, research, and financial systems, as well as internal department record keeping. Departments may use course evaluation and program evaluation data from students and other stakeholders to make necessary modifications, or to further enrich their programs. Many departments run exit surveys on student satisfaction as well as surveys on recent graduates regarding employment.

For programs that do not have additional accreditation outside of the HLC, the Office of Postdoctoral Affairs and Graduate Studies institutes a process of internal self-review based upon a set of standard criteria, with the end result being a recommendation to Vice Chancellor of Academic Affairs regarding the program (e.g. continue, additional review, enhance, discontinue) from the Dean of Graduate Studies. One example of this process used in the past is illustrated below. For professional programs with specific accreditation, the University understands the rigors undertaken to maintain accreditation and to prepare for site visits or annual updates. In these cases, Academic Affairs does not mandate additional internal review in preparation for Program Review. The final recommendation by Academic Affairs is made based on these inputs in conjunction with strategic planning and external forces (e.g. financial support, research landscape, state health-professional needs).

<u>Review of Biomedical Sciences Graduate Programs during 2020-21</u>

- Each department was asked to review their programs from a student, curriculum, and faculty perspective.
- A report was written which provided five-year details about: the graduate faculty in the program; the graduate students of each faculty member; and the degrees conferred and titles of theses or dissertations. Full description of the current curriculum was required.
- The department prepared a two-page summary narrative in line with Board of Regents Program Review requirements.
- The report was distributed to a select tenured faculty committee for review. To help remove bias, the faculty members chosen were from outside the reviewed department.
- The review committee met with program administrators for questions and feedback.
- The committee prepared its own report based upon review and made a recommendation to Academic Affairs regarding the program.

List of Reviewed Programs

The Program Review submitted to the Kansas Board of Regents in January 2022 consists of programs at the University of Kansas Medical Center reviewed during the July 1, 2020 - June 30, 2021 Academic Year. Six programs were reviewed during the academic year. The program name is followed by the CIP code assigned and the program's housing department and school. The awards offered within each program are listed for reference.

- Biochemistry and Molecular Biology (26.0210, Biochemistry and Molecular Biology, School of Medicine)

  Master of Science in Biochemistry and Molecular Biology
  Doctor of Philosophy in Biochemistry and Molecular Biology

- Cell Biology and Anatomy (26.0407, Anatomy and Cell Biology, School of Medicine)

  Master of Science in Cell Biology and Anatomy
  Doctor of Philosophy in Cell Biology and Anatomy

- Microbiology (26.0503, Microbiology, Molecular Genetics and Immunology, School of Medicine)

  Master of Science in Microbiology
  Doctor of Philosophy in Microbiology

- Cancer Biology (26.0911, Cancer Biology, School of Medicine)

  Master of Science in Cancer Biology
  Doctor of Philosophy in Cancer Biology

- Pharmacology (26.1001, Pharmacology, Toxicology and Therapeutics, School of Medicine)

  Master of Science in Pharmacology
  Doctor of Philosophy in Pharmacology

- Toxicology (26.1004, Pharmacology, Toxicology and Therapeutics, School of Medicine)

  Master of Science in Toxicology
  Doctor of Philosophy in Toxicology

Statistical Data

The information in the following table is taken primarily from KBOR data collections over the

most recent five-year period; that is, from AY 2017 to AY 2021. Both declared majors and degrees conferred are generated from the Kansas Postsecondary Database (KSPSD). Departmental faculty counts are part of Program Review data collections, as are ACT scores for undergraduate majors. Only tenured or tenure-track faculty with terminal degrees are submitted for the purposes of Program Review; as such, these do not typically reflect the scope of faculty instruction at KUMC. The Medical Center has several main types of faculty appointments: tenure-track, clinical scholar track, clinical track, research track, and educator track. All are important for maintaining the educational, research, and clinical missions of the Medical Center.

Minima Data for Reviewed Programs

Program	Award	Department	Program Review Minima Data (5 Year Averages)				Institutional Data
			Declared Majors	ACT Scores	Degrees Conferred	Departmental Faculty[1]	Program Core Faculty[2]
			AY 17-21, Declared Majors reflect Fall 20th Day				Fall 2020
Biochemistry and Molecular Biology	MS[3]	Biochemistry and Molecular Biology	0		< 1	10	18
	PhD		12		2		
Cell Biology and Anatomy	MS[3]	Anatomy and Cell Biology	0		< 1	13	36
	PhD		9		2		
Microbiology	MS[3]	Microbiology, Molecular Genetics and Immunology	< 1		< 1	10	14
	PhD		14		2		
Cancer Biology	MS	Cancer Biology	1		1	7	30
	PhD		9		2		
Pharmacology	MS[3]	Pharmacology, Toxicology and Therapeutics	0		0	12	17
	PhD		4		2		
Toxicology	MS[3]	Pharmacology, Toxicology and Therapeutics	0		< 1	12	17
	PhD		14		3		

[1] Faculty in the program's parent department who are tenured or on tenure-track and hold the appropriate terminal degree for the field.

[2] Faculty who teach full- or part-time in departmental program(s), or who may serve key roles in research mentoring of students, including some volunteer appointments.

[3] Students are admitted to the program at the PhD level. A master's is awarded to qualifying students who choose to end their program early or those who do not successfully qualify for the PhD. A master's is not awarded in route to the PhD.

Institutional Recommendations and Program Assessments

Program Review stipulates that an institution makes a recommendation about each program reviewed during the academic year using one of the following: continue, additional review, enhance, or discontinue. These recommendations are listed in the Program Review Summary Table. Further, for each program reviewed, a summary assessment and the institutional recommendation is presented in the form of a narrative. This "program narrative" is to include all degrees within a program.

To better understand the nature and assessment of our biomedical science programs, further context is given here. The first-year core curriculum for graduate students interested in becoming biomedical researchers is provided by the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS). Students are admitted to this program at the doctoral level. In addition to in-depth study on proteins and metabolism, molecular genetics, and cell structure and cell communication, the curriculum includes introductions to research ethics and bioinformatics. Along with its affiliation to academic departments at the Medical Center and the intercampus Neuroscience Graduate Program, the IGPBS has strong local support from the Stowers Institute for Medical Research, located in Kansas City, MO. Many of the Stowers' researchers have appointments to the graduate faculty at KUMC. Currently, around 13-16 students are admitted into the IGPBS each year.

During the IGPBS year, students meet faculty from the various departments and become acquainted with the types of research being conducted in their laboratories. Each student selects three laboratories for research rotations, which helps facilitate their choice of a research mentor. Students may choose among one of nine PhD programs (Cell Biology & Anatomy; Cancer Biology; Biochemistry and Molecular Biology; Microbiology; Molecular and Integrative Physiology; Neurosciences; Pathology and Laboratory Medicine; Pharmacology; Toxicology). The choice of a mentor determines the doctoral program which the student pursues and the department providing support. Occasionally, a student may not be able to complete all the requirements for the PhD. In that case, the student will be awarded a master's degree, provided they have completed the minimal requirements for that level. As such, the Medical Center addresses the Board minima requirements for these programs at the doctoral level only.

Biochemistry and Molecular Biology Program

The University of Kansas Medical Center recommends *continuation* of the Biochemistry and Molecular Biology Program (MS/PhD), based upon institutional review during the 2020-21 academic year. The graduate program is offered by the Department of Biochemistry and Molecular Biology (BMB) within the School of Medicine. As of Fall 2020, there were 12 PhD students and 2 MD/PhD students enrolled, which are healthy figures, and consistent with enrollment over each of the last five years. The program is supported by faculty and staff whose mission is to provide: a dynamic research environment with programs in the disciplines of biochemistry and molecular biology; a superior educational experience and rich training environment for graduate students, medical students, and postdoctoral fellows; and excellent service to the institution and community.

Students entering the BMB program are PhD or MD/PhD seeking students. Like other biomedical science graduate programs at the Medical Center, students are typically admitted through the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS), which provides the first-year core curriculum, before eventually selecting a research mentor by the beginning of their second year. During their second and third years, students take three advanced graduate courses in molecular genetics, protein structure and function, and methods for analyzing biomolecules. These courses require active student participation, with discussion and projects often centered on recent journal publications. Every semester, graduate students participate and present in weekly seminar courses. Special topics courses are available and tailored to meet individual student needs. All graduate students perform research that ultimately lead to publications and their doctoral dissertation.

Of the current 18 graduate faculty, 13 are primarily appointed within the Department of Biochemistry and Molecular Biology (11 tenure-track; 2 research-track). Of the 5 secondary appointees, 2 have appointments at the Medical Center within clinical departments and 3 are investigators at the Stowers Institute for Medical Research. In addition to advanced graduate courses, faculty teach the first lecture-based module in the IGPBS. Within this program, faculty efforts are directed towards helping students adapt to a new learning environment with advanced expectations. Two faculty members have important leadership and instructional roles in the first couple of years of the medical curriculum (i.e., Phase I). Dr. Slawson is current chair of the Education Council and director for the pre-matriculation block, where students from under-represented groups in medicine are invited to participate, allowing them to experience the flow and content of medical curriculum prior to the start of their first year. Dr. Fontes is chair of the Phase I Committee and the director of the Molecular and Cellular Medicine block in the first year. This is the first graded, “high-stakes” block of medical school and requires extensive work with students who have found the transition to medical education challenging. Almost all BMB tenure-track and research-track faculty teach within the Phase I curriculum, authoring, presenting, and lecturing in the flipped classroom Case-Based Collaborative Learning sessions.

The educational mission of the Department of Biochemistry and Molecular Biology is enhanced by its research mission. Areas of strength include regulation of gene expression and transcription; protein folding and structure determination; allosteric regulation of protein function; and signal transduction. Faculty are involved with interdisciplinary research centers and institutes at the Medical Center, including the Kidney Institute, the Kansas Institute for Precision Medicine, and the University of Kansas Cancer Center, to name a few. Tenure-track and research-track faculty in the BMB department were awarded nearly $2.5M dollars in extramural funding during the 2020 fiscal year, with over 80% of this representing project grant program funding from the National Institutes of Health. These resources support faculty salaries, stipends for graduate students, and research staff within the department, and thus provide for a cost-effective graduate program.

The strength of the curriculum and the faculty for the BMB graduate program can be measured in several ways. Three current graduate students have been awarded Biomedical Research Training Program

funds, a competitive program which supports applicants committed to pursuing externally funded individual fellowships or in contributing to the development of institutional training programs. At a recent KUMC Student Research Forum, a graduate student in the program made the final round of the 3-minute thesis competition, another placed first in oral presentations, and another had the best overall poster. Similarly, BMB faculty members have been honored for their efforts in research and education within the past five years. In 2021, Dr. Roelofs was awarded the University of Kansas Alzheimer Disease Center Developmental Project award and Dr. Hagan was recognized as a "NextGen Star" by the American Association for Cancer Research. Drs. Fontes, Parnell, and Slawson have all been honored with various awards for their efforts in teaching in the medical curriculum. Finally, of the 8 PhD graduates in the last five years, all are employed in either postdoctoral positions around the country (including prestigious institutions such as Scripps Research, University of Pennsylvania, and the National Institute for Child Health and Human Development), research positions at the University of Kansas Medical Center, or in an academic position at a local university.

BMB faculty serve on many KUMC committees, including the Radiation Safety Committee, the Research Advisory Committee, the School of Medicine (SOM) Promotion and Tenure Committee, the SOM Academic and Professionalism Committee, the Phase I Curriculum Committee, and the MD/PhD Advisory Committee. Additionally, faculty serve on regional, national, and international committees related to their research, as editors and reviewers for scientific journals, and as grant reviewers on national study sections. From an outreach perspective, the department sponsors the annual Heartland Undergraduate Biochemistry Forum, which includes a keynote seminar, and poster presentations by regional undergraduate and high school students. Faculty members present seminars and guest lectures at regional schools. The departmental laboratories frequently host regional undergraduate and high school students for research experiences. In 2021, a junior high outreach program hosted about 1800 middle school student interactions with researching scientists.

The Department of Biochemistry and Molecularly Biology is a valuable resource for the Medical Center and the State, due to its strengths in research, teaching, mentoring, service and outreach, providing its students with various opportunities to succeed in their research and educational endeavors and the ability to launch a successful career path upon graduation.

Cell Biology and Anatomy Program

The University of Kansas Medical Center recommends *continuation* of the Cell Biology and Anatomy (CBA) Program, based upon institutional review during the 2020-21 academic year. The graduate program is offered by the Department of Anatomy and Cell Biology within the School of Medicine. The program is designed to prepare students for a career in research with concentrations in cell biology, developmental biology, neuroscience, renal biology, or reproductive biology. Through active participation in biomedical research, students develop the skills and knowledge necessary to generate and disseminate scientific findings. In Fall 2020, there were 5 PhD students enrolled in the program, which is down from a recent three-year average of 12. This is an area of concern that is being monitored internally.

Students entering the CBA program are PhD or MD/PhD seeking students. Like other biomedical science graduate programs at the Medical Center, students are typically admitted through the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS), which provides the first-year core curriculum, before eventually selecting a research mentor by the beginning of their second year. After entry into the CBA program, students are required to take a graduate-level histology course, and at least one advanced course related to their research interests, such as in neuroscience, neurological disorders, or developmental biology. Each semester, students enroll in an analysis of scientific papers and in a departmental seminar course. During their graduate career, students give two hour-long research seminars and participate in educational activities, generally carried out within the laboratory by mentoring junior students. Over the last five-year period, there were 18 students enrolled in the CBA program, with 10 PhD degrees and 1 MS degree conferred. Program graduates went on to postdoctoral and residency fellowships at prominent educational institutions, including Stanford University, Scripps Clinic, Weill Cornell Medical College, and Washington University, or by gaining employment at biotech companies (e.g., Akoya Biosciences, BioAgilytix).

The bulk of the graduate training takes place in a research laboratory under the guidance of a faculty mentor and the graduate director of the CBA program. In consultation with these faculty, the student will form a research advisory committee during the fall of their second year. The members of this committee will meet bi-annually with the student to discuss research and classroom progress, provide advice and guidance on the research project and career development, and help prepare for and administer the required programmatic examinations. No later than the end of the fall semester of their third year, students must successfully complete a comprehensive examination. This exam consists of a written research proposal (in the style of a grant proposal to that National Institutes of Health), which is based on the anticipated dissertation project of the student, and an oral defense of that proposal. After passing the comprehensive exam, the student is considered a PhD candidate and will carry out laboratory research, culminating in the preparation of a doctoral dissertation. Most students complete their PhD within 4 to 5 years of entering the CBA program. In relatively rare instances, graduate students will terminate their training before completing the doctoral dissertation, and, depending upon the circumstances, will receive the MS degree.

The CBA program is supported by a diverse and experienced faculty. Of the current 36 graduate faculty, 18 are primarily appointed within the Department of Anatomy and Cell Biology (14 tenure-track; 3 research-track; 1 education-track). Of the 18 secondary appointees, 7 have appointments at KUMC, largely within clinical departments; 8 are affiliate investigators at the Stowers Institute for Medical Research; and 3 are current or prior investigators at Children's Mercy Hospital. In 2020, the Department of Anatomy and Cell Biology brought in almost $7M in National Institutes of Health (NIH) funding, including influential awards such as the Institutional Development Award (IDeA) and a Center for Biomedical Research Excellence (COBRE) grant. The IDeA helps fund the Kansas IDeA Network of Biomedical Research Excellence (K-INBRE), which supports undergraduate and graduate students at four-year universities across Kansas and assists with faculty recruitment statewide. Research funding is also

used in part to supplement departmental faculty salaries, support graduate student stipends, and hire technical staff, all of which positively contribute to the State of Kansas economy.

In addition to teaching graduate students within the CBA program and in the IGPBS curriculum, another key academic focus of the department involves supporting medical education. Two ACB graduate faculty serve as block directors in years one and two (i.e., Phase I) of the medical curriculum. Nearly all primary appointed faculty are involved in facilitation of Case-Based Collaborative Learning or Problem-Based Learning sessions in Phase I. Faculty also have a strong field-specific, service-oriented resume, with several holding memberships on editorial boards of professional journals, as elected offices in prestigious scientific societies, or with appointments to peer review committees of the NIH and other national funding agencies. Additionally, many are active in important university committees, such as the Institutional Animal Care and Use Committee, School of Medicine (SOM) Promotion and Tenure Committee, and the SOM Research Committee. In recognition of their teaching efforts, departmental faculty have been honored with numerous Student Voice Awards (voted on by medical students), as well as the Ruth Bohan Teaching Professorship (Drs. Wright and Werle) and the Chancellor's Distinguished Teaching Award (Dr. Christianson).

The Department of Anatomy and Cell Biology is a vibrant department with highly productive faculty, educating the next generation of cell biologists, developmental biologists, neuroscientists, and physicians, and graduating students who continue their careers as scientists, physician scientists, and scientist-educators. As such, the graduate program aligns closely to the core value of the Medical Center "to lead the nation in caring, healing, teaching and discovering." The program is also cost-effective due to the shared IGPBS curriculum and NIH-research funding, allowing the graduate training program to be competitive nationally and supporting its firm foundation at the Medical Center for years to come.

Microbiology Program

The University of Kansas Medical Center recommends *continuation* of the Microbiology Program (MS/PhD), based upon institutional review during the 2020-21 academic year. The graduate program is offered by the Department of Microbiology, Molecular Genetics and Immunology (MB) within the School of Medicine.

The mission of the department and program is to conduct high-impact research relevant to human health and to train the next generation of biomedical scientists and physicians, advancing the understanding of infection and immunity in ways that benefit humankind. This mission is well-aligned to that of the Medical Center, which is "to improve lives and communities in Kansas and beyond through innovation in education, research and health care". Infectious diseases, which are the second leading cause of death worldwide, are part of the program's focus, and the department has investigated novel approaches to fight the causative agents of COVID-19, AIDS, hepatitis, and Lyme disease, to name a few, and to develop interventions to treat genetic diseases using viral vectors. Immunology includes aspects of innate and adaptive immunity, the two primary branches of the immune system, and the department has conducted studies that fill gaps in the understanding of basic immunologic mechanisms.

As of Fall 2020, there were 14 PhD graduate students enrolled in the MB program, which mirrors similar enrollment for each of the last five years. Like other biomedical science graduate programs at the Medical Center, students are typically admitted through the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS), which provides the first-year core curriculum, before eventually selecting a research mentor by the beginning of their second year. In the department, students take introductory courses that cover two of the three main disciplines that are at the foundation of faculty research, namely, virology, immunology, or bacteriology. Students are then required to take two advanced courses related to fields in which their research is based. The needs of the students can vary widely each time these courses are offered so it is essential that the coursework is designed with sufficient flexibility. The department uses the method of active learning, in which students consult with faculty and design their own learning objectives. In addition to formal classes, graduate students are required to perform research that will ultimately lead to publications and their dissertation. The required research involves designing and implementing cutting-edge scientific theory and applications. Recent PhD graduates have found postdoctoral opportunities at prestigious institutions, including Washington University, the University of North Carolina at Chapel Hill, and the Vaccine and Gene Therapy Institute at Oregon Health & Science University, or in biomedical or bioagricultural employment at places like 4M Healthcare, Kriya Therapeutics, and the National Institute of Food and Agriculture (in Kansas City).

The fourteen graduate faculty consist of nine tenure-track faculty members, two research-track faculty members, one emeritus faculty, and two faculty with joint appointments. Faculty participate in the curriculum offered by the Interdisciplinary Graduate Program in Biological Sciences. In addition, there are grant-writing courses organized by two other departments that are taught, in part, by Microbiology faculty. All tenure-track faculty members in the Department of Microbiology, Molecular Genetics and Immunology are currently principal investigators on significant research grants. In fiscal year 2020, primary faculty have been awarded nearly $4M dollars in extramurally funded research grants, with a majority of these sponsored by the National Institutes of Health. The research portfolio serves the economic interests of the State of Kansas, as the funding earned by faculty members is used to hire graduates of universities, both locally and from around the State. The MB department is home to the Flow Cytometry Core Laboratory, whose director is a member of the department, and which houses six major instruments worth approximately $1.5 million. The Core serves investigators at the Medical Center, the University of Kansas-Lawrence, Kansas State University, Children's Mercy Hospital, the University of Missouri-Kansas City, and several companies in the area. Faculty in the department heavily use two Biosafety Level 3 Laboratories to train next generation scientists in fighting highly pathogenic viruses, such

as SARS-CoV-2, hantavirus, and Bourbon virus. The department's educational and research scope extends beyond PhD and MD/PhD students in the MB program, and include medical students, undergraduate students, and non-traditional students interested in pursuing research as a career, as well as high school students interested in microbiology, and there are short-term volunteer opportunities available for those needing direction on whether to pursue graduate or medical education. This outreach is vital to continuing the pipeline of students who can pursue biomedical science or medicine in the State in future generations.

Faculty scientists in the Department of Microbiology, Molecular Genetics and Immunology are also involved with interdisciplinary centers and institutes at the Medical Center, such as the University of Kansas Cancer Center, the Institute for Reproductive Health and Regenerative Medicine, the Diabetes Institute, and the Liver Center. In addition, faculty members have served as chair of the School of Medicine Research Committee and as members of the Medical Center's Research Advisory Committee, whose purpose is to advise administration on matters related to research infrastructure and funding. Faculty serve on regional, national, and international committees related to their research, including as reviewers for grant programs sponsored by the National Institutes of Health and the Department of Defense. The MB department supports the annual Great Plains Infectious Disease Conference, which provides an opportunity for interaction among the region's graduate students, post-doctoral fellows, and academia. Faculty have been honored for their efforts in research and education. One faculty member has been elected a member of the National Academy of Sciences (Dr. Lutkenhaus), and two were elected fellows of the American Academy of Microbiology (Drs. Lutkenhaus and Qiu). Department faculty members have won numerous Student Voice Awards, as well as the Medical Center's Ruth Bohan Teaching Professorship (Dr. Zückert).

In summary, the Department of Microbiology, Molecular Genetics, and Immunology is an excellent resource for the University of Kansas Medical Center and the State of Kansas. The Department performs life-saving research and, in the process of this work, provides an important economic resource to both the Medical Center and the State, while at the same time educating the next generation of physicians and scientists.

Cancer Biology Program

The University of Kansas Medical Center recommends *continuation* of the Cancer Biology Program (MS/PhD), based upon institutional review during the 2020-21 academic year. The graduate program is offered by the Department of Cancer Biology (CB) within the School of Medicine. The program is relatively new, admitting its first students in 2016. Since then, enrollment in the program has grown to 11 PhD students, as of Fall 2020.

The focus of the program is broadly defined as cancer research; however, there are student-identified areas of emphasis that include cancer cell biology, etiology and progression, cancer prevention and therapeutics, and cancer-care delivery. The program arms its students with intellectual skills that enable them to engage significantly within the scientific discipline, a critical component for achieving their educational and research goals. Students capitalize on the diversity of opportunities that are available, ultimately integrating in faculty laboratories at the Medical Center, the University of Kansas (Lawrence campus), the University of Kansas Cancer Center, and Children's Mercy Hospital. The CB program combines basic, translational, clinical, and population-based research to provide students a holistic educational experience that helps fulfill the mission of the Medical Center "to improve lives and communities in Kansas and beyond through innovation in education, research and health care." Additionally, the program closely aligns with the mission of the University of Kansas Cancer Center; through its innovative approaches to drug discovery, delivery, and development, to transform cancer research and clinical care delivered in Kansas and beyond.

Students entering the Cancer Biology Program are MS, PhD, or MD/PhD seeking students. Like other biomedical science graduate programs at the Medical Center, students are typically admitted through the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS), which provides the first-year core curriculum, before eventually selecting a research mentor by the beginning of their second year. The IGPBS curriculum includes in-depth study on proteins and metabolism, molecular genetics, and cell structure, as well as introductions to research ethics and biomedical research. Within the department, graduate students are required to take several comprehensive courses on carcinogenesis, tumor environment and tumor progression, seminar courses designed to assist the students in the art of public speaking and the presentation of data, and advanced electives. Apart from coursework, students are required to successfully complete and defend an oral and written comprehensive exam during their second year in the Department. After completion of these goals, the student can fully devote their time to research. The final milestone that must be achieved to obtain the PhD is the completion of a dissertation and an oral defense. The dissertation represents the culmination of research conducted by the student and is the basis for publications in scientific journals. Students graduating recently from the program have pursued various employment opportunities, from accepting post-doctoral positions at Research 1 universities including Yale, Northwestern, and KU, resuming medical school followed by residency training, or accepting positions within the biotech and pharmaceutical fields (e.g., Thermo Fisher Scientific).

The mission of the Cancer Biology department is to train students (future scientists) in the core principles and experimental approaches within cancer biology and to empower their ability to conduct hypothesis-driven research to better understand the fundamental mechanisms that cause and define the hallmarks of cancer. The department is home to 30 faculty members: 5 tenured faculty, 2 tenure-track faculty, 4 research-track faculty, and 19 faculty members with joint affiliations, including several from the University of Kansas in Lawrence. Approximately 75% of the faculty maintain an active research program and are involved in the teaching and training of the graduate students. CB faculty serve as course directors for the advanced cancer biology coursework, and several teach in the IGPBS curriculum. In addition to graduate studies, departmental faculty are involved in the medical education curriculum, serving as

facilitators for Case-Based Collaborative Learning (CBCL) taken by first and second-year medical students and participating in the development and writing of CBCL cases.

The expertise of the faculty spans a wide range of research topics including cancer initiation, progression, and treatment, and through a collaborative, multi-disciplinary approach, they promote basic discoveries that can be translated from bench-to-bedside, to improve cancer outcomes and quality of life for patients. The research mission of the department continues to serve the economic interests of the State of Kansas, with $10.5M in cancer-related, peer-reviewed funding from the National Institutes of Health, the Department of Defense, the National Science Foundation, the Komen Foundation, and the American Cancer Society. Faculty members have published over 250 cancer-relevant, peer-reviewed papers during 2017-2021, and of these publications, 13% were in high impact journals. Nearly every faculty member's research program has been or is currently supported by major external funding and several of our faculty members are nationally and internationally known for their contributions to the cancer field including, Dr. Danny Welch (Professor and Kansas Bioscience Authority Eminent Scholar), Dr. Scott Weir (Professor and Director of the Institute for Advancing Medical Innovation), Dr. Stefan Bossmann (Professor and Interim Chair of the department), and Dr. Michael Washburn (Professor and Executive Director of the Mass Spectrometry and Proteomics Core at KUMC).

Apart from their role in the CB department, ten faculty members are members of the University of Kansas Cancer Center, where their research efforts have positively contributed to the Cancer Center achieving National Cancer Institute-Designated status with the potential of achieving Comprehensive status in 2022. Several faculty members (Drs. Jensen, Welch, Weir, Thomas, and Neufeld) hold leadership positions in the Cancer Center, and they are leaders or co-leaders within the Cancer Center's core research programs: cancer biology; cancer prevention and control; and drug discovery, delivery, and experimental therapeutics. CB faculty also serve on many KUMC committees, including the IGPBS Admissions Committee, Research Advisory Committee, the School of Medicine Promotion and Tenure Committee, the MD/PhD Advisory Committee, Institutional Review Board, and the Institutional Animal Care and Use Committee, to name a few.

In closing, the Department of Cancer Biology provides an excellent educational and research training environment for its students, through devoted and engaged faculty, and it is an outstanding resource for the University of Kansas Medical Center, the University of Kansas Cancer Center, and the State of Kansas. A defining feature of the Cancer Biology PhD program is its central role in bringing together the diverse facets of cancer research and the experiences of our faculty, students, and staff. This nucleating function of the program positions students and their research in the spotlight of the community and provides an outstanding mechanism for engagement amongst students and faculty across diverse scientific disciplines.

Pharmacology and Toxicology Programs

The University of Kansas Medical Center recommends *continuation* of the Pharmacology and Toxicology Programs, based upon institutional review during the 2020-21 academic year. The graduate programs are offered by the Department of Pharmacology, Toxicology and Therapeutics (PTT) within the School of Medicine. The two graduate programs reflect and support the primary research themes of the department: neuropharmacology (the study of how drugs affect the nervous system), pharmacokinetics (the movement of substances within the body), and the toxicity of drugs, alcohol, and environmental chemicals. In addition, studies are conducted to understand which drugs enter the liver by specific transporters, and how genetics determine why the response to drugs can vary among different patients (personalized medicine). As of Fall 2020, there were 16 students in the toxicology graduate program, a stable figure over the last five years, and 3 students in the pharmacology graduate program, the latter of which is being monitored internally due to a decrease in both enrollment and in pharmacology faculty since the previous KBOR program review.

Students entering the graduate programs offered by the PTT department include those seeking PhD or MD/PhD degrees. Like other biomedical science graduate programs at the Medical Center, students are typically admitted through the Interdisciplinary Graduate Program in Biomedical Sciences (IGPBS), which provides the first-year core curriculum, before eventually selecting a research mentor by the beginning of their second year. In the department, students take a one-credit introductory course either on the principles of pharmacology or the principles of toxicology. After this introductory course all PTT students must take in-depth coursework on pharmacology and toxicology essentials as well as on the disposition of xenobiotics (i.e., substances foreign to the body). Students take elective courses, ideally to supplement their research projects. In addition to these formal classes, graduate students are required to give an annual seminar and to perform research leading to peer-reviewed publications and their dissertation. The required research involves formulating hypotheses and designing and implementing cutting-edge scientific experiments to test them. Graduates from the programs have been highly successful in landing postdoctoral, research or academic positions at institutions such as Duke University, Stanford University, Children's Mercy Hospital, and Baylor University, and in industries such as AstraZeneca, Global Blood Therapeutics, Locus Biosciences, Sekisui XenoTech (Kansas City, KS), and Hill's Pet Nutrition (Topeka).

The PTT department currently consists of nine tenure-track faculty members and two research-track faculty members with primary appointments, and nine faculty members with secondary appointments. In addition to teaching and mentoring its graduate students, the department supports the IGPBS, and in the medical education curriculum through directing the gastrointestinal/renal module taken by first year medical students. The faculty conduct high impact research relevant to human health and prepares its students for careers in the pharmacological, toxicological, and environmental sciences. During the previous KBOR review period (2007-2014 cycle), the department underwent a marked expansion through the addition of faculty with a major focus in liver pathobiology and toxicology. Since then, primary faculty numbers have decreased due to the retirement or departures; in response, the program is currently recruiting faculty members. The department continues to garner significant extramural funding, which helps keep the graduate programs cost-effective and is an economic resource for the State of Kansas. Seven of the nine tenure-track faculty members are principal investigators on research grants totaling $5.4M in fiscal year 2020, with primary support from the National Institutes of Health. This includes a Center of Biomedical Research Excellence Program (COBRE). The COBRE supports junior faculty members and core laboratories and provides support for a seminar program, in which nationally and internationally recognized speakers present their research to our faculty and trainees. Research opportunities in the PTT department extend beyond the program, and include medical students, students from the Master of Science in Biotechnology Program, undergraduate students funded through the Summer Undergraduate

Research Fellowship (SURF) program, and non-traditional students interested in pursuing research as a career.

Previous students and current faculty represent the State of Kansas on the national and international stage, as reviewers for grant programs, including those at the National Institutes of Health, National Science Foundation, and Environmental Protection Agency, and in funding programs from multiple European nations. Faculty members serve as editors or associate editors for numerous national and international scientific journals, and on scientific advisory panels of the Environmental Protection Agency, the National Institute of Occupational Safety and Health, and the Cures Acceleration Network (CAN) Review Board, to name a few.

Faculty scientists in the Department of Pharmacology, Toxicology and Therapeutics are involved with interdisciplinary centers and institutes at the Medical Center, including the Liver Center, the University of Kansas Cancer Center, the Institute for Reproductive Health and Regenerative Medicine, the Kansas Intellectual and Developmental Disabilities Research Center (KIDDRC), the Institute for Neurological Discoveries, the Kidney Institute, the KU Clinical Research Center, and the Institute for Advancing Medical Innovation. In leadership roles, PTT faculty represent professional societies including the American Society for Pharmacology and Experimental Therapeutics, the Society of Toxicology, the American Physiological Society, the International Society for the Study of Xenobiotics, the Society for Neuroscience, and American Association for the Study of Liver Diseases. The department includes the Scientific Director of the Disease Model and Assessment core of the KIDDRC and the new Director of the IGPBS.

Faculty members have been honored nationally for their efforts in research through such awards as the Mildred S. Christian Career Achievement Award (Academy of Toxicological Sciences), and the Society of Toxicology's MERIT Award, Translational Impact Award, and Leading Edge in Basic Science Award. Faculty have been honored by the university for exemplary research and teaching efforts through the Chancellors Club Research Award, numerous Student Voice Awards, the Ruth Bohan Teaching Award, and a Chancellors Club Teaching Professorship.

In summary, the Department of Pharmacology, Toxicology and Therapeutics and its graduate programs are an excellent resource for the University of Kansas Medical Center, the regional research community, and the State of Kansas. Through ground-breaking research relevant to human health and disease, our efforts contribute to the development of new medicines and therapies for the people of Kansas and educate the next generation of physicians and scientists.

Fiscal Implications of Program Changes (FY 2017 – FY 2021)

The University of Kansas Medical Center has not had any recommended program changes during the last five fiscal years.

University of Kansas Medical Center
Status of Programs Needing Additional Review
Reporting to Board AY 2018-2021

Program	Year of Report to Board	CIP	Degree Level	Recommendation*	Explanation of Recommendation**
Molecular Biotechnology	2021	26.0204	M	Additional Review	The School of Health Professions values the program's intent and need within the region. It is undertaking steps to re-assess the first-year (non-practicum) curriculum, which has provided challenges to sustained enrollment. Further, leadership is helping identify potential pipelines for student recruitment.

M= Masters; B=Bachelors; D= Doctorate

***Recommendation options are: Continue, Additional Review, Enhance, Discontinue**

****Please provide explanation for each recommendation**