Pharmacology and Toxicology Undergraduate Minor
Governance Document

This document contains the general rules for governance of the Pharmacology and Toxicology Undergraduate Minor referred to hereafter as simply PHARMTOX. This document has been approved by the faculty membership of PHARMTOX on _____.

MISSION STATEMENT: The interdisciplinary pharmacology and toxicology minor is intended to significantly increase the number of ISU graduates who can:

1) Understand, use and define key terms and concepts related to pharmacology and toxicology;
2) Apply concepts and standard practices in pharmacology and toxicology to solving practical problems relevant to these fields;
3) Analyze scientific data in pharmacology and toxicology;
4) Synthesize detailed and accurate descriptions of current knowledge on key topics in pharmacology and toxicology;
5) Make informed decisions about current controversies in pharmacology and toxicology, using appropriate scientific methods and ethical reasoning.

Faculty

Any faculty in the Biomedical Sciences Department (**BMS**) and any faculty in the Interdepartmental Toxicology Graduate Program (**TOX**) may participate in the administration of this program.

Faculty outside of TOX and BMS may participate. The ISU faculty member will submit a request to join the PHARMTOX program as faculty to the PHARMTOX supervisory committee. This request will include a statement indicating a desire to participate and a short c.v. The PHARMTOX supervisory committee will review the statement and make a decision regarding participation.

Administration

<u>Program Coordinator of the Minor (PCM) and Associate Coordinator of the Minor</u>

All activities of the PHARMTOX program will be coordinated by a Program Coordinator of the Minor (PCM). This PCM will be elected by the PHARMTOX faculty. The term of office for the PCM will normally be two years.

- A deadline will be set by which time faculty must vote
- At least 50% of the faculty of PHARMTOX must vote (yes, no, abstain).
- The deadline maybe extended if 50% of the faculty have not yet voted
- After the deadline the individual with the most total votes will be considered elected to the position.

The Program Coordinator of the Minor (PCM)'s responsibilities include carrying out existing program policies, suggesting new policies, administering the budget,

serving as a liaison with higher administration, coordinating the efforts of PHARMTOX committees, and supervising office staff. The PCM's responsibilities may be changed at any time at the discretion of the Supervisory Committee. The PCM may also assign responsibilities to other PHARMTOX Committees, the Associate PCM, faculty or staff; in this instance, however, the PCM will assume responsibility for assuring that the tasks are performed satisfactorily.

Before assuming office, the PCM will normally have served two years as Associate PCM. The duties of the Associate PCM is to share in administrative duties, as assigned by the active PCM. This will relieve the PCM of some duties, provide training for the Associate PCM, and provide more administrative continuity to the program.

Terms of office shall begin with fiscal years (July 1).

Supervisory Committee

A Supervisory Committee will be responsible for review of all aspects of the program, for guiding the establishment of policy, for interpreting and implementing policies that have been established by the PHARMTOX membership, and for advising the PCM.

In all decisions, each member, including the PCM, will have one vote. In case of disagreements between the Supervisory Committee and the PCM, the Supervisory Committee will have final authority. In the case of disagreements between the Supervisory Committee and the faculty, the faculty view, as determined by referenda, shall prevail.

At least one member of the four person Supervisory Committee must be a faculty member in BMS and one member of the Supervisory Committee must be in TOX. If the Supervisory Committee member is both BMS and TOX then this requirement has been met.

Membership

The Supervisory Committee shall consist of five faculty, including the PCM and Associate PCM. At least one member of the four person Supervisory Committee must be a faculty member in BMS and one member of the Supervisory Committee must be in TOX. If the Supervisory Committee member is both BMS and TOX then this requirement has been met.

Supervisory Committee members (excluding the PCM and Associate PCM) will serve for four years. One member of this committee will be replaced every year. Members may be re-elected to consecutive terms.

The Supervisory Committee will be elected by the PHARMTOX faculty. Elections will be held every year before May 15 and will be administered by the Supervisory Committee. Nominations will be solicited from the PHARMTOX membership. Nominees willing to serve will be voted upon by the PHARMTOX membership. Terms will start on July 1. The Supervisory Committee may appoint a PHARMTOX member on a temporary basis (until the next scheduled election) to complete any unfinished term of a Committee member or Associate PCM, or to substitute for a Committee member or Associate PCM on leave.

Meetings

To insure good communication between the PCM and the Supervisory Committee, the Supervisory Committee should meet twice yearly, preferably at a regularly scheduled time. It is the responsibility of the PCM to call the meetings; if the PCM is not available, meetings may be called by the Associate PCM.

Committees

Committees of PHARMTOX Faculty will be established as needed to perform tasks and advise the PCM on matters such as student admissions, curriculum, academic standards and faculty membership. Members will be appointed by the PCM. The number, membership, and responsibilities of the committees may be modified at any time at the discretion of the PCM. In cases of disagreement between a Committee and the PCM, the PCM will have final authority.

Faculty Meetings

Full faculty meetings should be held once per year to update faculty on PHARMTOX activities and to discuss issues of importance to the group. It is the responsibility of the PCM to call the meetings; if the PCM is not available, the meetings may be called by the Associate PCM.

Elections and Referenda

Except as noted below in the sections on ‘Establishment of Policies’ and ‘Changes in the Governance Document’, all elections and referenda will be determined by a majority vote of the PHARMTOX membership who respond to the call for votes. At least 50% of the membership must vote for an election or referendum to be valid.

Establishment of Policies

All policies modifying core-course requirements and major changes in PHARMTOX core-course content must be approved by a majority of the total PHARMTOX membership.

All other policies may be established by a vote of the Supervisory Committee. However, the Supervisory Committee should consult with the faculty when making significant policy decisions and should hold referenda for policy changes likely to be controversial. In addition, all policy decisions by the Supervisory Committee must be announced to the faculty; if three or more faculty object to a policy, a referendum must be held to determine its acceptance or rejection. Referenda on such policies will be determined by a majority vote of the PHARMTOX membership who respond to the call for votes; at least 50% of the membership must vote for a referendum to be valid.

Changes in the Governance Document

Policies contained within this Governance Document may be changed by a majority vote of the total PHARMTOX membership.

Students that may participate in the program

All undergraduates at Iowa State University may participate in this undergraduate minor provided they have the prerequisite coursework to take the required coursework. To complete a minor in PHARMTOX students must take 15 credits, including at least 6 credits taken at ISU in courses numbered 300 or above. Nine credits (9) of the courses listed in the minor must not be used to meet any other department, college, or university requirement except the credit requirement for graduation.

Faculty involved with the initiation and participation of the program

Richard Martin, BMS, interim PCM, (Chair of Interdepartmental Toxicology)
Aileen Keating, Animal Science, interim Associate PCM
Arthi Kanthasamy, BMS
Joel Coats, Entomology
Suzanne Hendrich, FSHN
Wilson Rumbeiha, VDPAM
Anumantha Kanthasamy, BMS (Chair of BMS)

Pharmacology and Toxicology undergraduate minor
Curriculum Plan

Prerequisites for Prospective undergraduate minors

Coursework required for pre-requisites for Core and Elective Courses to meet the requirements of this undergraduate minor

Required Common-Core Lecture Courses

TOX 401: Principles of Toxicology, 3 credits (offered fall)
Prereq: BBMB 404 or equivalent
Principles of toxicology governing entry, fate, and effects of toxicants on living systems. Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification. Fundamentals of foreign compound effects on metabolism, physiology, and morphology of different cell types, tissues, and organ systems.

BMS 439: Principles of Pharmacology, 4 credits (offered spring)
General principles of drug actions; drug disposition; drug acting or, cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems; anti-inflammatory and antibiotic drug; anti-cancer drugs; anesthetics CNS stimulants; lifestyle drugs; drug addiction, abuse and dependence; drugs in sport; drugs for obesity; biopharmaceuticals and gene therapy; drug development.

Physiology (select 1)

BMS 329 Anatomy and Physiology of Domestic Animals, 3 credits (offered spring)
Prereq: BIOL 212, BIOL 212L
Survey of body systems of domestic animals. Provides a medical science orientation particularly useful to students in a preveterinary medicine curriculum.

BIOL 335: Principles of Human and Other Animal Physiology, 4 credits (offered fall, spring)
Prereq: BIOL 314
Introduction to systemic functions with emphasis on mammals. Students cannot receive credit for both BIOL 334 and BIOL 335.

BIOL 334: Metabolic Physiology of Mammals, 3 credits
Prereq: BIOL 211, BIOL 212
Introduction to physiology of metabolic function in mammals and other animals. Metabolic processes and their interactions with various subsystems, approached form an organismal perspective. Integration of cellular, gastrointestinal, cardiovascular, respiratory, and renal processes, relevant to their control and

integration at the nervous and endocrine system levels. Functional aspects of organismal physiology; energy and water balances, physiology of rest exercise, and environmental stress. Students cannot receive credit for both BIOL 334 and BIOL 335.

Supportive Electives

TOX 354: General Pharmacology, 3 credits (offered spring)
General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems. Prerequisites: BBMB 404, BBMB 405

TOX 419/FS HN 419: Foodborne Hazards, 3 credits (offered alternative spring)
Prereq: MICRO 201 or MICRO 302, a course in biochemistry
Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards. Assessed service learning component. Only one of FS HN 419 and FS HN 519 may count toward graduation.

TOX 420/FS HN 420: Food Microbiology, 3 credits
Prereq: MICRO 201 or MICRO 302
Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

TOX 426: Veterinary Toxicology, 3 credits (offered spring)
Prereq: Permission of instructor
Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

BMS 443: Pharmacology and Therapeutics, 3 credits (offered fall)
Prereq: B M S 354
Pharmacology and therapeutic uses of fluids, antimicrobial and antiparasitic drugs, clinical use of veterinary drugs, and adverse drug reactions.

BMS 490: Independent Study, credits 1-3

TOX 499: Undergraduate Research, credits 1-3

BBMB 316: Principles of Biochemistry, credits 3 (offered spring)
Prereq: CHEM 231 or CHEM 331; BIOL 212; BIOL 313 and BIOL 314 strongly recommended.
Understanding biological systems at the molecular level; chemistry of biological macromolecules, enzyme function and regulation, metabolic pathways; integration of metabolism in diverse living systems. For students in biology and related majors who are not required to take more rigorous treatment of biochemistry found in

BBMB 404/405. Not acceptable for credit toward a major in biochemistry, biophysics, or agricultural biochemistry.

BBMB 404: Biochemistry I, credits 3 (offered fall)
Prereq: CHEM 332.
A general overview for graduate and advanced undergraduate students in agricultural, biological, chemical and nutritional sciences. Chemistry of amino acids, proteins, carbohydrates, and lipids, vitamins; protein structure; enzymology; carbohydrate metabolism.

BBMB 405: Biochemistry II, credits 3 (offered spring)
Prereq: BBMB 404
A general overview for graduate and advanced undergraduate students in agricultural, biological, chemical, and nutritional sciences. Metabolism of carbohydrates, amino acids, nucleotides and lipids; formation, turnover, and molecular relationships among DNA, RNA, and proteins; genetic code; regulation of gene expression; selected topics in the molecular physiology of plants and animals. Credit for both BBMB 420 and the BBMB 404 - BBMB 405 sequence may not be applied toward graduation.

BIOL 381: Environmental Systems I: Introduction to Environmental Systems, 3-4 credits (fall)
Prereq: 12 credits of natural science including biology and chemistry
Introduction to the structure and function of natural environmental systems. Emphasis on the analysis of material and energy flows in natural environmental systems and the primary environmental factors controlling these systems.

BIOL 382: Environmental Systems II: Analysis of Environmental Systems, 3 credits (spring)
Prereq: ENSCI 381
Continuation of ENSCI 381. Systems approach to the analysis of material and energy flows in natural environmental systems and the primary environmental factors controlling these systems.

BIOL 423: Developmental Biology, 3 credits (spring)
Prereq: BIOL 313
Principles of embryogenesis and animal development. Establishment of body axes, organ and limb development, and specification of cell fates. Emphasis on cell signaling and the control of gene expression within the context of a developing organism. Medically relevant subjects will be discussed, including stem cells, cancer biology, fertilization, and cloning.

BIOL 434: Endocrinology, 3 credits (spring)
Prereq: BIOL 211, BIOL 212
Chemical integration of vertebrate organisms. The structure, development, and evolution of the endocrine glands and the function and structure of their hormones.

BIOL 436: Neurobiology, 3 credits (fall)
Prereq: BIOL 212
Basic principles of brain function and development. Signaling of nerve cells, synaptic transmission, structure/function of ion channels and receptors, memory and synaptic plasticity, movement and central control, sensation and sensory processing, construction of neural circuits, early brain development, complex brain functions in health and disease.

BIOL 439: Environmental Physiology
Prereq: BIOL 335; physics recommended
Physiological adaptations to the environment with an emphasis on vertebrates.

A B E 424A: Air Pollution: Air quality and effects of pollutants, 1 credit
Prereq: Either PHYS 221 or CHEM 178 and either MATH 166 or 3 credits in statistics. Senior classification or above
1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

A B E 451: Food and Bioprocess Engineering, 3 credits (fall)
Prereq: A B E 216 and M E 436 or CH E 357, or FS HN 351 and MATH 266 or MATH 267
Application of engineering principles and mathematical modeling to the quantitative analysis of food and bioprocessing systems. Physical/chemical characteristics of foods and biological systems, flow processes, thermal processes and separation processes. Term paper required for graduate credit.

ENT 450: Pesticides in the Environment, 2 credits (spring)
Prereq: 9 credits of biological sciences
Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

ENSCI 486: Aquatic Ecology, 3 credits (fall)
Prereq: BIOL 312 or ENSCI 381 or ENSCI 402 or NREM 301
Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

B M E 440: Biomedical Applications of Chemical Engineering, 3 credits
Prereq: CH E 210, MATH 266, PHYS 222
Applications of material and energy balances, transport phenomena, chemical reaction engineering, and thermodynamics to problems in biomedical engineering and applied physiology; survey of biomedical engineering; biomaterials; biomedical imaging.

GEN 409: Molecular Genetics, 3 credits (fall)
Prereq: BIOL 313.
The principles of molecular genetics: gene structure and function at the molecular level, including regulation of gene expression, genetic rearrangement, and the organization of genetic information in prokaryotes and eukaryotes.

GEN 410: Analytic Genetics, 3 credits (spring)
Prereq: GEN 409.
The principles and practice of genetic analysis. Mendelian genetic analysis, mutational, transgenic, and genomic analysis of gene function, linkage and gene mapping, chromosomal aberrations, aneuploidy and polyploidy, extrachromosomal inheritance, analysis of genetic pathways.

FS HN 264: Fundamentals of Nutritional Biochemistry and Metabolism, 3 credits (Fall)
Prereq: FS HN 167; CHEM 163, CHEM 163L; BIOL 211
Digestion, absorption, metabolism, and biochemical functions of nutrients. Biochemical aspects of nutrient deficiencies.

FS HN 442: Issues in Food and Society, 2 credits (Fall)
Prereq: FS HN 242, FS HN 342
In-depth discussion, synthesis, and analysis of domestic and international food issues including: food systems from farm to fork, poverty and world hunger, over nutrition, population, agriculture and the environment, ethics, biotechnology, and policy.

FS HN 461: Medical Nutrition and Disease I, 4 credits (fall)
Prereq: FS HN 360, FS HN 361, FS HN 367; plus BIOL 256 and 256L or BIOL 306 or BIOL 335
(Dual-listed with NUTRS 561) Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state.

FS HN 464: Medical Nutrition and Disease II, 3 credits (spring)
Prereq: FS HN 360, FS HN 461; plus BIOL 256 and BIOL 256L or BIOL 306 or BIOL 335
(Dual-listed with NUTRS 564) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state.

FS HN 467: Molecular Basis of Nutrition in Disease Prevention, 3 credits (spring)
Prereq: FS HN 360 or equivalent
Understanding the molecular basis for the role of diet in the development and prevention of common diseases such as diabetes, cancer, and vascular diseases. Translating this understanding into practical approaches for improving the health of individuals and populations.

FS HN 489: Issues in Food Safety, 1 credit (spring)
Prereq: Credit or enrollment in FS HN 101 or FS HN 272 or HSP M 233; FS HN 419 or FS HN 420; FS HN 403
Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

CHEM 211: Quantitative and Environmental Analysis, 2 credits (fall, spring)
Prereq: CHEM 163 and CHEM 163L, CHEM 201 and CHEM 201L; or credit or enrollment in CHEM 178; and concurrent enrollment in CHEM 211L
Theory and practice of elementary volumetric, chromatographic, electrochemical and spectrometric methods of analysis. Chemical equilibrium, sampling, and data evaluation. Emphasis on environmental analytical chemistry; the same methods are widely used in biological and materials sciences as well.

CHEM 331: Organic Chemistry I, 3 credits, (fall, spring, summer)
Prereq: CHEM 178 or CHEM 201, enrollment in CHEM 331L highly recommended.
The first half of a two semester sequence. Modern organic chemistry including nomenclature, synthesis, structure and bonding, reaction mechanisms. For students majoring in physical and biological sciences, premedical and pre-veterinary curricula, chemistry and biochemistry.