

QBS132-1
Molecular Biologic Markers in Human Health Studies

Summary:

This course covers the use of human tissue samples in the context of translational research, including observational epidemiology studies and clinical trials. Lectures focus on study design, bio-specimen collection, biomarker types, kinetics and validation. Discussion will focus on examples of biomarker utilization including identifying susceptible populations, exposure assessment, molecular-genetic characterization of disease phenotype, evaluating drug compliance, monitoring dose-response, testing molecularly targeted therapy efficacy, and predicting prognosis.

Learning objectives of the course:

- Understand ethical and logistical issues pertaining to the collection, storage, and assessment of bio-specimens in the context of various molecular epidemiologic and trial study designs.
- Become familiar with the pros and cons of various incidence, intervention, and prognostic study designs that incorporate biologic markers.
- Understand how to incorporate inter-individual susceptibility markers, including inherited genetic variants into trials and prognostic studies.
- Understand exposure assessment, including dimensions of xenobiotics and endogenous factors, routes of exposure, kinetics and biomonitoring considerations.
- Identify potential sources of measurement error and bias in the assessment of exposure and molecular markers, the characteristics of good biomarkers, and appropriate validation and quality control measures.
- Learn how to formulate hypotheses and interpret exposure - molecular marker - disease relationships.
- Become familiar with analytic models and statistical techniques used for analysis of observational, intervention, and prognostic data incorporating biologic markers.
- See current examples of the tissues, assays, and tools being used for assessing dose response, biomonitoring, individual susceptibility and molecularly targeting therapeutics.

Meets: Fall Term: Monday, Wednesday, Friday in Williamson #xxx. Time: 8:30-9:30 am.

Format: Discussion of articles from the primary literature as examples of molecular marker applications. Each student will participate in these interactive Article Discussion sessions. Lecture modules will cover core topics, as well as applied examples.

Readings: All reading materials will be provided on-line. Pre-readings, including articles and textbook sections or reviews are assigned to be read prior to each lecture.

Problem set: Questions on prior material. To be submitted class time on due date.

Interview & Presentation: Students will interview an investigator actively involved in the assessment of biologic markers in bio-samples from human subjects. Bio-sample examples include: urine, cord blood, amniotic fluid, breast milk, hair, nails, teeth, exhaled breath, saliva, skin, tumor. The Investigator should not be the student's primary thesis mentor. Students will develop a series of interview questions about the research project that relate to the specific topics covered in this course. The focus will be on guidance specific to the rationale and methods for obtaining representative biosamples from the tissue-type of interest. Career advice will also be solicited. Students will develop a presentation (15 min maximum) for the class, sharing and demonstrating what they learned. (See Rubric for specific guidance.)

Final Exam: A written examination will be given in class covering the prior material delivered in lecture modules. The final exam is cumulative.

Grading policies:

- 10% Attendance
- 10% Article review & discussion effort
- 25% Problem set
- 25% Interview presentation
- 30% Final exam

Date	Core Topic	Discussion	Instructor	Pre-Reading
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9/16	1 Study plan		Andrew	IARC Ch.1
9/18		Article: exposure markers, risk markers		Rostron, 2019
9/21	2 Disease process models		Andrew	Kriebel p.158-172
9/23	3 Dimensions of exposure and dose		Andrew	Wild, 2013
9/25	Student present -xx	Article: observational		Lee, 2017
9/28	4 Effect Modification		Andrew	IARC p. 294-299
9/30	5 Subject characteristics & selection		Andrew	Rundle, 2012
10/2	Student present -xx	Article: genetic susceptibility, effect modification		Kirk, 2005
10/5	6 Tissue, assay heterogeneity		Andrew	Jaffe, 2016
10/7	Example: Aflatoxin adducts		Andrew	
10/9	Student present -xx	Article: clinical trial		Curl, 2019
10/12	9d Physiologically based tissue assessment		Andrew	IARC Ch. 3
10/14	8 Markers in randomized trials, CONSORT		Andrew	Berry, 2012 Kaptchuk, 2015 Moher, 2001
10/16	Student present -xx	Article: temporal reliability		Hinners, 2012
10/19	9 Markers in observational studies, STROBE, PROBE		Andrew	IARC Ch.14, p.261-264 Gallo, 2010
	<i>Attend a talk at Life Sciences Symposium</i>			<i>Life Sciences Center, Hanover</i>
10/21	7 Biomarker validation, reliability		Andrew	Vineis, Ch. 6
10/23	Student present - xx			
10/25	Infectious disease, microbiome		Hoehn	IARC Ch. 23
10/26	Translational research: Statins	Problem Set due	Andrew	Endo, 2010
10/28	Pragmatic- explanatory continuum, PRECIS		Andrew	Thorpe, 2009
10/30	Student present - xx	Article: organ toxicant distribution		Bjorkman, 2007
11/2	Diagnostic, STARD, Prognostic markers, REMARK, TRIPOD		Andrew	Bossuyt, 2003 McShane, 2005
11/4	Subgroup analysis		Andrew	Rothwell, 2005
11/9	Student present - xx	Article: tissue heterogeneity		Yuan, 2007 Shin, 2018
11/11	Risk communication, ethics		Andrew	IARC Ch. 2 Shepperd, 2013
11/13	Final Exam			

Fall 2020

Institutional Policies

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

Students with disabilities who may need disability-related academic adjustments and services for this course are encouraged to see me privately as early in the term as possible.

At Dartmouth, we value integrity, responsibility, and respect for the rights and interests of others, all central to our Principles of Community. We are dedicated to establishing and maintaining a safe and inclusive campus where all have equal access to the educational and employment opportunities Dartmouth offers. We strive to promote an environment of sexual respect, safety, and well-being. In its policies and standards, Dartmouth demonstrates unequivocally that sexual assault, gender-based harassment, domestic violence, dating violence, and stalking are not tolerated in our community. The Sexual Respect Website (<https://sexual-respect.dartmouth.edu>) at Dartmouth provides a wealth of information on your rights with regard to sexual respect and resources that are available to all in our community. Please note that, as a faculty member, I am obligated to share disclosures regarding conduct under Title IX with Dartmouth's Title IX Coordinator. Confidential resources are also available, and include licensed medical or counseling professionals (e.g., a licensed psychologist), staff members of organizations recognized as rape crisis centers under state law (such as WISE), and ordained clergy (see https://dartgo.org/titleix_resources). Should you have any questions, please feel free to contact Dartmouth's Title IX Coordinator or the Deputy Title IX Coordinator for the Guarini School. Their contact information can be found on the sexual respect website at: <https://sexual-respect.dartmouth.edu>.