Graduate Molecular Virology (BIOL 5301), CRN 27510 **Spring 2015**

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OFFICE HOURS: MW, 1 p.m. – 3 p.m. or by appointment
CLASS MEETS: Mon and Wed, 5:00 – 6:20 pm, LART 208
TEXTBOOK: None (primary literature will be used)

COURSE DISCRIPTION AND GOALS. During the course of the semester, we will seek to understand basic concepts of virology at the molecular level, by examining the life cycles of several families of DNA and RNA viruses as well as retroviruses, which have RNA genomes but have a DNA intermediate. Topics will include analysis of cell attachment and entry, viral transcription, translation, genome replication, assembly of virus particles, and integration into host genomes.

By the end of the semester, students will:

- understand how the tools of molecular biology, biochemistry, and genetics are used in virology research
- be able to critically analyze references from the primary literature
- have developed and/or practiced written and verbal communication skills that are essential for a career in science
- be able to THINK more critically

CLASS POLICIES

ACADEMIC DISHONESTY. It is the official policy of the University of Texas at El Paso that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Please see the Office of Student Conduct and Conflict Resolution (OSCCR) website at http://sa.utep.edu/osccr/ for details.

COURTESY. As a courtesy to your classmates, please give your full attention to whoever is speaking, whether it is a fellow student or I, and try to limit your in-class discussions to topics related to virology. Please turn cell phones and pagers off or set them to silent mode for the duration of the class. Please be on time for class – it disturbs the class when you come in late.

MISSED EXAMS. If you know ahead of time that you will not be able to take an exam on the scheduled date, notify me as soon as possible and I will allow you to take it early, with no penalty. If you miss an exam and you can provide PROOF for your (reasonable) absence, the written exam will be rescheduled at my convenience but must be taken before the graded exam is distributed to the class. If you miss the exam, and you cannot provide proof for your absence, you will not be allowed to make it up.

DISABILITIES. If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, by email to cass@utep.edu, or go to Union Building East, Room 106. For additional information, please visit the CASS website at http://www.utep.edu/CASS. *CASS' Staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.*

GRADING SYSTEM

Your grade will be based on a comprehensive assessment of your skills and their development throughout the course of the semester, using the criteria described below. Your grade will not be based on a curve. Instead, you will each EARN a grade that reflects the effort you put into the course and the knowledge you've gained.

1. **Literature discussions**. All Wednesday class periods will feature an in-class analysis of scientific papers, beginning with single figures and progressing to entire papers by the end of the semester. These discussions are mandatory.

2. **Exams**. A total of three exams will be given during the semester. Each exam will consist of a take-home problem, worth 100 pts, that you will have one week to complete. You are free to use notes and references, and to consult your classmates, as long as the end result is WRITTEN IN YOUR OWN WORDS. Any exams that are identical to any others will receive a score of zero. The exams will test your understanding of all of the materials covered in class and your ability to APPLY the concepts you have learned. The final project (see below) will take the place of a final exam.

3. **Final project**. A final project will be due on the last day of class (May 6). Students will choose between writing a mock grant proposal, writing a mock scientific paper, or preparing a lesson plan about a specific virus-related topic. This final project will cover any topic of your choice that relates to the way that one or more viruses interact with host cells. The written guidelines for each project type will be posted on BlackBoard.

4. **Class participation**. Each student is expected to verbally contribute to the class every time we meet, even if you don't present a figure that day.

In summary, the grades will break down as follows:

Literature discussions	300 points	= 30%
Class participation	200 points	= 20%
Exams	300 points	= 30%
Final project	200 points	= 20%
Total	1000 points,	

where,
A = 900 – 1000
B = 800 - 899
C = 700 – 799
D = 600 – 699
F = 599 and below

CLASS SCHEDULE
Subject to change depending on the pace of the course

Lect.	Day/Date	TOPICS	Reading
1	W Jan. 21	Introduction	--
2	M Jan. 26	Attachment: virus structure, cellular receptors	Huang (10)
3	W Jan. 28		
4	M Feb. 2	Cell entry – receptor mediated endocytosis, membrane fusion	Arias, Edinger (1, 6)
5	W Feb. 4		
6	M Feb. 9	Transcription: DNA templates	Backström (2)
7	W Feb. 11		
8	M Feb. 16	Transcription: RNA templates	Mateos-Gomez (15)
9	W Feb. 18	**Exam 1 due 2/18**	
10	M Feb. 23	Processing of viral pre-mRNA	Mandal (14)
11	W Feb. 25		
12	M Mar. 2	Translation	Bier (3)
13	W Mar. 4		
--	Mar. 9-13	**SPRING BREAK – NO CLASSES**	--
14	M Mar. 16	Post-translational modification (PTM),	Everett (8)
15	W Mar. 18		
16	M Mar. 23	Intracellular trafficking, autophagy	Eisfeld, Taylor (7, 16)
17	W Mar. 25	**Exam 2 due 3/25**	
18	M Mar. 30	DNA genome replication, I	Kusumoto-Matsuo (11)
19	W Apr. 1		
20	M Apr. 6	DNA genome replication, II	Boyle (4)
21	W Apr. 8		
22	M Apr. 13	RNA genome replication;	Gant (9)
23	W Apr. 15		
24	M Apr. 20	Reverse transcription and integration	Bueno (5)
25	W Apr. 22	**Exam 3 due 4/22**	
26	M Apr. 27	Viral assembly and maturation	Kutluay, van Bel (12, 17)
27	W Apr. 29		
29	M May 4	Cell exit/budding;	Leyva-Grado (13)
29	W May 6	**Final project due May 6**	

Reading list

1. **Arias, C. F., D. Silva-Ayala, and S. Lopez.** 2015. Rotavirus Entry: a Deep Journey into the Cell with Several Exits. J Virol **89:**890-893.
2. **Backstrom, E., K. B. Kaufmann, X. Lan, and G. Akusjarvi.** 2010. Adenovirus L4-22K stimulates major late transcription by a mechanism requiring the intragenic late-specific transcription factor-binding site. Virus Res **151:**220-228.
3. **Bier, K., A. York, and E. Fodor.** 2011. Cellular cap-binding proteins associate with influenza virus mRNAs. J Gen Virol **92:**1627-1634.
4. **Boyle, K. A., E. S. Stanitsa, M. D. Greseth, J. K. Lindgren, and P. Traktman.** 2011. Evaluation of the role of the vaccinia virus uracil DNA glycosylase and A20 proteins as intrinsic components of the DNA polymerase holoenzyme. J Biol Chem **286:**24702-24713.
5. **Bueno, M. T., D. Reyes, L. Valdes, A. Saheba, E. Urias, C. Mendoza, O. I. Fregoso, and M. Llano.** 2013. Poly(ADP-ribose) polymerase 1 promotes transcriptional repression of integrated retroviruses. J Virol **87:**2496-2507.
6. **Edinger, T. O., M. O. Pohl, and S. Stertz.** 2014. Entry of influenza A virus: host factors and antiviral targets. J Gen Virol **95:**263-277.
7. **Eisfeld, A. J., G. Neumann, and Y. Kawaoka.** 2011. Human immunodeficiency virus rev-binding protein is essential for influenza a virus replication and promotes genome trafficking in late-stage infection. J Virol **85:**9588-9598.
8. **Everett, R. D., C. Boutell, and B. G. Hale.** 2013. Interplay between viruses and host sumoylation pathways. Nature reviews. Microbiology **11:**400-411.
9. **Gant, V. U., Jr., S. Moreno, A. Varela-Ramirez, and K. L. Johnson.** 2014. Two membrane-associated regions within the Nodamura virus RNA-dependent RNA polymerase are critical for both mitochondrial localization and RNA replication. J Virol **88:**5912-5926.
10. **Huang, W. R., Y. C. Wang, P. I. Chi, L. Wang, C. Y. Wang, C. H. Lin, and H. J. Liu.** 2011. Cell Entry of Avian Reovirus Follows a Caveolin-1-mediated and Dynamin-2-dependent Endocytic Pathway That Requires Activation of p38 Mitogen-activated Protein Kinase (MAPK) and Src Signaling Pathways as Well as Microtubules and Small GTPase Rab5 Protein. J Biol Chem **286:**30780-30794.
11. **Kusumoto-Matsuo, R., T. Kanda, and I. Kukimoto.** 2011. Rolling circle replication of human papillomavirus type 16 DNA in epithelial cell extracts. Genes Cells **16:**23-33.
12. **Kutluay, S. B., T. Zang, D. Blanco-Melo, C. Powell, D. Jannain, M. Errando, and P. D. Bieniasz.** 2014. Global changes in the RNA binding specificity of HIV-1 gag regulate virion genesis. Cell **159:**1096-1109.
13. **Leyva-Grado, V. H., R. Hai, F. Fernandes, A. Belicha-Villanueva, C. Carter, and M. A. Yondola.** 2014. Modulation of an ectodomain motif in the influenza A virus neuraminidase alters tetherin sensitivity and results in virus attenuation in vivo. J Mol Biol **426:**1308-1321.
14. **Mandal, D., Z. Feng, and C. M. Stoltzfus.** 2010. Excessive RNA splicing and inhibition of HIV-1 replication induced by modified U1 small nuclear RNAs. J Virol **84:**12790-12800.
15. **Mateos-Gomez, P. A., S. Zuniga, L. Palacio, L. Enjuanes, and I. Sola.** 2011. Gene N proximal and distal RNA motifs regulate coronavirus nucleocapsid mRNA transcription. J Virol **85:**8968-8980.
16. **Taylor, M. P., T. B. Burgon, K. Kirkegaard, and W. T. Jackson.** 2009. Role of microtubules in extracellular release of poliovirus. J Virol **83:**6599-6609.
17. **van Bel, N., Y. van der Velden, D. Bonnard, E. Le Rouzic, A. T. Das, R. Benarous, and B. Berkhout.** 2014. The allosteric HIV-1 integrase inhibitor BI-D affects virion maturation but does not influence packaging of a functional RNA genome. PLoS One **9:**e103552.