

Instructor - Duane W. Sears (sears@lifesci.ucsb.edu) Office Hours –TBATA - Matt Sumethasorn (matt.sumethasorn@lifesci.ucsb.edu) Office Hours –TBA

(Wk)	Date	Lecture Title and Reading
(1)	M Aug. 1	Introductory Videos: (A) Course Introduction (B) Immune Organs (C) FACS and Flow Cytometry Ref (1) - DW Sears. Technology Focus 1 - Flow Cytometry and Fluorescence Activated Cell Sorting (2) - DW Sears. Technology Focus 2 - CD Antigen Designations
T	2	L01 - Overview of the of Vertebrate Immune System Introductory Video: (D) Immune Cells
W	3	L02 - Polarized Activation and Effector Functions of CD4 T Cells GN Case #48 - <i>Lepromatous Leprosy</i> Ref (3) - HD Ochs, et al. TH17 cells & regulatory T cells in primary immunodeficiency diseases. <i>J. Allergy Clin. Immunol.</i> 123:977-82 (2009)
R	4	L03 - Coordinated Cross-regulation of Innate and Adaptive Immunity Introductory Video: (E) MHC Genes, Proteins, and Diversity GN Case #9 - <i>DiGeorge Syndrome</i> Ref (4) - A Iwasaki & R Medzhitov Regulation of adaptive immunity by the innate immune system. <i>Science</i> 327:291-5 (2010) (5) - G Eberl, et al. Review Summary - Innate lymphoid cells: A new paradigm in immunology. <i>Science</i> 349: 879 (2015)
F	5	L04 - Severe Combined Immune Deficiencies (SCIDs) GN Case #5 - <i>X-linked Severe Combined Immunodeficiency (X-Linked SCID)</i> Case #6 - <i>Adenosine Deaminase (ADA) Deficiency</i> Case #11 - <i>Graft-versus-Host Disease (GVHD)</i>
F	5	Online discussion broadcast in LSB 1001 Time: AUG 5, 2:30-4:00PM (recorded)
(2)	M 8	L05 - SCIDs Caused by Defective T and B Lymphocyte Maturation GN Case #7 - <i>Omenn Syndrome (OS)</i> Case #8 - <i>MHC Class II Deficiency or so-called Bare Lymphocyte Syndrome Type II (BLS II)</i>
T	9	L06 - SCIDs Caused by Defective T and B Lymphocyte Activation GN Case #2 - <i>CD40 Ligand Deficiency, or X-Linked Hyper IgM Syndrome 1 (XHIGM)</i> Case #11 - <i>Graft-Versus-Host Disease</i> Case #16 - <i>Wiskott-Aldrich Syndrome (WAS)</i>
W	10	L07 - Severe Immune Deficiencies Caused by Defective B Lymphocyte Maturation GN Case #1 - <i>X-Linked Agammaglobulinemia (XLA)</i> Case #3 - <i>Activation-Induced Cytidine Deaminase (AID) Deficiency</i>
R	11	Online pre-exam review broadcast in LSB 1001 Time: AUG 11, 2:30-4:00PM (recorded)
F	12	L08 - Modern Anti-Cancer Immunotherapies - Checkpoint blocking antibodies, anti-tumor antibodies and anti-tumor vaccines. Ref (6) - M McNutt. Cancer Immunotherapy. <i>Science</i> 342:1417 (2013) (7) - J Couzin-Frankel. Cancer Immunotherapy. <i>Science</i> 342:1432-3 (2013) (8) - A Pollack. Merck Has Strong Results in a Cancer Drug Trial. <i>New York Times</i> , June 3 (2013) (9) - MX Sliwkowski and I Mellman. Antibody Therapeutics in Cancer. <i>Science</i> 341:1192-1198 (2013) (10) - P Sharma and J. P. Allison. The Future of Immune Checkpoint Therapy. <i>Science</i> 348:56-61 (2015) (11) - C Fox. "Training T cells to fight their own cancers." <i>Bioscience Technol.</i> (2014) (12) - L Delamarre. "Neo approaches to cancer vaccines." <i>Science</i> 348:760-761 (2015).
(3)	M 15	Online MIDTERM 1 exam – Location: TBA 5-8 PM (sign up for a computer lab on GauchoSpace or with ProctorU)
T	16	L09 - Gene Defects Impairing Innate Mechanisms of Anti-microbial Immunity GN Case #23 - <i>X-Linked Hypohydrotic Ectodermal Dysplasia (XLHED) and Immunodeficiency</i> Case #28 - <i>Recurrent Herpes Simplex Encephalitis (HSE)</i> Case #29 - <i>Interleukin 1 Receptor-Associated Kinase 4 (IRAK4) Deficiency</i> Ref (13) - F Radow Cellular Self-Defense. <i>Science</i> 340:701-6 (2013)
W	17	L10 - Gene Defects Impairing CTL and NK Lymphocyte Anti-viral Immunity GN Case #12 - <i>MHC Class I Deficiency or Bare Lymphocyte Syndrome Type 1 (BLS I)</i> Case #14 - <i>Hemophagocytic Lymphohistiocytosis</i>
R	18	L11 - Complement Component Defects Impairing Anti-microbial Immunity GN Case #31 - <i>Hereditary Angioedema</i> Case #32 - <i>Factor I Deficiency</i> Case #33 - <i>Deficiency of the C8 Complement Component</i>
F	19	L12 - Leukocyte Gene Defects Impairing Anti-microbial Immunity GN Case #26 - <i>Chronic Granulomatous Disease (CGD)</i> Case #27 - <i>Leukocyte Adhesion Deficiency (LAD)</i> Case #24 - <i>Interferon-γ Receptor Deficiency</i>
F	19	Online discussion broadcast in LSB 1001 Time: AUG 19, 2:30-4:00PM (recorded)



(Wk)	Date	Lecture Title and Reading
(4) M	22	L13 - Anti-Viral Vaccines Eliciting Broadly Neutralizing Antibodies GN Case #10 - <i>Acquired Immune Deficiency Syndrome (AIDS)</i> Ref (14) - JF Scheid. HIV-specific B cell response in patients with broadly neutralizing serum activity <i>Science 350:1175-6 (2015)</i> (15) - F Klein. Antibodies in HIV-1 Vaccine Development and Therapy. <i>Science 341:1199-204 (2013)</i> . (16) - J Mascola. The modern era of HIV-1 vaccine development. Current vaccine designs are on the path to eliciting antibodies that neutralize HIV-1. <i>Science 349:139-40 (2015)</i>
T	23	L14 - Autoimmune Pathology Resulting from Impaired T Cell Regulation GN Case #17 - <i>Autoimmune Polyendocrinopathy-Candidiasis-Ectodermal Dystrophy (APECED)</i> Case #18 - <i>Immune Dysregulation, Polyendocrinopathy, Enteropathy X-linked (IPEX) Disease</i> Case #19 - <i>Autoimmune Lymphoproliferative Syndrome (ALPS)</i> Ref (17) - DW Sears. T Regulatory Cell Focus - History and Introduction to T Regulatory Cells
W	24	L15 - Autoimmune Pathology Arising from Aberrant T Cell Activation GN Case #40 - <i>Multiple Sclerosis (MS)</i> Case #44 - <i>Celiac Disease</i> Ref (18) - L Steinman. A brief history of TH17, the first major revision in the TH1/TH2 hypothesis of T cell-mediated tissue damage. <i>Nature Medicine 13:139-145 (2007)</i> (19) - ML Estes Maternal TH17 cells take a toll on baby's brain. <i>Science 351 919-920 (2016)</i>
R	25	Online pre-exam review broadcast in LSB 1001 Time: AUG 25, 2:30-4:00PM (recorded)
F	26	L16 - Autoimmune Pathology Arising from Aberrant B Cell Activation GN Case #36 - <i>Rheumatoid Arthritis (RA)</i> Case #37 - <i>Systemic Lupus Erythematosus (SLE)</i> Case #42 - <i>Myasthenia Gravis</i> Case #43 - <i>Pemphigus Vulgaris</i>
(5) M	29	Online MIDTERM 2 exam – Location: TBA 5-8 PM (sign up for a computer lab on GauchoSpace or with ProctorU)
T	30	L17 - Immune Pathology Arising from Hyperactive T Cells GN Case #39 - <i>Crohn's Disease</i> Case #47 - <i>Toxic Shock Syndrome (TSS)</i> Case #53 - <i>Contact Sensitivity to Poison Ivy</i>
W	31	L18 - Immune Pathology Arising from Hyper IgE Production GN Case #20 - <i>Hyper IgE Syndrome (HIES)</i> Case #49 - <i>Acute Systemic Anaphylaxis</i> Case #50 - <i>Allergic Asthma</i> Case #51 - <i>Atopic Dermatitis</i>
R	1	L19 - Immune Pathology Arising from Dysregulated Proinflammatory Responses GN Case #34 - <i>Hereditary Periodic Fever Syndromes</i>
F	2	L20A - The Hygiene Hypothesis Ref (20) - M Yazdanbakhsh <i>et al.</i> Allergy, Parasites, and the Hygiene Hypothesis. <i>Science 296:490-4 (2002)</i> . (21) - M Pollan. Some of my best friends are germs. <i>New York Times, May 15 (2013)</i> L20B - Epithelial Surface Immunity Ref (22) - LV Hooper <i>et al.</i> "Interactions between the microbiota & the immune system." <i>Science 336:1268-73 (2012)</i>
(6) M	5	LABOR DAY
T	6	L20C - Immunity and Disease Shaped by the Host Microbiota Ref (5) - G Eberl, <i>et al.</i> Review - Innate lymphoid cells: A new paradigm in immunology. <i>Science 349: 879 (2015)</i> (23) - AN Hegazy and F. Powrie. Microbiota RORγt regulates intestinal suppressor T cells. Gut microbes influence the balance of regulatory T cell subtypes to control inflammation. <i>Science 349:929-30 (2015)</i> (24) - T Gensollen <i>et al.</i> How colonization by microbiota in early life shapes the immune system. <i>Science 352:539-44 (2016)</i> (25) - M Velasquez-Manoff. Educate Your Immune System, <i>New York Times, June 5 (2016)</i> (26) - PA Smith. A new kind of transplant bank. <i>New York Times, February 17 (2014)</i> (27)-(31) <u>Optional reading</u> listed on the next page includes additional recent interesting articles on these topics.
W	7	Online Pre-exam review broadcast in LSB 1001 Time: SEP 7, 4:00-5:30PM (recorded)
R	8	No Lecture
F	9	Online FINAL EXAM – Location: TBA 12-5 PM (sign up for a computer lab on GauchoSpace or with ProctorU)

Exams	(Times)	400 points	Dates	Times	Locations	Pre-Exam Reviews - LSB 1001	Times
Midterm #1	(90 min)	100 points	Monday, August 15 th	5-8 pm	TBA	Thursday, August 11 th	TBA
Midterm #2	(90 min)	100 points	Monday, August 29 th	5-8 pm	TBA	Thursday, August 25 th	2:30-4:00PM
Final Exam	(180 min)	200 points	Friday, September 9 th	12-5 pm	TBA	Wednesday, September 7 th	4:00-5:30PM

Reading References

- (1) D. W. Sears. Technology Focus 1 - Flow Cytometry and Fluorescence Activated Cell Sorting
- (2) D. W. Sears. Technology Focus 2 - CD antigen designations
- (3) H. D. Ochs, et al. TH17 cells and regulatory T cells in primary immunodeficiency diseases. *J. Allergy Clin. Immunol.* 123:977-82 (2009)
- (4) A. Iwasaki and R. Medzhitov. Regulation of adaptive immunity by the innate immune system. *Science* 327:291-295 (2010)
- (5) G. Eberl, et al. "Innate lymphoid cells: A new paradigm in immunology." *Science* 349: 879 (2015)
- (6) M. McNutt. Cancer Immunotherapy. *Science* 342:1417 (2013)
- (7) J. Couzin-Frankel. Cancer Immunotherapy. *Science* 342:1432-3 (2013)
- (8) A. Pollack. Merck Has Strong Results in a Cancer Drug Trial. *New York Times*, June 3 (2013)
- (9) M X Sliwkowski and I Mellman. Antibody Therapeutics in Cancer. *Science* 341:1192-1198 (2013)
- (10) P. Sharma and J. P. Allison. The Future of Immune Checkpoint Therapy. *Science* 348:56-61 (2015)
- (11) C. Fox. "Training T cells to fight their own cancers." *Bioscience Technol.* (2014)
- (12) L. Delamarre et al. "Neo approaches to cancer vaccines. A neoantigen-based vaccine elicits T cell responses in cancer patients." *Science* 348:760-761 (2015).
- (13) F. Randow et al. Cellular Self-Defense: How Cell-Autonomous Immunity Protects Against Pathogens. *Science* 340: 701-6 (2013)
- (14) J. F. Scheid. "HIV-specific B cell response in patients with broadly neutralizing serum activity. Antibody characterization from single B cells led to identification of monoclonal antibodies with broad and potent activity against HIV." *Science* 350:1175-6 (2015)
- (15) F. Klein. "Antibodies in HIV-1 Vaccine Development and Therapy" (Review) *Science* 341:1168-1171 (2013).
- (16) J. Mascola. "The modern era of HIV-1 vaccine development. Current vaccine designs are on the path to eliciting antibodies that neutralize HIV-1." *Science* 349:139-40 (2015)
- (17) D. W. Sears. T Regulatory Cell Focus - History and Introduction to T Regulatory Cells
- (18) L. Steinman. A brief history of TH17, the first major revision in the TH1/TH2 hypothesis of T cell-mediated tissue damage. *Nature Medicine* 13:139-145 (2007)
- (19) M. L. Estes and A. K. McAllister. "Maternal TH17 cells take a toll on baby's brain" *Science* 351 919-920 (2016)
- (20) M. Yazdanbakhsh et al. Allergy, Parasites, and the Hygiene Hypothesis. *Science* 296:490-4 (2002)
- (21) M. Pollan. Some of my best friends are germs. *New York Times*, May 15 (2013)
- (22) L. V. Hooper et al. "Interactions Between the Microbiota & the Immune System." *Science* 336:1268-1273 (2012)
- (23) A. N. Hegazy and F. Powrie. Microbiota RORγ regulates intestinal suppressor T cells. Gut microbes influence the balance of regulatory T cell subtypes to control inflammation. *Science* 349:929-30 (2015)
- (24) T. Gensollen et al. How colonization by microbiota in early life shapes the immune system. *Science* 352:539-544 (2016).
- (25) M Velasquez-Manoff. Educate Your Immune System, *New York Times*, June 5 (2016).
- (26) P. A. Smith. A new kind of transplant bank. *New York Times* February 17 (2014)

- (27) K. Hinde and Z. T. Lewis. Mother's littlest helpers. Breastmilk nourishes the microbes colonizing the neonatal intestinal tract. *Science* 348: 1427-8 (2015)
- (28) J. Kaiser. How farm life prevents asthma. Lung reaction to bacteria may explain protection for farm children, bolstering hygiene hypothesis. *Science* 349:1034 (2015)
- (29) M. J. Schuijs et al. Farm dust and endotoxin protect against allergy through A20 induction in lung epithelial cells. *Science* 349:1106-10 (2015)
- (30) L. A. Reynolds and B. B. Finlay. Worming Their Way into the Picture: Microbiota Help Helminths Modulate Host Immunity. *Immunity* 43:840-842 (2015)
- (31) W. B. Williams et al. Diversion of HIV-1 Vaccine-induced Immunity by gp41-microbiota Cross-reactive Antibodies. *Science* 349:705 (2015)