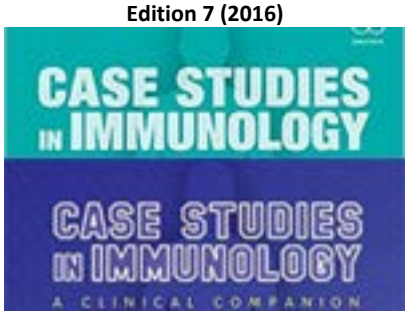
Instructor: **Duane Sears** (duanesears@ucsb.edu) - **Office:** **LSB Rm. 1111** **TAs:** TBA

Note: MIDTERMS 1 & 2 will be given during WEEKS 3 & 5 but the EXACT DAYS and TIMES are not yet set.

(Wk) Day Date **Lec #** **Lecture Title & Reading – Case #'s are black if the same in both editions. Blue case # only 7th ed. Red case # only 6th ed.**

(1) M AUG 3 **Introductory Videos**: (**INT-A**) Course Introduction (**INT-B**) Immune Organs (**INT-C**) Flow Cytometry and FACS
Ref (1) - DW Sears. Technology Focus 1 - Flow Cytometry and Fluorescence Activated Cell Sorting
(2) - DW Sears. Technology Focus 2 - CD Antigen Designations

Edition 7 (2016)



Edition 6 (2012)

T **4** **L01 - Overview of the of Vertebrate Immune System**
Introductory Video: (**INT-D**) Immune Cells

W **5** **L02 - Polarized Activation and Effector Functions of CD4 T Cells**
GN Case #46 (#48)- *Lepromatous Leprosy*
Ref (3) - HD Ochs, et al. TH17 cells & regulatory T cells in primary immunodeficiency diseases. *J. Allergy Clin. Immunol. 123:977-82 (2009)*

R **6** **L03 - Cross-regulation of Innate and Adaptive Immunity**
Introductory Video: (**INT-E**) MHC Genes, Proteins, & Diversity
GN Case #9 - *DiGeorge Syndrome*
Ref (4) - A Iwasaki & R Medzhitov Regulation of adaptive immunity by the innate immune system. *Science 327:291-5 (2010)*
(5) - G Eberl, *et al.* Review Summary - Innate lymphoid cells: A new paradigm in immunology. *Science 349: 879 (2015)*

F **7** **L04 - Severe Combined Immune Deficiencies (SCIDs)**
GN Case #5 - *X-linked Severe Combined Immunodeficiency (X-Linked SCID)*
Case #6 - *Adenosine Deaminase (ADA) Deficiency*
Case #11 - *Graft-versus-Host Disease (GVHD)*

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(2) M **10** **L05 - SCIDs Caused by Defective T and B Lymphocyte Maturation**
GN Case #7 - *Omenn Syndrome (OS)*
Case #8 - *MHC Class II Deficiency or so-called Bare Lymphocyte Syndrome Type II (BLS II)*

T **11** **L06 - SCIDs Caused by Defective T and B Lymphocyte Activation**
GN Case #2 - *CD40 Ligand Deficiency, or X-Linked Hyper IgM (XHIGM) Syndrome 1*
Case #16 - *Wiskott-Aldrich Syndrome (WAS)*

W **12** **L07 - Severe Immune Deficiencies Caused by Defective B Lymphocyte Maturation**
GN Case #1 - *X-Linked Agammaglobulininemia (XLA)*
Case #3 - *Activation-Induced Cytidine Deaminase (AID) Deficiency*

R **13** **L08 - Modern Anti-Cancer Immunotherapies -** *Checkpoint blocking antibodies, anti-tumor antibodies and anti-tumor vaccines.*
Ref (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) - MX 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. "Neo approaches to cancer vaccines." *Science 348:760-761 (2015).*

F **14** **L09 - Gene Defects Impairing Innate Mechanisms of Anti-microbial Immunity**
GN Case #23 - *X-Linked Hypohydrotic Ectodermal Dysplasia (XLHHED) and Immunodeficiency*
Case #28 - *Recurrent Herpes Simplex Encephalitis (HSE)*
Case #29 - *Interleukin 1 Receptor-Associated Kinase 4 (IRAK4) Deficiency*
Ref (13) - F Randow Cellular Self-Defense. *Science 340:701-6 (2013)*

F **14** **Exam review: Time and campus location, TBA**

(3) **MIDTERM 1 WEEK 3 (TBA) ON CAMPUS: Reserve a computer lab seat. OFF CAMPUS: Pre-register with ProctorU.**

T **18** **L10 - Gene Defects Impairing CTL and NK Lymphocyte Anti-viral Immunity**
GN Case #12 - *MHC Class I Deficiency or Bare Lymphocyte Syndrome Type 1 (BLS I)*
Case #14 - *Hemophagocytic Lymphohistiocytosis*
Case #24 - *Interferon-γ Receptor Deficiency*

W **19** **L11 - Complement Component Defects Impairing Anti-microbial Immunity**
GN Case #31 - *Hereditary Angioedema*
Case #32 - *Factor I Deficiency (This case is NOT in the 7th ed.)*
Case #32 (#33) - *Deficiency of the C8 Complement Component*

R **20** **L12 – Immune Pathology Arising from Defective Leukocyte Functions**
GN Case #26 - *Chronic Granulomatous Disease (CGD)*
Case #27 - *Leukocyte Adhesion Deficiency (LAD)*

F **21** **L13 - Anti-Viral Vaccines Eliciting Broadly Neutralizing Antibodies**
GN Case #10 - *Acquired Immune Deficiency Syndrome (AIDS)*
Ref (14) - JF Scheid. HIV-specific B cell response with broadly neutralizing serum activity *Science 350:1175-6 (2015)*
(15A) - J Cohen. Bound for Glory. *Science 341:1168-1171 (2013).*
(15B) - F Klein. Antibodies in HIV-1 Vaccine Development and Therapy. *Science 341:1199-1204 (2013).*
(16) - J Mascola. The modern era of HIV-1 vaccine development. *Science 349:139-40 (2015*

(Wk)	Day	Date	Lec #	Lecture Title and Reading
(4)	M	24	L14	**Autoimmune Pathology Resulting from Impaired T Cell Regulation**
				GN Case #17 - *Autoimmune Polyendocrinopathy-Candidiasis-Ectodermal Dystrophy (APECED)*
				Case #18 - *Immune Dysregulation, Polyendocrinopathy, Enteropathy X-linked (IPEX) Disease*
				Case #19 - *Autoimmune Lymphoproliferative Syndrome (ALPS)*
				Ref (17) - DW Sears. T Regulatory Cell Focus - History and Introduction to T Regulatory Cells
	T	25	L15	**Autoimmune Pathology Arising from Aberrant T Cell Activation**
				GN Case #38 (#40) - *Multiple Sclerosis (MS)*
				Case #42 (#44) - *Celiac Disease*
				Ref (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) - ML Estes Maternal TH17 cells take a toll on baby's brain. *Science 351 919-920 (2016)*
	W	26	L16	**Autoimmune Pathology Arising from Aberrant B Cell Activation**
				GN Case #35 (#36) - *Rheumatoid Arthritis (RA)*
				Case #36 (#37) - *Systemic Lupus Erythematosus (SLE)*
				Case #40 (#42) - *Myasthenia Gravis*
				Case #41 (#43) - *Pemphigus Vulgaris*
	R	27	L17	**Immune Pathology Arising from Hyperactive T Cells**
				GN Case #37 (#39) - *Crohn's Disease*
				Case #45 (#47) - *Toxic Shock Syndrome (TSS)*
				Case #53 (#49) - *Contact Sensitivity to Poison Ivy*
	F	28		**Exam review: Time and campus location, TBA**
(5)				**MIDTERM 2 WEEK 5 (TBA) ON CAMPUS: Reserve a seat in a computer lab. OFF CAMPUS: Pre-register with ProctorU.**
	T	Sept 1	L18	**Immune Pathology Arising from Hyper IgE Production**
				GN Case #20 - *Hyper IgE Syndrome (HIES)*
				Case #49 - *Acute Systemic Anaphylaxis (This case is NOT in the 7th ed.)*
				Case #47 (#50) - *Allergic Asthma*
				Case #51 - *Atopic Dermatitis (This case is NOT in the 7th ed.)*
	W	2	L19	**Immune Pathology Arising from Dysregulated Proinflammatory Responses**
				GN Case #33 (#34) - *Hereditary Periodic Fever Syndromes*
	R	3	L20A	**The Hygiene Hypothesis**
				Ref (20) - M Yazdanbakhsh *et al.* Allergy, Parasites, and the Hygiene Hypothesis. *Science 296:490-4 (2002).*
				(21A) - M Pollan. Some of my best friends are germs. *New York Times Magazine, May 15 (2013)*
				(21B) – M Thernstrom. The allergy buster. *New York Times Magazine, March 17(2013)*
				(28-29) Optional reading listed on the next page includes additional recent interesting articles on these topics.
			L20B	**Epithelial Surface Immunity**
				Ref (22) - LV Hooper *et al.* "Interactions between the microbiota & the immune system." *Science 336:1268-73 (2012)*
	F	4	L20C	**Immunity and Disease Shaped by the Host Microbiota**
				Ref (5) - G Eberl, et al. Review - Innate lymphoid cells: A new paradigm in immunology. Science 349: 879 (2015)
				(24) - T Gensollen *et al.* How colonization by microbiota in early life shapes the immune… *Science 352:539-44 (2016)*
				(23) – Optional reading - AN Hegazy and F. Powrie. *Science 349:929-30 (2015)*
(6)	M	7		**LABOR DAY**
	T	8	L20D	**Autoimmune Predisposition Linked to Human Microbiota Diversity**
				Ref (25) - M Velasquez-Manoff. Educate Your Immune System, *New York Times, June 5 (2016)*
				(26) - PA Smith. A new kind of transplant bank. *New York Times, February 17 (2014)*
				(27) - K Hinde and ZT Lewis. Mother's littlest helpers. *Science 348: 1427-8 (2015)*
				(30-32) Optional reading listed on the next page includes additional recent interesting articles on these topics.
			L20E	**Calibration of Immune Self/Nonself Discrimination by Host Microbiota: Course Recap and Coda**
	W	9		**No Lecture. Exam review: Time and campus location, TBA**
	R	10		**No Lecture.**
	F	11		**FINAL, FRI, Sep 11 ON CAMPUS: Reserve a seat in a computer lab. OFF CAMPUS: Pre-register with ProctorU.**

Exams	(Times)	400 points	Dates	Exam start TBA	Locations	Pre-Exam Review Times and Locations	
Midterm 1	(90 min)	100 points	**TBA**	**TBA**	**TBA**	Friday, August 14	TBA
Midterm 2	(90 min)	100 points	**TBA**	**TBA**	**TBA**	Friday, August 28	TBA
Final Exam	(180 min)	200 points	**Friday, September 11**	**10:30 am & 1:30 pm**	**TBA**	Wednesday, Sept. 9	TBA

See GauchoSpace for additional information about the times and locations of the weekly discussion and review sessions hosted by the instructors.

Required Textbook: ***"Case Studies in Immunology"*** by R. Geha and L. Notarangelo (**GN**), Edition 6 (2012) or Edition 7 (2016), published by Garland Science. Both editions are acceptable but avoid other editions because the cases are not similarly numbered and some of the cases on this syllabus are either missing or different in other editions.

Reading References

Assigned Reading

(1) D. W. Sears. Technology Focus 1 - Flow Cytometry and Fluorescence Activated Cell Sorting (GS, Wk0)

(2) D. W. Sears. Technology Focus 2 - CD antigen designations (GS, Wk0)

(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)*

(15A) J. Cohn. "Bound for Glory." *341:1168-1171 (2013).*

(15B) F. Klein. "Antibodies in HIV-1 Vaccine Development and Therapy" (Review) *Science 341:1199-1204 (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)*

(21A) M. Pollan. Some of my best friends are germs. *New York Times Magazine, May 15 (2013)*

(21B) M. Thernstrom. The Allergy Buster. *New York Times Magazine, March 7 (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 RORg regulates intestinal suppressor T cells. Gut microbes influence the balance of regulatory T cell subtypes to control inflammation. *Science 349:929-30 (2015)*

(24A) T. Gensollen *et al.* How colonization by microbiota in early life shapes the immune system. *Science 352:539-544 (2016)*

(24B) J. E. Brody. The Importance of Infants' Exposure to Micro-Organisms. *New York Times, Feb. 5, 2018*

(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)*

Optional Reading (but no less interesting).

(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)*

(32) T. Vatanen *et al.* Variation in microbiome LPS immunogenicity contributes to autoimmunity in humans. *Cell 165 842–53 (2016)*