David G Schatz

List of Publications by Year
in descending order

157 papers	13,460 citations	22153 59 h-index	23533 111 g-index
171 all docs	171 docs citations	171 times ranked	10007 citing authors

#	Article	IF	Citations
1	Structural insights into the evolution of the RAG recombinase. Nature Reviews Immunology, 2022, 22, 353-370.	22.7	30
2	Ig Enhancers Increase RNA Polymerase II Stalling at Somatic Hypermutation Target Sequences. Journal of Immunology, 2022, 208, 143-154.	0.8	13
3	HMCES protects immunoglobulin genes specifically from deletions during somatic hypermutation. Genes and Development, 2022, 36, 433-450.	5.9	17
4	Structural visualization of transcription activated by a multidrug-sensing MerR family regulator. Nature Communications, 2021, 12, 2702.	12.8	25
5	Sarco/endoplasmic reticulum Ca2+-ATPase (SERCA) activity is required for V(D)J recombination. Journal of Experimental Medicine, 2021, 218, .	8.5	8
6	The RAG1 N-terminal region regulates the efficiency and pathways of synapsis for V(D)J recombination. Journal of Experimental Medicine, 2021, 218, .	8.5	13
7	Structural basis of mismatch recognition by a SARS-CoV-2 proofreading enzyme. Science, 2021, 373, 1142-1146.	12.6	91
8	RAG2 abolishes RAG1 aggregation to facilitate V(D)J recombination. Cell Reports, 2021, 37, 109824.	6.4	14
9	Transcription factor binding at Ig enhancers is linked to somatic hypermutation targeting. European Journal of Immunology, 2020, 50, 380-395.	2.9	12
10	Identification of RAG-like transposons in protostomes suggests their ancient bilaterian origin. Mobile DNA, 2020, 11, 17.	3.6	19
11	A Future Outlook on Molecular Mechanisms of Immunity. Trends in Immunology, 2020, 41, 549-555.	6.8	1
12	Sequence-dependent dynamics of synthetic and endogenous RSSs in V(D)J recombination. Nucleic Acids Research, 2020, 48, 6726-6739.	14.5	8
13	Making ends meet in class switch recombination. Cell Research, 2020, 30, 711-712.	12.0	1
14	Nucleolar localization of RAG1 modulates V(D)J recombination activity. Proceedings of the National Academy of Sciences of the United States of America, 2020, 117, 4300-4309.	7.1	22
15	Disease-associated CTNNBL1 mutation impairs somatic hypermutation by decreasing nuclear AID. Journal of Clinical Investigation, 2020, 130, 4411-4422.	8.2	11
16	Structural basis for the activation and suppression of transposition during evolution of the RAG recombinase. EMBO Journal, 2020, 39, e105857.	7.8	8
17	Structures of a RAG-like transposase during cut-and-paste transposition. Nature, 2019, 575, 540-544.	27.8	30
18	TET enzymes augment activation-induced deaminase (AID) expression via 5-hydroxymethylcytosine modifications at the <i>Aicda</i> superenhancer. Science Immunology, 2019, 4, .	11.9	65

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19	Transposon molecular domestication and the evolution of the RAG recombinase. Nature, 2019, 569, 79-84.	27.8	100
20	Intra-VÎº Cluster Recombination Shapes the Ig Kappa Locus Repertoire. Cell Reports, 2019, 29, 4471-4481.e6.	6.4	9
21	Topologically Associated Domains Delineate Susceptibility to Somatic Hypermutation. Cell Reports, 2019, 29, 3902-3915.e8.	6.4	33
22	DNA melting initiates the RAG catalytic pathway. Nature Structural and Molecular Biology, 2018, 25, 732-742.	8.2	40
23	Immature Lymphocytes Inhibit <i>Rag1</i> and <i>Rag2</i> Transcription and V(D)J Recombination in Response to DNA Double-Strand Breaks. Journal of Immunology, 2017, 198, 2943-2956.	0.8	24
24	New insights into the evolutionary origins of the recombinationâ€activating gene proteins and V(D)J recombination. FEBS Journal, 2017, 284, 1590-1605.	4.7	86
25	RAG1 targeting in the genome is dominated by chromatin interactions mediated by the non-core regions of RAG1 and RAG2. Nucleic Acids Research, 2016, 44, gkw633.	14.5	19
26	Collaboration of RAG2 with RAG1-like proteins during the evolution of V(D)J recombination. Genes and Development, 2016, 30, 909-917.	5.9	37
27	Modeling altered T-cell development with induced pluripotent stem cells from patients with RAG1-dependent immune deficiencies. Blood, 2016, 128, 783-793.	1.4	45
28	Discovery of an Active RAG Transposon Illuminates the Origins of V(D)J Recombination. Cell, 2016, 166, 102-114.	28.9	170
29	Bcl6 Is Required for Somatic Hypermutation and Gene Conversion in Chicken DT40 Cells. PLoS ONE, 2016, 11, e0149146.	2.5	9
30	The Role of RAG in V(D)J Recombination. , 2016, , 99-106.		0
31	Mechanisms of clonal evolution in childhood acute lymphoblastic leukemia. Nature Immunology, 2015, 16, 766-774.	14.5	163
32	Single-molecule analysis of RAG-mediated V(D)J DNA cleavage. Proceedings of the National Academy of Sciences of the United States of America, 2015, 112, E1715-23.	7.1	20
33	Spatio-temporal regulation of RAG2 following genotoxic stress. DNA Repair, 2015, 27, 19-27.	2.8	10
34	The Mechanism of V(D)J Recombination. , 2015, , 13-34.		9
35	RAG Represents a Widespread Threat to the Lymphocyte Genome. Cell, 2015, 162, 751-765.	28.9	98
36	Genomic landscape of cutaneous T cell lymphoma. Nature Genetics, 2015, 47, 1011-1019.	21.4	347

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37	The architecture of the 12RSS in V(D)J recombination signal and synaptic complexes. Nucleic Acids Research, 2015, 43, 917-931.	14.5	11
38	Recruitment of RAG1 and RAG2 to Chromatinized DNA during V(D)J Recombination. Molecular and Cellular Biology, 2015, 35, 3701-3713.	2.3	6
39	Chromosomal Loop Domains Direct the Recombination of Antigen Receptor Genes. Cell, 2015, 163, 947-959.	28.9	140
40	Mapping and Quantitation of the Interaction between the Recombination Activating Gene Proteins RAG1 and RAG2. Journal of Biological Chemistry, 2015, 290, 11802-11817.	3.4	18
41	Histone reader BRWD1 targets and restricts recombination to the Igk locus. Nature Immunology, 2015, 16, 1094-1103.	14.5	37
42	Regulation and Evolution of the RAG Recombinase. Advances in Immunology, 2015, 128, 1-39.	2.2	70
43	Targeting Of Somatic Hypermutation By immunoglobulin Enhancer And Enhancer-Like Sequences. PLoS Biology, 2014, 12, e1001831.	5.6	51
44	Super-Enhancer Transcription Converges on AID. Cell, 2014, 159, 1490-1492.	28.9	8
45	Synapsis Alters RAG-Mediated Nicking at <i>Tcrb</i> Recombination Signal Sequences: Implications for the â€œBeyond 12/23â€•Rule. Molecular and Cellular Biology, 2014, 34, 2566-2580.	2.3	21
46	The RAG Recombinase Dictates Functional Heterogeneity and Cellular Fitness in Natural Killer Cells. Cell, 2014, 159, 94-107.	28.9	147
47	Induction of homologous recombination between sequence repeats by the activation induced cytidine deaminase (AID) protein. ELife, 2014, 3, e03110.	6.0	4
48	Higher-Order Looping and Nuclear Organization of Tcra Facilitate Targeted RAG Cleavage and Regulated Rearrangement in Recombination Centers. Cell Reports, 2013, 3, 359-370.	6.4	40
49	A Critical Context-Dependent Role for E Boxes in the Targeting of Somatic Hypermutation. Journal of Immunology, 2013, 191, 1556-1566.	0.8	15
50	Multiple Transcription Factor Binding Sites Predict AID Targeting in Non-Ig Genes. Journal of Immunology, 2013, 190, 3878-3888.	0.8	32
51	RAG and HMGB1 create a large bend in the 23RSS in the V(D)J recombination synaptic complexes. Nucleic Acids Research, 2013, 41, 2437-2454.	14.5	23
52	The Ataxia Telangiectasia mutated kinase controls IgÎº allelic exclusion by inhibiting secondary <i>VÎº</i>-to-<i>JÎº</i> rearrangements. Journal of Experimental Medicine, 2013, 210, 233-239.	8.5	42
53	Peripheral subnuclear positioning suppresses <i>Tcrb</i> recombination and segregates <i>Tcrb</i> alleles from RAG2. Proceedings of the National Academy of Sciences of the United States of America, 2013, 110, E4628-37.	7.1	27
54	Cooperative recruitment of HMGB1 during V(D)J recombination through interactions with RAG1 and DNA. Nucleic Acids Research, 2013, 41, 3289-3301.	14.5	38

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55	Identification of Core DNA Elements That Target Somatic Hypermutation. Journal of Immunology, 2012, 189, 5314-5326.	0.8	26
56	A Dual Interaction between the DNA Damage Response Protein MDC1 and the RAG1 Subunit of the V(D)J Recombinase. Journal of Biological Chemistry, 2012, 287, 36488-36498.	3.4	22
57	Dendritic cellâ€"mediated activation-induced cytidine deaminase (AID)â€"dependent induction of genomic instability in human myeloma. Blood, 2012, 119, 2302-2309.	1.4	45
58	Localized epigenetic changes induced by DH recombination restricts recombinase to DJH junctions. Nature Immunology, 2012, 13, 1205-1212.	14.5	42
59	AID-Targeting and Hypermutation of Non-Immunoglobulin Genes Does Not Correlate with Proximity to Immunoglobulin Genes in Germinal Center B Cells. PLoS ONE, 2012, 7, e39601.	2.5	5
60	A role for cohesin in T-cell-receptor rearrangement and thymocyte differentiation. Nature, 2011, 476, 467-471.	27.8	217
61	V(D)J Recombination: Mechanisms of Initiation. Annual Review of Genetics, 2011, 45, 167-202.	7.6	446
62	Uracil residues dependent on the deaminase AID in immunoglobulin gene variable and switch regions. Nature Immunology, 2011, 12, 70-76.	14.5	106
63	Recombination centres and the orchestration of V(D)J recombination. Nature Reviews Immunology, 2011, 11, 251-263.	22.7	486
64	Promoters, enhancers, and transcription target RAG1 binding during V(D)J recombination. Journal of Experimental Medicine, 2010, 207, 2809-2816.	8.5	65
65	Sin1-mTORC2 Suppresses rag and il7r Gene Expression through Akt2 in B Cells. Molecular Cell, 2010, 39, 433-443.	9.7	64
66	The In Vivo Pattern of Binding of RAG1 and RAG2 to Antigen Receptor Loci. Cell, 2010, 141, 419-431.	28.9	257
67	Imatinib Resistance and Progression of CML to Blast Crisis: Somatic Hypermutation AIDing the Way. Cancer Cell, 2009, 16, 174-176.	16.8	10
68	RAG-1 and ATM coordinate monoallelic recombination and nuclear positioning of immunoglobulin loci. Nature Immunology, 2009, 10, 655-664.	14.5	130
69	Structure of the RAG1 nonamer binding domain with DNA reveals a dimer that mediates DNA synapsis. Nature Structural and Molecular Biology, 2009, 16, 499-508.	8.2	77
70	Ebf1-dependent control of the osteoblast and adipocyte lineages. Bone, 2009, 44, 537-546.	2.9	81
71	Balancing AID and DNA repair during somatic hypermutation. Trends in Immunology, 2009, 30, 173-181.	6.8	178
72	Leaky severe combined immunodeficiency and aberrant DNA rearrangements due to a hypomorphic RAG1 mutation. Blood, 2009, 113, 2965-2975.	1.4	42

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73	Negative Regulation of Activation-Induced Cytidine Deaminase Protein Prevents Aberrant Somatic Hypermutation and Lymphomagenesis.. Blood, 2009, 114, 94-94.	1.4	0
74	Two levels of protection for the B cell genome during somatic hypermutation. Nature, 2008, 451, 841-845.	27.8	524
75	A Role for Small RNA Molecules during the DNA Repair Phase of Somatic Hypermutation. Blood, 2008, 112, 785-785.	1.4	1
76	Understanding the spread of mutations during somatic hypermutation. FASEB Journal, 2008, 22, 849.3.	0.5	0
77	Activation-induced Cytidine Deaminase-mediated Sequence Diversification Is Transiently Targeted to Newly Integrated DNA Substrates. Journal of Biological Chemistry, 2007, 282, 25308-25313.	3.4	6
78	Targeting of AIDâ€Mediated Sequence Diversification by cisâ€Acting Determinants. Advances in Immunology, 2007, 94, 109-125.	2.2	25
79	The Beyond 12/23 Restriction Is Imposed at the Nicking and Pairing Steps of DNA Cleavage during V(D)J Recombination. Molecular and Cellular Biology, 2007, 27, 6288-6299.	2.3	27
80	Fluorescence Resonance Energy Transfer Analysis of Recombination Signal Sequence Configuration in the RAG1/2 Synaptic Complex. Molecular and Cellular Biology, 2007, 27, 4745-4758.	2.3	16
81	Role of Activation-Induced Deaminase Protein Kinase A Phosphorylation Sites in Ig Gene Conversion and Somatic Hypermutation. Journal of Immunology, 2007, 179, 5274-5280.	0.8	29
82	Strand-Biased Spreading of Mutations During Somatic Hypermutation. Science, 2007, 317, 1227-1230.	12.6	53
83	DNA deaminases converge on adaptive immunity. Nature Immunology, 2007, 8, 551-553.	14.5	6
84	AID and Igh switch region-Myc chromosomal translocations. DNA Repair, 2006, 5, 1259-1264.	2.8	19
85	Origins of peripheral B cells in IL-7 receptor-deficient mice. Molecular Immunology, 2006, 43, 326-334.	2.2	24
86	Targeting of somatic hypermutation. Nature Reviews Immunology, 2006, 6, 573-583.	22.7	298
87	Control of gene conversion and somatic hypermutation by immunoglobulin promoter and enhancer sequences. Journal of Experimental Medicine, 2006, 203, 2919-2928.	8.5	52
88	Mobilization of RAG-Generated Signal Ends by Transposition and Insertion In Vivo. Molecular and Cellular Biology, 2006, 26, 1558-1568.	2.3	49
89	Roles of the Ig Îº Light Chain Intronic and 3â€² Enhancers in<i>Igk</i>Somatic Hypermutation. Journal of Immunology, 2006, 177, 1146-1151.	0.8	44
90	Response to 'Amplifying Igh translocations'. Nature Immunology, 2005, 6, 118-118.	14.5	2

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91	B cells and osteoblast and osteoclast development. Immunological Reviews, 2005, 208, 141-153.	6.0	61
92	Radiosensitization of MDA-MB-231 breast tumor cells by adenovirus-mediated overexpression of a fragment of the XRCC4 protein. Molecular Cancer Therapeutics, 2005, 4, 1541-1547.	4.1	23
93	Expression of activation-induced cytidine deaminase is regulated by cell division, providing a mechanistic basis for division-linked class switch recombination. Proceedings of the National Academy of Sciences of the United States of America, 2005, 102, 13242-13247.	7.1	76
94	Histone Modifications Associated with Somatic Hypermutation. Immunity, 2005, 23, 101-110.	14.3	68
95	Biochemistry of V(D)J Recombination. , 2005, 290, 49-85.		56
96	IMMUNOLOGY: UNGstoppable Switching. Science, 2004, 305, 1113-1114.	12.6	9
97	Synapsis of Recombination Signal Sequences Located in cis and DNA Underwinding in V(D)J Recombination. Molecular and Cellular Biology, 2004, 24, 8727-8744.	2.3	15
98	Mutational Analysis of Terminal Deoxynucleotidyltransferase- Mediated N-Nucleotide Addition in V(D)J Recombination. Journal of Immunology, 2004, 172, 5478-5488.	0.8	25
99	Up-Regulation of Hlx in Immature Th Cells Induces IFN-Î³ Expression. Journal of Immunology, 2004, 172, 114-122.	0.8	47
100	Staggered AID-dependent DNA double strand breaks are the predominant DNA lesions targeted to SÂ in Ig class switch recombination. International Immunology, 2004, 16, 549-557.	4.0	88
101	New concepts in the regulation of an ancient reaction: transposition by RAG1/RAG2. Immunological Reviews, 2004, 200, 261-271.	6.0	21
102	V(D)J recombination. Immunological Reviews, 2004, 200, 5-11.	6.0	118
103	B cellâ€"specific loss of histone 3 lysine 9 methylation in the VH locus depends on Pax5. Nature Immunology, 2004, 5, 853-861.	14.5	113
104	Identification of an AID-independent pathway for chromosomal translocations between the Igh switch region and Myc. Nature Immunology, 2004, 5, 1117-1123.	14.5	67
105	Non-redundancy of cytidine deaminases in class switch recombination. European Journal of Immunology, 2004, 34, 844-849.	2.9	18
106	Antigen receptor genes and the evolution of a recombinase. Seminars in Immunology, 2004, 16, 245-256.	5.6	78
107	Partial reconstitution of V(D)J rearrangement and lymphocyte development in RAG-deficient mice expressing inducible, tetracycline-regulated RAG transgenes. Molecular Immunology, 2004, 40, 813-829.	2.2	4
108	Uncovering the V(D)J recombinase. Cell, 2004, 116, S103-S108.	28.9	31

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109	Pax5-Deficient Mice Exhibit Early Onset Osteopenia with Increased Osteoclast Progenitors. Journal of Immunology, 2004, 173, 6583-6591.	0.8	57
110	Regulation of RAG1/RAG2-mediated transposition by GTP and the C-terminal region of RAG2. EMBO Journal, 2003, 22, 1922-1930.	7.8	64
111	RNA AIDs DNA. Nature Immunology, 2003, 4, 429-430.	14.5	16
112	Charles A. Janeway, Jr. (1943-2003). Cell, 2003, 113, 433-434.	28.9	2
113	Extrachromosomal Recombination Substrates Recapitulate beyond 12/23 Restricted V(D)J Recombination in Nonlymphoid Cells. Immunity, 2003, 18, 65-74.	14.3	62
114	Charles A. Janeway, Jr. (1943-2003). Immunity, 2003, 18, 591-592.	14.3	0
115	Defective DNA Repair and Increased Genomic Instability in Artemis-deficient Murine Cells. Journal of Experimental Medicine, 2003, 197, 553-565.	8.5	178
116	DNA mismatches and GC-rich motifs target transposition by the RAG1/RAG2 transposase. Nucleic Acids Research, 2003, 31, 6180-6190.	14.5	29
117	RAG1-DNA Binding in V(D)J Recombination. Journal of Biological Chemistry, 2003, 278, 5584-5596.	3.4	29
118	Pax5 is required for recombination of transcribed, acetylated, 5' IgH V gene segments. Genes and Development, 2003, 17, 37-42.	5.9	141
119	A Functional Analysis of the Spacer of V(D)J Recombination Signal Sequences. PLoS Biology, 2003, 1, e1.	5.6	67
120	The Activation-induced Deaminase Functions in a Postcleavage Step of the Somatic Hypermutation Process. Journal of Experimental Medicine, 2002, 195, 1193-1198.	8.5	106
121	IMMUNOLOGY: One AID to Unite Them All. Science, 2002, 295, 1244-1245.	12.6	22
122	Evidence of a critical architectural function for the RAG proteins in end processing, protection, and joining in V(D)J recombination. Genes and Development, 2002, 16, 1934-1949.	5.9	68
123	Somatic Hypermutation of Immunoglobulin Genes. Cell, 2002, 109, S35-S44.	28.9	201
124	Inducible, reversible hair loss in transgenic mice. Transgenic Research, 2002, 11, 241-247.	2.4	3
125	Identification of Basic Residues in RAG2 Critical for DNA Binding by the RAG1-RAG2 Complex. Molecular Cell, 2001, 8, 899-910.	9.7	46
126	Factors and Forces Controlling V(D)J Recombination. Advances in Immunology, 2001, 78, 169-232.	2.2	164

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127	Location, location, location: the cell biology of immunoglobulin allelic control. Nature Immunology, 2001, 2, 825-826.	14.5	7
128	Cell-cycle-regulated DNA double-strand breaks in somatic hypermutation of immunoglobulin genes. Nature, 2000, 408, 216-221.	27.8	250
129	Genetic Modulation of T Cell Receptor Gene Segment Usage during Somatic Recombination. Journal of Experimental Medicine, 2000, 192, 1191-1196.	8.5	49
130	Intermolecular V(D)J Recombination. Journal of Biological Chemistry, 2000, 275, 8341-8348.	3.4	16
131	Identification of Two Catalytic Residues in RAG1 that Define a Single Active Site within the RAG1/RAG2 Protein Complex. Molecular Cell, 2000, 5, 97-107.	9.7	151
132	The RAG Proteins and V(D)J Recombination: Complexes, Ends, and Transposition. Annual Review of Immunology, 2000, 18, 495-527.	21.8	571
133	[19] cDNA representational difference analysis: A sensitive and flexible method for identification of differentially expressed genes. Methods in Enzymology, 1999, 303, 325-349.	1.0	102
134	Developing B-cell theories. Nature, 1999, 400, 615-617.	27.8	8
135	Transposition mediated by RAG1 and RAG2 and the evolution of the adaptive immune system. Immunologic Research, 1999, 19, 169-182.	2.9	18
136	Developmental neurobiology: Alternative ends for a familiar story?. Current Biology, 1999, 9, R251-R253.	3.9	28
137	Rearranging Views on Neurogenesis. Neuron, 1999, 22, 7-10.	8.1	78
138	Detection of RAG Protein-V(D)J Recombination Signal Interactions Near the Site of DNA Cleavage by UV Cross-Linking. Molecular and Cellular Biology, 1999, 19, 3788-3797.	2.3	72
139	DNA Hairpin Opening Mediated by the RAG1 and RAG2 Proteins. Molecular and Cellular Biology, 1999, 19, 4159-4166.	2.3	107
140	Transposition mediated by RAG1 and RAG2 and its implications for the evolution of the immune system. Nature, 1998, 394, 744-751.	27.8	743
141	Identification of V(D)J recombination coding end intermediates in normal thymocytes. Journal of Molecular Biology, 1997, 267, 1-9.	4.2	41
142	V(D)J recombination movesin vitro. Seminars in Immunology, 1997, 9, 149-159.	5.6	41
143	Coding Joint Formation in a Cell-Free V(D)J Recombination System. Immunity, 1997, 7, 303-314.	14.3	55
144	RAG1 and RAG2 Form a Stable Postcleavage Synaptic Complex with DNA Containing Signal Ends in V(D)J Recombination. Cell, 1997, 89, 43-53.	28.9	281

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145	Crystal structure of the RAG1 dimerization domain reveals multiple zinc-binding motifs including a novel zinc binuclear cluster. Nature Structural Biology, 1997, 4, 586-591.	9.7	138
146	Î±Î² Lineage-committed thymocytes can be rescued by the Î³Î´ T cell receptor (TCR) in the absence of TCR Î² chain. European Journal of Immunology, 1997, 27, 2948-2958.	2.9	48
147	A Zinc-binding Domain Involved in the Dimerization of RAG1. Journal of Molecular Biology, 1996, 260, 70-84.	4.2	104
148	RAG1 Mediates Signal Sequence Recognition and Recruitment of RAG2 in V(D)J Recombination. Cell, 1996, 87, 253-262.	28.9	192
149	Initiation of V(D)J recombination in vitro obeying the 12/23 rule. Nature, 1996, 380, 85-88.	27.8	223
150	rag-1 and rag-2: Biochemistry and Protein Interactions. Current Topics in Microbiology and Immunology, 1996, 217, 11-29.	1.1	4
151	In-frame TCR Î´ gene rearrangements play a critical role in the Î±Î²/Î³Î´ T cell lineage decision. Immunity, 1995, 2, 617-627.	14.3	113
152	Down-regulation of RAG1 and RAG2 gene expression in PreB cells after functional immunoglobulin heavy chain rearrangement. Immunity, 1995, 3, 601-608.	14.3	345
153	Recombination activating gene-1 (RAG-1) transcription in the mammalian CNS. , 1993, , 283-295.		2
154	The recombination activating gene-1 (RAG-1) transcript is present in the murine central nervous system. Cell, 1991, 64, 189-200.	28.9	279
155	Selective expression of RAG-2 in chicken B cells undergoing immunoglobulin gene conversion. Cell, 1991, 64, 201-208.	28.9	134
156	The V(D)J recombination activating gene, RAG-1. Cell, 1989, 59, 1035-1048.	28.9	1,096
157	Stable expression of immunoglobulin gene V(D)J recombinase activity by gene transfer into 3T3 fibroblasts. Cell, 1988, 53, 107-115.	28.9	167