Ebola Virus: A Scientometric Study of World Research Publications

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ABSTRACT

The virus of Ebola belongs to the filovirus family. The hemorrhagic fever occurs due to Ebola virus and is highly transmittable. The study covers a scientometric analysis of publications on Ebola virus worldwide. It revealed that 2446 papers have been published on Ebola virus in 159 journals, originating from 84 countries till December 31, 2013. These publications have received 69,960 citations until March 1, 2015. The maximum literature on this deadly virus is published in the form of articles and review, 2040 (83.40%). The highest number of papers was published in 2012, i.e., 198 (8.1%). Eighty-four countries have contributed in Ebola research with at least one publication. Top ten countries produced 2124 (86.8%) of the total research publications on Ebola virus. The United States is the leading country with 1146 (46.9%) in research outcome. The average citation per publication on papers in the area is ~28.6 citations per paper. The majority of papers is published in English language, 2149 (87.9%). Overall, 157 journals produced the Ebola virus research and "Journal of Virology" has published 257 (10.5%) of the papers. In addition, the world over 160 institutions contributed in Ebola virus research, and National Center for Infectious Diseases (~3.3) has recorded highest relative citation impact. Feldmann from the University of Manitoba is the leading author in the field with 129 (5.3%) papers.

Keywords: Antigen detection tests, Ebola virus, Filovirus family, Filovirus infections, Hemorrhagic fever.

INTRODUCTION

Ebola virus has been the cause for several thousand deaths in Africa. It was found for the first time in Central Africa during 1976 and 1977.[1,2] The virus was named Ebola after the river in the proximity of Yambuku in the region of Zaire in Africa. People have been assuming that the transmission of Ebola is related to the rain forest ecosystem, for example, a rainy period follows an extensive dry period, drier air impetuous the proliferation of the virus.[3] Hemorrhagic fever occurs due to Ebola virus and is highly transmittable. The virus of Ebola belongs to the filovirus family, hemorrhagic fever with mortality rates of 90% in humans.[4,5] Therefore, several means are being adopted by the health workers for decontamination of Ebola virus, for example, thermal inactivation, etc., In addition, it may be inactivated with various chemical agents including formalin and quaternary ammonium ions.[6] The virus is composed of a negative-sense and a single-stranded molecule. The virus is categorized in the family *Filoviridae*. Mainly four species constitute the genus of the virus such as Zaire, Sudan, Ivory Coast, and Reston.[7] The virus perseveres in animals after that transmits to humans. Ebola hemorrhagic fever needs the virus-specific diagnostic tests to control the spread of

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these viruses.[8,9] It has been assumed in the recent study that fruit bats might be the reservoir for species. However, it is not apparent whether species are involved and how the virus transmits.[10] It is identified that genus Ebola virus has five known species: (i) Zaire Ebola virus, (ii) Sudan Ebola virus, (iii) Taï Forest Ebola virus, (iv) Bundibugyo Ebola virus, and (v) Reston Ebola virus.[11] The primary transmission occurs through body and body fluid contact. The virus has approximately 90% mortality rate.[12-14] Therefore, rapid antigen-detection tests with filovirus-specific monoclonal antibodies (mAb) are by far the best ways for early diagnosis. At present, no effective treatment is available for Ebola virus hemorrhagic fever.[5,15] However, the treatment to protect rodents from lethal fever has not been active.[16,17] The outbreak is occurring on a periodic basis. Therefore, technical inhibits to deliver the vaccination ought to overcome at the earliest. However, keeping in view the hurdles to developing the vaccine, it seems that scientists have to work hard to develop the vaccination for the deadly disease occurring due to Ebola virus.[10] Nevertheless, the antigen-detection tests with filovirus-specific mAb could be one of the best ways for diagnosis of filovirus infections.[18,19]

The Objectives of the Study

The primary aim of the study is a scientometric analysis of world research publications on Ebola virus. However, the objectives of the study are limited to the following:

- To examine the pattern of research output on Ebola virus
- To identify the most productive journals publishing research on Ebola virus
- To identify the language wise distribution of publications on Ebola virus
- To find out the country-wise distribution of publications on Ebola virus
- To verify the transformative activity index (TAI)
- To understand the authorship patterns in Ebola virus research
- To study the citation pattern in Ebola virus research
- To identify the prolific institutes and their relative citation impact (RCI) in Ebola virus research
- To identify the most prolific authors in Ebola virus research
- To identify the highly cited papers on Ebola virus.

METHODOLOGY OF THE STUDY

The data of the study are obtained from Scopus (http://www.scopus.com) database. The Medical Subject Headings (MeSH) was used to identify the search terms. The following search terms have been used to yield the records from database, Ebola virus, Ebola hemorrhagic fever, *Filoviridae*-Ebola, viral hemorrhagic fevers, Ebola virus disease, and hemorrhagic virus. In addition, truncation method was used to retrieve the maximum records from database. The records related to Ebola virus have been identified since December 31, 2013. The citations were counted using 1-year citations window such as 2003–2004 and 2004–2005 in Scopus until January 1, 2015.

RESULTS

A total of 2446 documents are published on Ebola virus research until December 31, 2013. These publications have received 69,960 citations until March 1, 2015.

Pattern of Research Outcome

Overall, 2446 papers have been published in 159 journals, originated from 84 countries. Figure 1 illustrates the growth of publications and citations during 1977–2013. The first paper on Ebola virus published in 1977. Subsequently, a maximum number of papers were published in 2012, i.e., 198 (8.1%), followed by 165 (6.7%) papers in the year 2013. The research on this deadly virus accelerated after 2000, and 1864 (76.2%) papers were published during 2001–2013. The average publication per year on this deadly virus has been ~66.1. The average citation per publication (ACPP) has been the highest (~5.7) in the year 2009 followed by (~5.5) in 2008.

Country-wise Research Outcome on Ebola Virus

Figure 2 shows the Ebola virus research outcome worldwide. Totally, 84 countries had contributed to Ebola research with at least one publication. Top ten countries produced 2124 (86.8%) of the total research publications on Ebola virus.

The United States is the leading country with 1146 (46.9%) in research outcome, followed by Germany 194 (7.9%), France 173 (7.1%), and the United Kingdom 159 (6.5%). It is apparent that developed countries have been focusing on the research on this deadly virus. However, none of the developing countries appear in the list of top ten countries producing Ebola research outcome. The citations of top countries were calculated [Table 1] till December 31, 2014, and the highest citations were recorded on the publications of the United States 46,642 (66.7%), followed by France 5231 (7.5%) and the United Kingdom 3587 (5.1%).

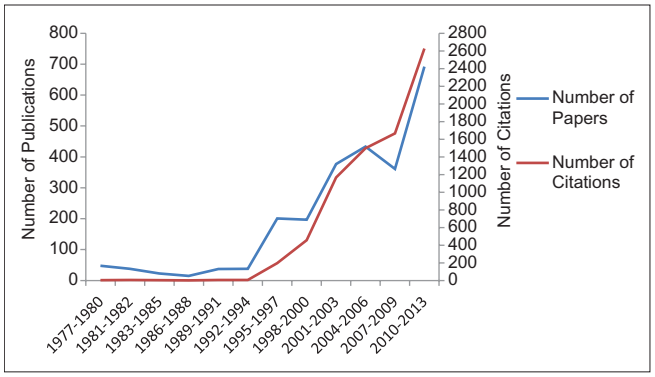

Figure 1: Growth of Publications and Citations on Ebola Virus

Outcome by Type of Publications and Citations Count

Table 2a shows that the majority of research has been published in the form of articles/review/note and short survey and counted (92.5%). The maximum papers were published in the form of article 1485 (60.7%), followed by review 555 (22.7%), note 133 (5.4%), short survey 116 (4.7%), editorial 98 (4.0%), and letters 59 (2.4%). Table 2b analyzes the citations.

The citations of the research outcome published in different formats were also analyzed. The 2446 papers on Ebola virus have received 69,960 citations with average of ~28.6 citations per paper. The data sets revealed that 691 (28.3%) papers have not been cited till March 1, 2015, and remaining 1755 (71.7%) cited one or more times. Table 2b shows that 15 papers have received 300 or more citations. Thirty-five papers have been cited between 200 and 300 times. It was found that 100 articles on Ebola virus have been cited more than 100 times. Overall, 389 (15.9%) papers received 50 or more citations and 710 (29.0%) papers received 1-9 citations. Besides this, 35 highly cited papers were also identified.

Subject Specialty Journals and Most Prolific Journals Used for Publishing Research on Ebola

Overall, 157 journals produced the Ebola virus research. Table 3 illustrates that top 20 journals collectively produced 845 (34.5%) papers. Remaining 137 journals published the 1601 (65.5%) papers. The "Journal of Virology" has published the maximum 257(10.5%) papers. The paper published in "Journals of Virology" has accumulated highest citations, 4552. The SCImago Journal Rankings-2013 of journal "Nature" is found the highest~21.323, followed by "Science"~12.465. The AQ1 Source Normalized Impact per Paper (SNIP)-2013 of top 20 journals was also identified and found that the journal "Lancet" has the highest SNIP-2013 (~11.265). Besides this, the impact per publication (IPP) was also determined and found that the journal "Nature" has witnessed the highest IPP value ~32.997.

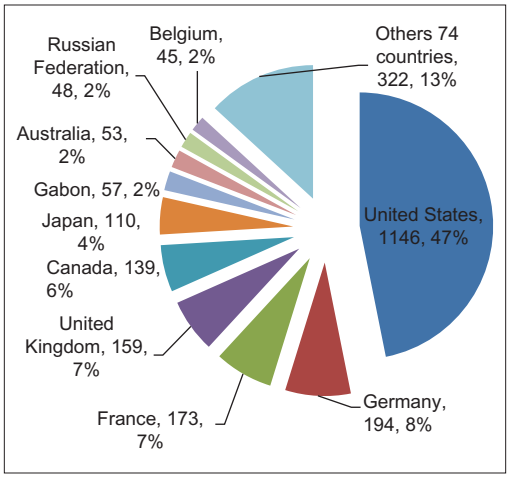

Figure 2: Country--wise Share of Publications

Table 1: Country wise Research Outcome on Ebola Virus

Country	Number of Publications (%)	Citations
United States	1146 (46.9)	46642
Germany	194 (7.9)	3072
France	173 (7.1)	5231
United Kingdom	159 (6.5)	3587
Canada	139 (5.7)	2682
Japan	110 (4.5)	1571
Gabon	57 (2.3)	1340
Australia	53 (2.2)	1582
Russian Federation	48 (2.0)	295
Belgium	45 (1.8)	410
Others 74 countries	322 (13.2)	3548
Total	2446 (100.0)	69960

Table 2a: Format of Ebola Virus Publications

Type of Documents	Number of Publications	Percentage
Article	1485	60.7
Review	555	22.7
Note	133	5.4
Short Survey	116	4.7
Editorial	98	4.0
Letter	59	2.4

Distribution of Papers by Language

The Ebola virus research has been published in ten languages. Maximum number of papers have been published in English 2149 (87.9%), followed by French 125 (5.1%), Russian 70 (2.9%), German 43 (1.8%), Japanese 23 (0.9%), Spanish 13 (0.5%), Polish 12 (0.5%), Chinese 10 (0.4%), Dutch 9 (0.4%), and Crouch 8 (0.3%).

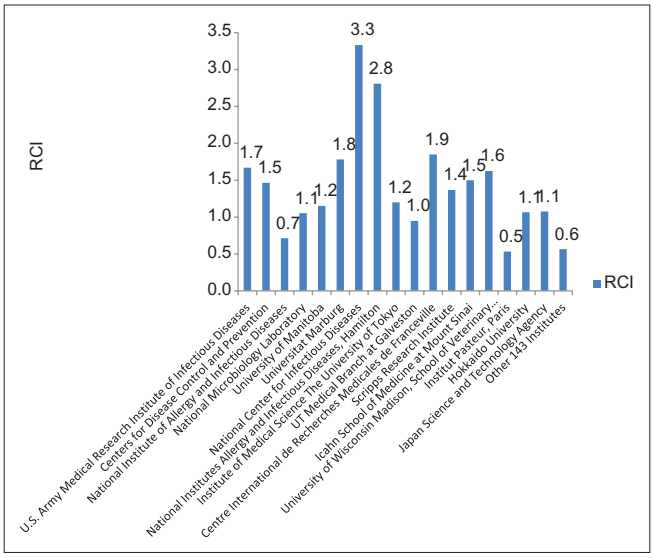

Figure 3: Relative Citation Impact of Leading Institutions in Ebola Virus Research

Table 2b: Rates of Papers of All Formats Being Cited

Citations	Number of Papers	Total Citations
0	691	0
1-9	710	841
10-19	270	3805
20-29	179	4341
30-39	123	4234
40-49	84	3684
50-59	65	8851
60-69	50	3219
70-79	50	3681
80-89	40	3351
90-100	34	3223
>100	100	13965
>200	35	8464
>300	15	8301

Prolific Institutions and Relative Citation Impact

In the field of Ebola virus research, 160 institutions around the world have contributed in research. The study found that top 17 institutions jointly produced the 1166 (47.7%) publications. Besides this, other 143 institutions have contributed 1280 (52.3%) publications. The top 17 institutions in Ebola Research. The US Army Medical Research Institute of Infectious Diseases is identified the leading institution in the field of study with 222 (9.1%) publications and 10,600 (15.2%) citations. The second leading institution in research is "Centers for Disease Control and Prevention" with 106 (4.3%) publications and 4410 (6.3%) citations. ACPP was also calculated and found that National Center for Infectious Diseases (~94.3) has the highest ACPP, followed by National Institutes Allergy and Infectious Diseases, Hamilton (~79.1) [Table 4].

Figure 3 shows RCI of leading institutions in Ebola virus research. National Center for Infectious Diseases (~3.3) has the highest RCI value, followed by National Institutes Allergy and Infectious Diseases, Hamilton (~2.8), Centre International de Recherches Medicales de Franceville (~1.9), Universitat Marburg (~1.8), and US Army Medical Research Institute of Infectious Diseases (~1.7).

Most Productive Authors in Ebola Virus Research

The most productive authors on Ebola virus research were found [Table 5]. It is known that top 26 authors jointly published the 1033 (42.2%) publications with 53,690 (76.7%) citations. Feldmann from the University of Manitoba is the leading author in the field with 129 (5.3%) papers, followed by Peter B Jährling 65 (2.7%) from the National Institute of Allergy and Infectious Diseases, Bethesda, United States. ACPPs were calculated and found that Sanchez from LECOM Bradenton School of Pharmacy, Bradenton, United States, has the highest (~92.9) ACPP, followed by Geisbert from National Institute of Allergy and Infectious Diseases, Bethesda, United States (~80.0).

Besides this, the h-index of leading authors is also revealed in Table 5. Nabel GJ from National Institute of Allergy and Infectious Diseases, Vaccine Research Center, Bethesda, United States, has the highest h-index value ~93, followed by Kawaoka from University of Wisconsin-Madison, School of Veterinary Medicine (~92).

Highly Cited Papers on Ebola Virus

The study identified the 30 highly cited papers on Ebola Virus [Table 6]. These papers have received 12,299 (17.6%) citations. The paper entitled "Emerging infectious diseases of wildlife - threats to biodiversity and human health" published in "Science" got the highest citations 1343 (1.9%), followed by a paper entitled "Global trends in emerging infectious diseases" published in "Nature" 1129 (1.6%).

DISCUSSION AND CONCLUSIONS

It is revealed that 2446 papers have been published on Ebola virus in 159 journals, originating from 84 countries till December 31, 2013. These publications have received 69,960 citations until March 1, 2015. The maximum literature on this deadly virus published in the form of articles and review 2040 (83.40%), followed by notes 133 (5.4%) and short survey 116 (4.7%). The maximum number of papers was published in 2012, i.e. 198 (8.1%).

Table 3: Most Prolific Journals Publishing EV Research

Journal Title and Country of Publication	Number of papers	SJR (SCImago Journal Rankings) -2013	SNIP (Source Normalized Impact per Paper) -2013	Citations	IPP
Journal of Virology	180	3.492	1.255	4552	4.900
Virology	77	1.784	0.950	1091	3.201
Science	52	12.465	7.900	1303	25.903
Voprosy Virusologii	51	0.156	0.094	42	0.202
Journal of Infectious Diseases	48	3.607	1.169	699	5.591
Plos Pathogens	46	5.017	1.812	640	7.346
Lancet	46	11.563	11.265	640	27.002
Nature	37	21.323	8.222	1376	32.997
Emerging Infectious Diseases	36	3.182	2.265	546	5.527
Proceedings of the National Academy of Sciences of the United States of America	35	7.048	2.969	1177	9.756
Viruses	32	1.631	0.981	169	3.267
Plos One	32	1.724	3.618	561	1.100
Antiviral Research	29	1.512	1.311	388	3.964
Nature Medicine	23	10.988	4.705	646	20.236
Vaccine	21	1.715	1.112	328	3.186
Journal of General Virology	21	1.715	1.146	295	3.447
Journal of the American Medical Association	21	6.278	10.022	62	23.820
Releve Epidemiologique Hebdomadaire Section D Hygiene Du Secretariat De La Societe Des Nations Weekly Epidemiological Record Health Section of the Secretariat of the League of Nations	20	1.423		43	
Current Topics in Microbiology and Immunology	19	1.192	0.762	131	3.020
Transactions of the Royal Society of Tropical Medicine and Hygiene	19	0.982	1.141	66	2.097
Other 137 Journals	1601	-	-		
Grand Total	2446				

Table 4: Prolific Institutes Publishing Ebola Virus Research

Rank	Name of Institution	Number of publications	No of Citations	ACPP
1	U.S. Army Medical Research Institute of Infectious Diseases	222	10600	47.7
2	Centers for Disease Control and Prevention	106	4410	41.6
3	National Institute of Allergy and Infectious Diseases	102	2093	20.5
4	National Microbiology Laboratory	91	2732	30.0
5	University of Manitoba	80	2682	33.5
6	Universitat Marburg	78	3973	50.9
7	National Center for Infectious Diseases	52	4903	94.3
8	National Institutes Allergy and Infectious Diseases, Hamilton	52	4115	79.1
9	Institute of Medical Science The University of Tokyo	50	1703	34.1
10	UT Medical Branch at Galveston	49	1349	27.5
11	Centre International de Recherches Medicales de Franceville	49	2596	53.0
12	Scripps Research Institute	47	1811	38.5
13	Icahn School of Medicine at Mount Sinai	43	1855	43.1
14	The University of Wisconsin-Madison, School of Veterinary Medicine	39	1803	46.2
15	Institut Pasteur, Paris	37	541	14.6
16	Hokkaido University	36	1096	30.4
17	Japan Science and Technology Agency	33	982	29.8
18	Other 142 Institutes	1280		
	Total	2446		

Table 5: Most Productive Authors Publishing Research on Ebola Virus

Author	Affiliation	No of papers	No of Citations	ACPP	h-Index
Feldmann, H.	University of Manitoba, Department of Medical Microbiology, Winnipeg, Canada	129	4491	34.8	56
Jahrling, Peter B.	National Institute of Allergy and Infectious Diseases, Bethesda, United States	65	4622	71.1	58
Geisbert, T.W.	National Institute of Allergy and Infectious Diseases, Bethesda, United States	64	5120	80.0	58
Bavari, S.	USAMRIID, Fort Detrick, United States	63	2145	34.0	42
Kawaoka, Y.	University of Wisconsin Madison, School of Veterinary Medicine, Department of Pathobiological Sciences, Madison, United States	60	2616	43.6	92
Rollin, P.E.	Centers for Disease Control and Prevention, Atlanta, United States	45	2714	60.3	72
Chepurnov, A.A.	Siberian Branch of Russian Academy of Medical Sciences, Novosibirsk, Russian Federation	43	294	6.8	12
Becker, S.	Robert Koch Institut, Division Highly Pathogenic Microorganisms, Berlin, Germany	41	1446	35.3	35
Nichol, S.T.	Centers for Disease Control and Prevention, Special Pathogens Branch, Atlanta, United States	40	2433	60.8	68
Takada, A.	University of Zambia, School of Veterinary Medicine, Lusaka, Zambia	40	1653	41.3	44
Klenk, H.D.	Universitat Marburg, Institute for Virology, Marburg, Germany	39	3085	79.1	71
Sanchez, A.	LECOM Bradenton School of Pharmacy, Bradenton, United States	38	3532	92.9	45
Basler, C.F.	Icahn School of Medicine at Mount Sinai, Department of Microbiology, New York, United States	37	1723	46.6	42
Volchkov, Viktor E.	Universite de Lyon, Molecular Basis of Viral Pathogenicity, Lyon, France	37	2068	55.9	28
Bray, M.	National Institute of Allergy and Infectious Diseases, Division of Clinical Research, Bethesda, United States	35	2377	67.9	51
Warfield, K.L.	Unither Virology LLC, Gaithersburg, United States	32	1259	39.3	29
Muhlberger, E.	Novosibirskij Gosudarstvennyj Universitet, Department of Microbiology and National Emerging Infectious Diseases Laboratory, Novosibirsk, Russian Federation	30	1659	55.3	28
Ksiazek, T.G.	King Abdulaziz University, Department of Medicine, Jeddah, Saudi Arabia	30	1662	55.4	78
Hensley, L.E.	National Institute of Allergy and Infectious Diseases, Integrated Research Facility, Bethesda, United States	29	2284		36
Nabel, G.J.	National Institute of Allergy and Infectious Diseases, Vaccine Research Center, Bethesda, United States	29	2309		93
Gonzalez, J.P.	Metabiota, San Francisco, United States	28	1111		29
Olinger, G.G.	National Institute of Allergy and Infectious Diseases, Integrated Research Facility, Bethesda, United States	27	616		21
Peters, C.J.	UT Medical Branch at Galveston, Galveston, United States	26	1761		79
Ebihara, H.	National Institutes of Health, Bethesda, Bethesda, United States	26	710		24

Table 6: Highly Cited Papers on Ebola Virus

Title	Author	Source	Number of Citations
Emerging infectious diseases of wildlife - Threats to biodiversity and human health	Daszak, P., Cunningham, A.A., Hyatt, A.	2000, Science 287 (5452), pp. 443-449	1343
Global trends in emerging infectious diseases	Jones, K.E., Patel, N.G., Levy, M.A., *et. al*.	2008, Nature 451 (7181), pp. 990-993	1129
Knocking down barriers: Advances in siRNA delivery	Whitehead, K.A., Langer, R., Anderson, D.G.	2009, Nature Reviews Drug Discovery 8 (2), pp. 129-138	953
Furin at the cutting edge: From protein traffic to embryogenesis and disease	Thomas, G.	2002, Nature Reviews Molecular Cell Biology 3 (10), pp. 753-766	540
Viral membrane fusion	Harrison, S.C.	2008, Nature Structural and Molecular Biology 15 (7), pp. 690-698	482
HIV-1 and Ebola virus encode small peptide motifs that recruit Tsg101 to sites of particle assembly to facilitate egress	Martin-Serrano, J., Zang, T., Bieniasz, P.D.	2001, Nature Medicine 7 (12), pp. 1313-1319	457
Isolation of the etiologic agent of Korean hemorrhagic fever	Lee, H.W., Lee, R.W., Johnson, K.M	1978, Journal of Infectious Diseases 137 (3), pp. 298-308	426

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Table 6: Contd...

Title	Author	Source	Number of Citations
Development of a preventive vaccine for Ebola virus infection in primates	Sullivan, N.J., Sanchez, A., Rollin, P.E., Yang, Z.-Y., Nabel, G.J.	2000, Nature 408 (6812), pp. 605-609	418
Fruit bats as reservoirs of Ebola virus	Leroy, E.M., Kumulungui, B., Pourrut, X. *et. al*	2005, Nature 438 (7068), pp. 575-576	408
Strategies in the design of antiviral drugs	De Clercq, E.	2002, Nature Reviews Drug Discovery 1 (1), pp. 13-25	399
2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings	Siegel, J.D., Rhinehart, E., Jackson, M., Chiarello, L.	2007, American Journal of Infection Control 35 (10 SUPPL. 2), pp. S65-S164	391
Unsafe injections in the developing world and transmission of bloodborne pathogens: A review	Simonsen, L., Kane, A., Lloyd, J., Zaffran, M., Kane, M.	1999, Bulletin of the World Health Organization 77 (10), pp. 789-800	379
C-type lectins DC-SIGN and L-SIGN mediate cellular entry by Ebola Virus in cis and in trans	Alvarez, C.P., Lasala, F., Carrillo, J. *et. al*	2002, Journal of Virology 76 (13), pp. 6841-6844	324
Bats: Important reservoir hosts of emerging viruses	Calisher, C.H., Childs, J.E., Field, H.E., Holmes, K.V., Schountz, T.	2006, Clinical Microbiology Reviews 19 (3), pp. 531-545	319
Virology: Endosomal proteolysis of the ebola virus glycoprotein is necessary for infection	Chandran, K., Sullivan, N.J., Felbor, U., Whelan, S.P., Cunningham, J.M.	2005, Science 308 (5728), pp. 1643-1645	307
Pathogens: Raft hijackers	Manes, S., Del Real, G., Martinez-A, C.	2003, Nature Reviews Immunology 3 (7), pp. 557-568	288
Retrovirus envelope domain at 1.7 A resolution	Fass, D., Harrison, S.C., Kim, P.S.	1996, Nature Structural Biology 3 (5), pp. 465-469	282
A system for functional analysis of Ebola virus glycoprotein	Takada, A., Robison, C., Goto, H., *et. al*.	1997, Proceedings of the National Academy of Sciences of the United States of America 94 (26), pp. 14764-14769	277
Accelerated vaccination for Ebola virus haemorrhagic	Sullivan, N.J., Geisbert,	2003, Nature	276
fever in non-human primates	T.W., Gelsbert, J.B., *et. al*.	424 (6949), pp. 681-684	
Lipid raft microdomains: A gateway for compartmentalized trafficking of Ebola and Marburg viruses	Bavari, S., Bosio, C.M., Wiegand, E., *et. al*	2002, Journal of Experimental Medicine 195 (5), pp. 593-602	274
Structures and mechanisms of viral membrane fusion proteins: Multiple variations on a common theme	White, J.M., Delos, S.E., Brecher, M., Schornberg, K.	2008, Critical Reviews in Biochemistry and Molecular Biology 43 (3), pp. 189-219	271
The virion glycoproteins of Ebola viruses are encoded in two reading frames and are expressed through transcriptional editing	Sanchez, A., Trappier, S.G., Mahy, B.W.J., *et. al*.	1996 Proceedings of the National Academy of Sciences of the United States of America 93 (8), pp. 3602-3607	270
Rapid detection and quantification of RNA of Ebola and Marburg viruses, Lassa virus, Crimean-Congo hemorrhagic fever virus, Rift Valley fever virus, dengue virus, and yellow fever virus by real-time reverse transcription-PCR	Drosten, C., Gottig, S., Schilling, S., *et. al*.	2002, Journal of Clinical Microbiology 40 (7), pp. 2323-2330	266
Catastrophic ape decline in western equatorial Africa	Walsh, P.D., Abernethy, K.A., Bermejo, M., *et. al*.	2003, Nature 422 (6932), pp. 611-614	265
Defective humoral responses and extensive intravascular apoptosis are associated with fatal outcome in Ebola virus-infected patients	Baize, S., Leroy, E.M., Georges-Courbot, *et. al*.	1999, Nature Medicine 5 (4), pp. 423-426	265

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Table 6: Contd...

Title	Author	Source	Number of Citations
The Ebola virus VP35 protein functions as a type I IFN antagonist	Basler, C.F., Wang, X., Muhlberger, E. *et. al*.	2000, Proceedings of the National Academy of Sciences of the United States of America 97 (22), pp. 12289-12294	263
Nonviral delivery of synthetic siRNAs in vivo 117 (12), pp. 3623-3632	Akhtar, S., Benter, I.F.	2007, Journal of Clinical Investigation	260
Crystal structure of the Ebola virus membrane fusion subunit, GP2, from the envelope glycoprotein ectodomain	Weissenhorn, W., Carfi, A., Lee, K.-H., Skehel, J.J., Wiley, D.C.	1998, Molecular Cell 2 (5), pp. 605-616	260
Viral evasion and subversion of pattern-recognition receptor signalling	Bowie, A.G., Unterholzner, L.	2008, Nature Reviews Immunology 8 (12), pp. 911-922	255
A PPxY motif within the VP40 protein of Ebola virus interacts physically and functionally with a ubiquitin ligase: Implications for filovirus budding	Harty, R.N., Brown, M.E., Wang, G., Huibregtse, J., Hayes, F.P.	2000, Proceedings of the National Academy of Sciences of the United States of America 97 (25), pp. 13871-13876	252

Eighty-four countries have contributed in Ebola research with at least one publication. Top ten countries produced 2124 (86.8%) of the total research publications on Ebola virus. The United States is the leading country with 1146 (46.9%) in research outcome followed by Germany 194 (7.9%). ACPP on publications in the area is ~28.6 citations per paper. The majority of papers is published in English language, 2149 (87.9%). Overall, 159 journals produced the Ebola virus research and "Journal of Virology" has published 257 (10.5%) papers. In the area of Ebola Virus research, 160 institutions contributed and National Center for Infectious Diseases (~3.3) has recorded the highest RCI. Feldmann from University of Manitoba is the leading author in the field with 129 (5.3%) papers, followed by Peter B Jährling 65 (2.7%) from National Institute of Allergy and Infectious Diseases, Bethesda, United States. At present, a state-of-art test takes 6 h to 3 days to know the infection and causes delay in treatment; therefore, a technique should be developed to detect the virus infection within ~ 40 min. This can be done using electrochemical immunosensing methodology.[20] The World Health Organization[21] has suggested that to counter the Ebola virus countries around the world ought to review and improve national public health emergency preparedness, response plans, and coordination structures including Incident Management Structure and an Emergency Operations Centre.

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Nil.

Conflicts of Interest

There are no conflicts of interest.

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