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### Knowledge Mapping of Bluetongue Disease Research: A Scientometric Analysis (1940-2020)

G.Rathinasabapathy<sup>1</sup>, K.Veeranjaneyulu<sup>2</sup>, K.N.Kandpal<sup>3</sup>

1. University Librarian, Tamil Nadu Veterinary and Animal Sciences University  
Chennai – 600 051, Tamil Nadu, India

E-mail: [librarian@tanuvas.org.in](mailto:librarian@tanuvas.org.in)

2. Librarian, National Institute of Technology, Warangal, Telengana, India

E-mail: [veeru030463@gmail.com](mailto:veeru030463@gmail.com)

3. Chief Technical Officer, National Library of Veterinary Science (NLVS)  
ICAR-Indian Veterinary Research Institute, Izat Nagar, Uttar Pradesh, India.

E-mail: [kandpalivri@gmail.com](mailto:kandpalivri@gmail.com)

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#### Abstract

**Problem:** Livestock rearing plays a vital role in rural economy and the diseases affecting the livestock are major challenge faced by the farming community. Bluetongue is one of the major diseases affecting livestock which causes huge economic loss across the globe. So far, no scientometric mapping has been done on the bluetongue disease research publications which is very much important to stakeholders in the field. Therefore, this present study attempts to explore the growth pattern of Bluetongue disease research literature published globally during the past seven decades i.e. 1940-2020. **Methodology:** The data for this scientometric study has been retrieved from the Scopus database using the keywords “Bluetongue”, “Blue tongue” and “Blue-tongue”. The downloaded articles were classified chronologically and transferred to a spreadsheet for the analysis as per the objectives of the Study. MS-Excel and VOSViewer 1.6.17 have been used for data analysis and preparation of illustrations and constructing and visualising bibliometric networks. **Findings and Conclusion:** The study results revealed that there was a total of 2,694 publications indexed during the past seven decades and a spurt in literature seen during the year 2008 which was 161 publications (5.98%) and the average number of publications is 38.49. Roy P affiliated with NERC Institute of Virology, Oxford, U.K. is the most productive author with 177 publications (6.57%) and 6862 citations, 38.77 average citation per paper and h-index of 54. Veterinary Record is the top journal preferred by the researchers to publish bluetongue related research publications since 165 publications (6.12%) are published

in the journal which is having SJR of 0.36. The USA is the top country with 601 publications followed by United Kingdom (528), India (234), Australia (233) and France (216).The top 10 countries have contributed 2379 publications which is 88.30%.The Pirbright Institute, U.K. is the top contributor in the field of bluetongue research with 267 publications which is 9.91% to the global publication output.The predominant type of publications is Journal Articles (86.38%). Publications on Bluetongue has been published in 13 languages and English is the predominant language with 2559 publications (94.98%) and 2132 (79.14%) are open access publications.The present scientometric study provides an in-depth analysis of publication output on Bluetongue disease and done a knowledge mapping of the literature of about seven decades i.e. from 1940 to 2020.The study concludes that considering the disease burden and increasing economic loss to the rural economy, the Government and Non-government agencies shall carry out collaborative research projects in this field with sufficient funding support.

**Keywords:** 1. Knowledge mapping 2. Bluetongue, Animal disease 3. Virus disease, Livestock diseases 4. Cattle diseases 5. Small Ruminants 6. Sheep and Goat 7. Scientometrics 8. Bibliometrics

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## 1. Introduction

Scientometrics is the quantitative study of science. It aims to analyze and evaluate science, technology, and innovation. Major research includes measuring the impact of authors, publications, journals, institutes, Citations, highly cited works and countries as referenced to sets of scientific publications such as articles and patents. There are huge number of scientometric studies undertaken by scientometricians on various diseases affecting humans but the scientometric studies on animal disease research publications is scanty. Therefore, the present study attempts to analyse the research publications related to Bluetongue disease, a major disease affecting livestock and causing severe economic loss to the farming community across the globe.

Bluetongue is a viral disease affecting sheep, cattle, deer, goats and camelids (camels, llamas, alpacas, guanaco and vicuña). Although sheep are most severely affected, cattle are the main mammalian reservoir of the virus and are very important in the epidemiology of the disease. The bluetongue virus is transmitted by biting midges of the genus *Culicoides* and not normally from direct contact with infected animals. A recent study by Alkhamis (2020) reported that Bluetongue virus (BTV) epidemics are responsible for worldwide economic losses of up to US\$ 3 billion. So, the authors felt that it is necessary to undertake a scientometric study on the publication on Bluetongue disease research so that the outcome of the study would be useful to the stakeholders viz., research scholars, scientists, policy makers and farming community.

## 2. Review of Literature

Review of related literature is a primary component of any research investigation. It enables the investigator to understand the earlier research interests, research patterns and the magnitude of the research output in the field of knowledge. Hence, there is a need to review such significant works and their relevance for the present study.

A scientometric study undertaken by DaneshandGhaviDel (2020) analyzed the scientific publications of the Coronavirus and reported that the most percentage of the publication of Coronavirus was in 2005 (6.8%) followed by 2004 (6.78%), and 2006 (5.92%), respectively. They have also found that the University of Hong Kong, Chinese Academy of Sciences, and Utrecht University have ranked first to third, respectively and the Journal of Virology, is the most preferred journal to publish the papers by the Coronavirus researchers.

Bansal et al. (2018) have analyzed research productivity on chikungunya in India during 2006-15. They have reported that a total of 9919 publications were retrieved and analysed and found that 77.35% contributions are from Medicine of the total publications and rest is other subjects. The annual average growth rate was 17.56% and citation impact per paper was 10.79. The study also depicted 10 most productive countries, 15 organizations and authors.

A scientometric study conducted by Nagalingam (2017) on Parkinson disease research productivity in Asia during 2010– 2017 found that there was a total of 14064 publications in the area during the period of study. The study reported that research article was the preferred communication media used by the scientists. The study also found that Hattori, N (China) was the most productive author.

Yi et al (2016) studied the scientific output in the field of Ebola research based on the publications indexed in Web of Science between 1900 and 2014. They observed that the earliest article indexed was from 1977 and there were 2477 publications during the study period and article form of publications is the most preferable bibliographic form of publications.

Singh (2016) analysed 567 publications indexed in Scopus database on Zika Virus and revealed that a high degree of collaboration among the authors in the published literature. A study carried out by Bhardwaj (2016) on Ebolo virus research revealed that 2446 papers published in 159 journals originating from 84 countries till the end of 2013 and the publications yielded 69960 citations until March 2015.

Ruiz-Saenz and Martinez (2015) have undertaken a scientometric study on Columbian publications on viruses and viral diseases published in indexed journals during the period 2000 and 2013 based on the Medline, SciELO, LILACS and Scopus databases. The

study found that 711 papers were published and out of which 40.4% were published in local journals and the remaining in foreign journals.

Sachithanantham and Raja (2015) have studied about the rabies research literature in India covering the period from 1950 to 2014 retrieved from PubMed database and found that 495 records covered in the database during the study period. The literature growth, India's contribution compared to the world literature output, prolific authors and their collaborative pattern, journal distribution, most productive institution and geographical distribution were discussed in the study.

Gupta and Bala (2013) analysed the research output of India in Alzheimer's disease research during 2002-11 on several parameters including the growth, rank and global publications share, citation impact, share of international collaborative papers and collaborative partner countries, sub-field wise distribution and productive institutions and author's contribution and their impact and communication media. They have reported that India ranks at 16th position (with 900 papers) among top 20 top countries with a global publication share of 1.33% (rising from 0.39% in 2002 to 2.36% during 2011) and an annual average publication growth rate of 31.92% during 2002-11.

### **3. Objectives**

The main objective of this study is to analyse the research performance in bluetongue disease research during 1940-2020, based on publications indexed in Scopus database. In particular, the study focuses on the following objectives:

- To study the global research output on bluetongue and its growth
- To identify the prolific authors
- To identify the core periodicals published bluetongue research literature
- To find out the leading countries in bluetongue research
- To identify the most productive institutions
- To identify the leading funding agencies supporting bluetongue research
- To find out the types of documents
- To identify the distribution of bluetongue publications by keywords and languages
- To find out the quantum of open access publications
- To identify the highly cited papers on bluetongue research

### **4. Scope and Methodology**

The study is based on the research literature as indexed in Scopus online database during the years from 1940 to 2020. The data has been retrieved from the database using the keywords "Bluetongue", "Blue tongue" and "Blue-tongue" as the researchers use the three kind of spellings to mention the disease "bluetongue". Data curation process was carried out for the removal of duplicate and irrelevant records. Finally,

datasets of 2,694 records were analysed further to obtain the results pertaining to journals, authors, institutions and citation metric. Bibliometric parameters, simple statistical techniques and VOSviewer version 1.6.17 have been used for this study to analyse the data to achieve the objectives of the present study.

## 5. Analysis and Interpretation of Data

### 5.1 Growth of Publications

The study revealed that a total of 2,694 publications have been indexed by Scopus during the period from 1940 to 2020. The first record was indexed during 1940 and there were no records during 1941-1946. Two records were added during 1947 and 1948 respectively. Only 5 records were indexed between 1940 and 1950. The highest number of records i.e. 161 were indexed during 2008. The average number of records is 38.49. The growth of bluetongue research publications during 1940 to 2020 i.e. over the seven decades is depicted in Figure-1.

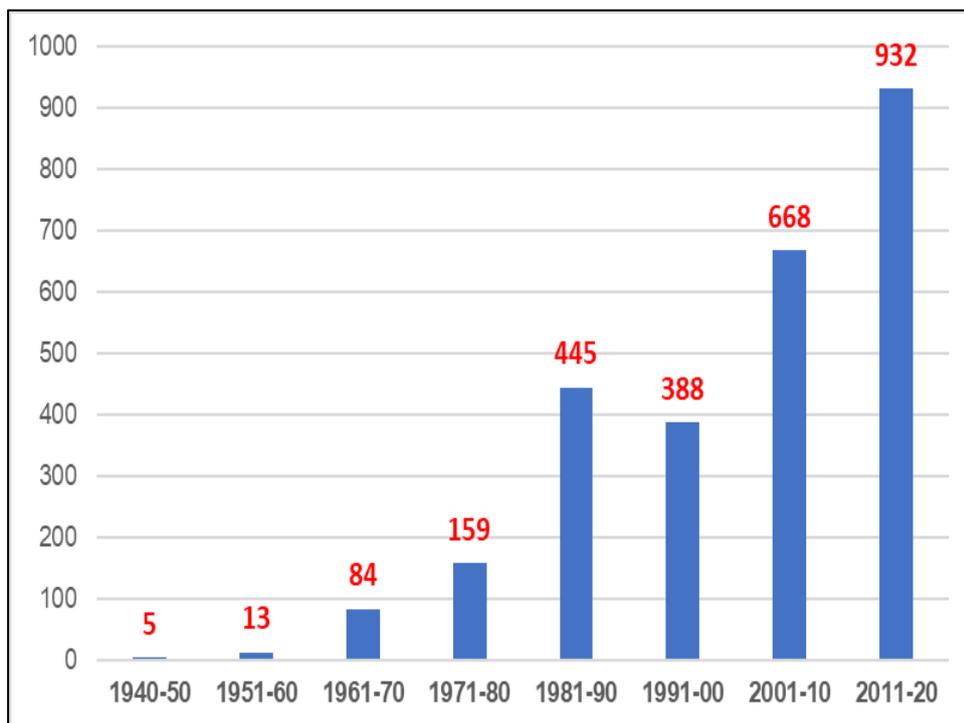


Figure 1: Growth of Bluetongue Research Publications

The growth of publications on bluetongue is steadily increasing over decades except during 1991-2000. During the first decade 1940-1950, it was only 5 and during 1951-60, it was 13 which was 260% increase. The highest growth rate has been observed during the decade 1961-70 which was 646.15% and the lowest growth rate i.e. -87.19% found during 1991-2000. The decade-wise growth of bluetongue research publications is furnished in Table-1.

## 5.2 Prolific Authors

The list of twenty top authors who produced highest contribution to research output on Bluetongue disease is given in Table-2. In terms of number of publications, Roy P affiliated with NERC Institute of Virology, Oxford, U.K. is the most productive author with 177 publications followed by Zientara, S affiliated with UMR Virologie, INRAE, France with 106 publications, Osburn, B.I. affiliated with School of Veterinary Medicine, University of California, Davis, USA with 103 publications, Merterns P.P.C. affiliated with the Pirbright Institute, U.K. with 81 publications and Mellor P.S. affiliated with the Pirbright Institute, U.K. with 77 publications. Out of top 10 prolific authors, Maan, S. affiliated with Lala Lajpathi Roy University of Veterinary and Animal Sciences, Hisar, India is in 9<sup>th</sup> position with 51 publications, 1666 citations and h-index of 27. Prasad, G. affiliated with Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, India is in 13<sup>th</sup> position with 41 papers, 1988 citations and h-index of 16. It has been observed that 9 out of 20 prolific authors have contributed more than fifty research publications each while rest 11 authors contributed less than 50 publications each. The top 20 prolific authors who have contributed to bluetongue research with more publications are furnished with total publications, total citations, average citation per paper and h-index in Table-2.

## 5.3 Core Periodicals of Bluetongue research output

The study revealed that Veterinary Record acquired first rank among the top twenty journals under consideration with its total records of 165 (6.12%) in all journals contributed in research during 1940 – 2020. The journals that rank between second and 10<sup>th</sup> position are Veterinary Microbiology (4.53%), Journal of Virology (3.82%), American Journal of Veterinary Research (3.67%), Virology (2.75%), Journal of General Virology (2.52%), Progress in Clinical and Biological Research (2.52%), Australian Veterinary Journal (2.49%), Virus Research (2.49%) and Journal of Virological Methods (2.34%). The results show that all the 2694 publications on bluetongue were published in 159 serials indexed by the Scopus database. The study also revealed that the top 20 journals have published 1334 papers (49.52%) and 139 other journals published 1360 papers (50.48%). Out of top 20 journals, U.S.A. is in the top with 8 journals (40%) followed by Netherlands with 5 journals (25%), United Kingdom with 4 journals (20%) and South Africa, Australia and Italy with each one (5%). The publication output of the top twenty journals with number of papers, percentage of share, Scimago Journal Rank 2020 and country of publication are furnished in Table – 3.

## 5.4 Leading Countries in Bluetongue Research

The results of the global ranking of countries engaged in bluetongue research as per publications indexed in Scopus show that USA is the top country with 601 publications (%) followed by United Kingdom with 528 publications (%), India with 234 records (%), Australia with 233 records (%) and France with 216 records (%). The top 10 countries with more publications on bluetongue research along with its global publication share is furnished in Figure-2.

The top 10 countries have contributed 2379 publications which is 88.30% and the remaining 11.70% were contributed by other countries. The details are furnished in Table- 4.

## 5.5 International Collaboration of Publications

The study revealed there is international collaboration among researchers of various countries and the United Kingdom is in the top with 412 publications, 18650 citations and TLS of 290 followed by USA with 489 publications, 14054 citations and TLS of 216. The top 20 countries with highest number of documents, citations and TLS are furnished in Table-5 and the same is illustrated in Figure-3

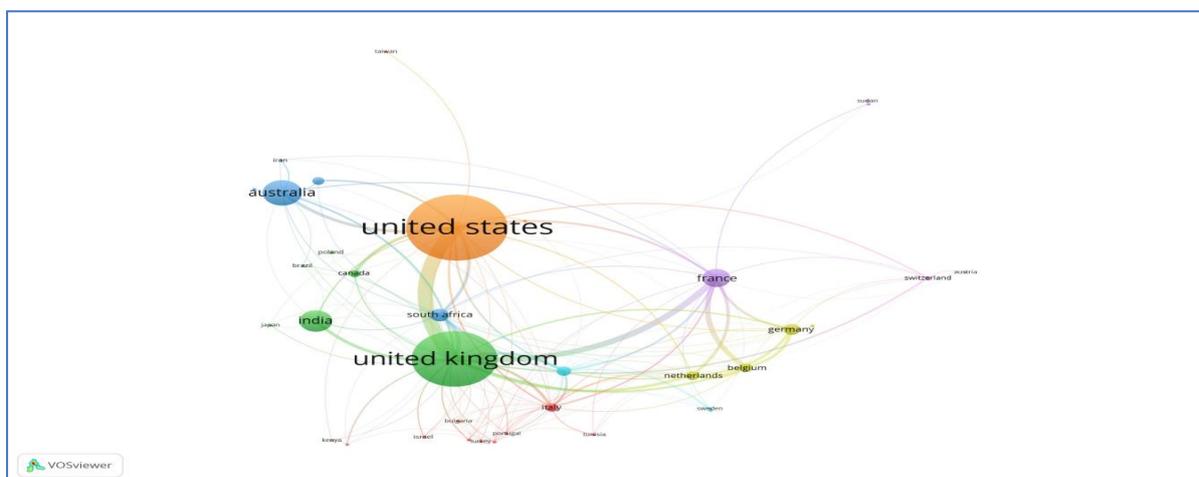


Figure-3. Collaboration Network of Countries

## 5.6 Most Productive Institutions

The study revealed that the Pirbright Institute, U.K. is the top contributor in the field of bluetongue research with 267 publications which is 9.91% to the global publication output followed by University of California, Davis, USA with 175 publications (6.49%), USDA Agricultural Research Service, USA with 103 publications (3.82%), UMR, Virologie with 89 publications (3.30%), the University of Alabama at Birmingham with 87 publications (3.23%), Wageningen University, Indian Veterinary Research Institute and

London School of Hygiene & Tropical Medicine each with 78 publications (2.90%) respectively. USDA ARS Arthropod-Borne Animal Diseases Research Laboratory is in 9<sup>th</sup> place with 75 publications (2.78%) followed by Ecole Nationale Veterinaire d Alfort with 73 publications (2.71%).

The top 20 institutions contributed 1713 publications which is about 63.58% of the global publication output and the remaining 36.42% were contributed by other institutions. The top 20 institutions with the number of publications along with their share to global publications are listed in Table - 6

### **5.7 Leading Funding Agencies**

Research funding is very important to ensure quality research and development activities and many funding agencies are supporting the research activities concerned with bluetongue disease around the globe as it has a huge impact on the rural economy.

The present study has identified the top 20 funding agencies based on the number of research publications and the Biotechnology and Biological Sciences Research Council (BBSRC) is the top agency with 115 publications followed by the UK Research and Innovation with 98 publications. European Commission is in third place with 88 publications followed by National Institutes of Health with 75 publications and Seventh Framework Programme with 69 publications.

It has been observed that 35 publications have been brought out with the funding support of the Indian Council of Agricultural Research (ICAR), Ministry of Agriculture, Government of India and the ICAR-Indian Veterinary Research Institute has published 13 publications and the total publications from this agency is 48 which is 1.78% of the total publications. The top 20 funding agencies with more numbers of publications are listed in Table-7.

### **5.8 Keywords in Bluetongue Research Publications**

The study found that Bluetongue virus is the top keyword with the frequency of 1909 followed by Bluetongue Orbivirus (1811), Nonhuman (1045), Sheep (1019) and Virology (526). The top 10 keywords with more frequency are furnished in Figure- 4 and Table- 8.



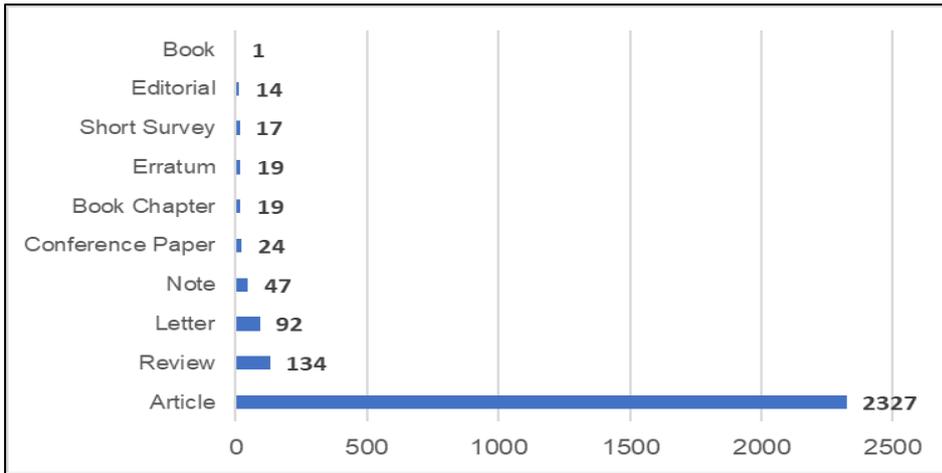


Figure-5. Types of Documents

### 5.11 Distribution of Publications by Languages

The study revealed that the publications on Bluetongue has been published in 13 languages and English is the predominant language with 2559 publications (94.98%) followed by French with 37 publications (1.37%), German with 35 publications (1.29%), Dutch with 19 publications (0.71%) and Chinese with 18 publications (0.67%). The figure- 6 show the distribution of Bluetongue publications by languages.

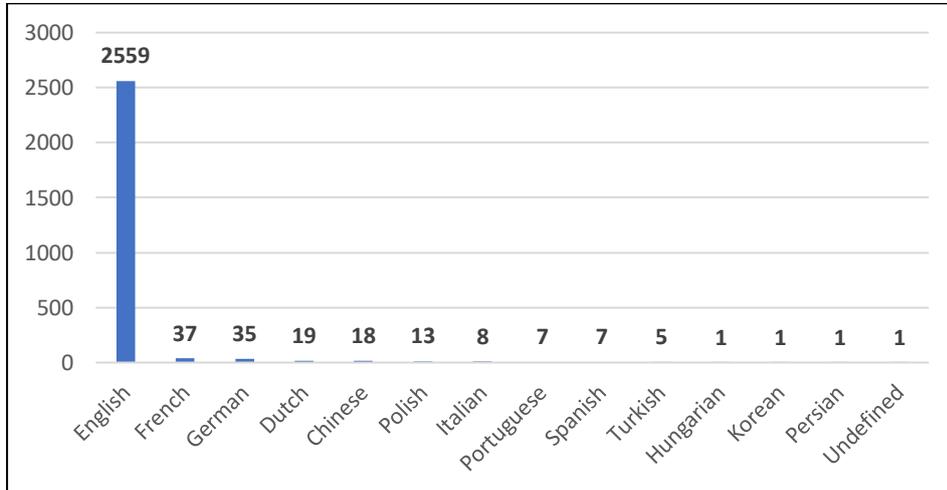


Figure- 6. Distribution of Publications by Languages

### 5.12 Open Access Publications

An attempt has been made to identify how many publications are available under open access and found that out of 2694 publications, 2132 publications (79.14%) are available under different types of open access viz., 840 publications (31.18%) under all open access, 595 publications (22.09%) under Green open access, 344 publications (12.77%) under Bronze open access, 278 publications (10.32%) under Gold open access. Therefore, 562 publications (20.86%) are not available under open access which needs subscription. The details are illustrated in Figure-7.

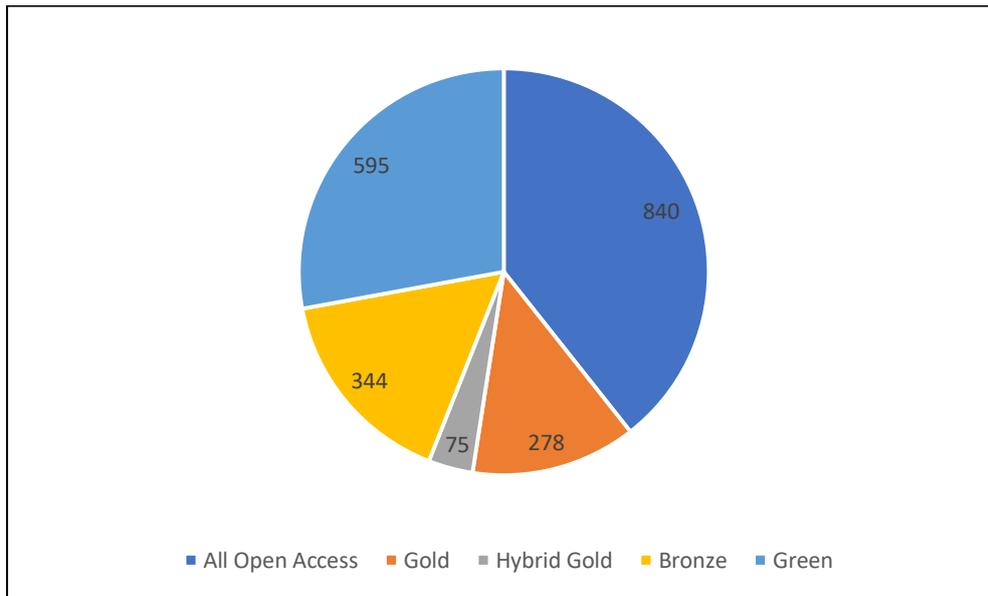


Figure-7. Open Access Publications

### 5.13 Highly Cited Papers

The most frequently cited publication is "Purse, B.V., Mellor, P.S., Rogers D.J., Samuel, A.R., Merterns, PPC and Baylis, M (2005). Climate Change and the recent emergence of Bluetongue in Europe" published in Nature Reviews Microbiology 3 (2): pp.171-181 which has got a total citation of 586 followed by Grimes J. M. et al. (457), Maclachlan N.J. The top most cited publications are published by 10 difference journals in which only two are core veterinary journals. The top 10 most cited papers in the field of bluetongue research are listed in Table-10.

## 6. Findings

- The present study, based on the research productivity as indexed in Scopus online database during the years from 1940 to 2020 found that a total of 2,694 publications. A spurt in bluetongue research literature happened during 2008 with 161 publications, the highest during the past seven decades. The average number of records is 38.49.
- Roy P affiliated with NERC Institute of Virology, Oxford, U.K. is the most productive author with 177 publications (6.57%) and 6862 citations, 38.77 average citation per paper and h-index of 54. Beer, M. is the author with highest h-index of 61 who is in 18<sup>th</sup> position with 35 publications.

- Veterinary Record is the top journal preferred by the researchers to publish bluetongue related research publications since 165 publications (6.12%) are published in the journal which is published from U.K. and having SJR of 0.36 (2020). The 2694 publications were published in 159 serials indexed by the Scopus database.
- The USA is the top country with 601 publications followed by United Kingdom with 528 publications, India with 234 records, Australia with 233 records and France with 216 records. The top 10 countries have contributed 2379 publications which is 88.30% and the remaining 11.70% were contributed by other countries.
- The Pirbright Institute, U.K. is the top contributor in the field of bluetongue research with 267 publications which is 9.91% to the global publication output followed by University of California, Davis, USA, USDA Agricultural Research Service, USA, UMR, Virologie and the University of Alabama at Birmingham.
- The Biotechnology and Biological Sciences Research Council (BBSRC) is the top agency with 115 publications.
- The preferred type of publication by the researchers of Bluetongue is Journal Articles (86.38%) followed by Reviews (4.97%), Letters (3.41%), Note (1.74%), conference paper (0.89%) and book chapter (0.71%).
- Publications on Bluetongue has been published in 13 languages and English is the predominant language with 2559 publications (94.98%) followed by French, German, Dutch and Chinese.
- Out of 2694 publications, 2132 publications (79.14%) are available under different types of open access.

## 7. Conclusion

The present scientometric study provides an in-depth analysis of publication output on Bluetongue disease and done a knowledge mapping of the literature of about seven decades i.e. from 1940 to 2020. The authors hope that the findings of the study will be highly useful to the stakeholders consisting of research scholars, scientists, policy makers, academicians and students concerned with animal disease diagnosis and control with special reference to bluetongue disease. The authors would like to suggest that the agencies those involved in animal disease diagnosis and control shall give priority to bluetongue research. Considering the disease burden and increasing economic loss to the rural economy, the Government and Non-government agencies

shall carry out collaborative research projects in this field with sufficient funding support.

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**Table 1. Growth Rate of Bluetongue Research Publications**

S. No.	Decade	Records	Growth Rate (%)	Cumulative No. of Records
1	1940-50	5	-	5
2	1951-60	13	260.00	18
3	1961-70	84	646.15	102
4	1971-80	159	189.29	261
5	1981-90	445	279.87	706
6	1991-00	388	-87.19	1094
7	2001-10	668	172.16	1762
8	2010-2020	932	139.52	2694
	Total	2694		2694

**Table-2. Top 20 Authors with Publication and Citation Details**

S. No.	Author	TP	%	TC	ACPP	h-index
1	Roy, P.	177	6.57	6862	38.77	54
2	Zientara, S.	106	3.93	2945	27.78	41
3	Osburn, B.I.	103	3.82	2061	20.01	37
4	Mertens, P.P.C.	81	3.00	5202	64.22	54
5	Mellor, P.S.	77	2.86	5925	76.95	60
6	Sailleau, C.	73	2.71	1975	26.37	29
7	MacLachlan, N.J.	61	2.26	2713	44.58	51
8	Savini, G.	59	2.19	1453	24.68	36
9	Maan, S.	51	1.89	1666	32.67	27
10	Bréard, E.	48	1.78	1455	30.31	30
11	De Clercq, K.	43	1.59	2629	61.14	32
12	Viarouge, C.	43	1.59	1673	38.91	21
13	Prasad, G.	41	1.52	1988	48.49	16
14	Hoffmann, B.	39	1.45	1261	32.33	48
15	Maan, N.S.	37	1.37	1493	40.35	24
16	Nomikou, K.	37	1.37	1414	38.22	28
17	Vitour, D.	36	1.34	626	17.39	25
18	Beer, M.	35	1.30	1236	35.31	61

19	Carpenter, S.	35	1.30	1783	50.94	35
20	Luedke, A.J.	34	1.26	595	17.50	17

TP = "Total Publications", TC = Total Citations, ACCP = "Average Citation per Paper"

**Table - 3. Top 20 Journals with more publications**

S. No.	Title	Records	%	SJR 2020	Country
1	Veterinary Record	165	6.12	0.36	U.K.
2	Veterinary Microbiology	122	4.53	1.16	Netherlands
3	Journal of Virology	103	3.82	2.62	U.S.A.
4	American Journal of Veterinary Research	99	3.67	0.61	U.S.A.
5	Virology	74	2.75	1.39	U.S.A.
6	Journal of General Virology	68	2.52	1.55	U.K.
7	Progress in Clinical and Biological Research	68	2.52	-	U.S.A.
8	Australian Veterinary Journal	67	2.49	0.38	U.S.A.
9	Virus Research	67	2.49	1.18	Netherlands
10	Journal of Virological Methods	63	2.34	0.79	Netherlands
11	Preventive Veterinary Medicine	60	2.23	0.82	Netherlands
12	Transboundary and Emerging Diseases	58	2.15	1.39	U.K.
13	PLOS One	51	1.89	0.99	U.S.A.
14	Vaccine	47	1.74	1.59	Netherlands
15	Onderstepoort Journal of Veterinary Research	45	1.67	0.56	South Africa
16	Journal of Veterinary Diagnostic Investigation	39	1.45	0.53	U.S.A.
17	Journal of Medical Entomology	36	1.33	0.87	U.S.A.
18	Medical and Veterinary Entomology	36	1.33	1.03	U.K.
19	Archives of Virology	33	1.24	0.94	Australia
20	Veterinaria Italiana	33	1.24	0.39	Italy
	Other Titles	1360	50.48	-	-
	Total	2694	100.00	-	-

**Table -4. Leading 10 Countries with highest publications on Bluetongue**

S. No.	Country	Records	%
1.	U.S.A.	601	22.31
2.	U.K.	528	19.60
3.	India	234	8.69
4.	Australia	233	8.65
5.	France	216	8.01
6.	South Africa	128	4.75
7.	Italy	118	4.38
8.	Germany	110	4.08
9.	Spain	107	3.97
10.	Netherlands	104	3.86
	Total	2379	88.30

**Table-5. International Collaboration of Publications**

S. No.	Country	Documents	Citations	Total Link Strength
1	United Kingdom	412	18650	290
2	United States of America	489	14054	216
3	France	138	5019	151
4	Netherlands	69	2790	92
5	Belgium	67	2806	83
6	South Africa	93	3637	75
7	Italy	65	2724	73
8	Germany	83	2128	72
9	Spain	72	2235	69
10	Australia	190	3956	55
11	India	158	1671	34
12	Switzerland	33	1333	31
13	Canada	55	1164	30
14	Greece	11	368	19
15	Portugal	9	353	19
16	China	59	652	18
17	Morocco	5	122	17
18	Trinidad and Tobago	8	153	11
19	Iran	20	276	10
20	Israel	16	248	10

**Table – 6. Top 20 Institutions with more publications on Bluetongue**

S. No.	Type	Records	(%)
1.	The Pirbright Institute, U.K.	267	9.91
2.	University of California, Davis, U.S.A.	175	6.49
3.	USDA Agricultural Research Service, U.S.A.	103	3.82
4.	UMR Virologie	89	3.30
5.	The University of Alabama at Birmingham	87	3.23
6.	Wageningen University	78	2.90
7.	Indian Veterinary Research Institute	78	2.90
8.	London School of Hygiene & Tropical Medicine	78	2.90
9.	USDA ARS Arthropod-Borne Animal Diseases Research Laboratory	75	2.78
10.	Ecole Nationale Vétérinaire d'Alfort	73	2.71
11.	College of Veterinary Science, Hisar, India	69	2.56
12.	ANSES - French Agency for Food, Environmental and Occupational Health & Safety	69	2.56
13.	Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise G. Caporale	66	2.45
14.	INRAE	64	2.38
15.	CSIRO Australian Animal Health Laboratory	61	2.26
16.	Onderstepoort Veterinary Institute	60	2.23
17.	Veterinary and Agrochemical Research Centre	59	2.19
18.	Friedrich-Loeffler-Institute	58	2.15
19.	Natural Environment Research Council	56	2.08
20.	Flinders University	48	1.78
	Contribution of 20 Institutions	1713	63.58
	By other Institutions	981	36.42
	Total	2694	100.00

**Table-7. Top 20 Funding agencies for Bluetongue Research**

S. No.	Type	Records
1.	Biotechnology and Biological Sciences Research Council	115
2.	UK Research and Innovation	98
3.	European Commission	88
4.	National Institutes of Health	75
5.	Seventh Framework Programme	69
6.	U.S. Department of Health and Human Services	67
7.	U.S. Department of Agriculture	66
8.	National Institute of Allergy and Infectious Diseases	42

9.	Indian Council of Agricultural Research	35
10.	Department for Environment, Food and Rural Affairs, UK Government	28
11.	Australian Research Council	21
12.	Horizon 2020 Framework Programme	20
13.	Medical Research Council	19
14.	National Natural Science Foundation of China	19
15.	Wellcome Trust	17
16.	Department of Education and Training	15
17.	ICAR-Indian Veterinary Research Institute	13
18.	Ministry of Agriculture of the People's Republic of China	13
19.	National Center for Research Resources	13
20.	Ministry of Science and Technology of the People's Republic of China	12
	Total	845

**Table – 8. Top 20 Keywords**

S. No.	Keyword	Records
1.	Bluetongue Virus	1909
2.	Bluetongue Orbivirus	1811
3.	Nonhuman	1045
4.	Sheep	1019
5.	Virology	526
6.	Ovis Aries	485
7.	Controlled Study	477
8.	Immunology	466
9.	Isolation and Purification	416
10.	Viral Antibodies	414

**Table-9. Subject-wise distribution of Bluetongue publications**

S. No.	Subject Domain	Records
1	Veterinary Science	1372
2	Immunology and Microbiology	1074
3	Medicine	624
4	Agricultural and Biological Sciences	612
5	Biochemistry, Genetics and Molecular Biology	382
6	Multidisciplinary	77
7	Environmental Science	76
8	Pharmacology, Toxicology and Pharmaceutics	22

9	Social Sciences	17
10	Materials Science	15

**Table-10. Top 10 Highly Cited Papers**

S. No.	Article	Author(s)	Citations
1.	Climate change and the recent emergence of bluetongue in Europe (2005). <i>Nature Reviews Microbiology</i> , 3 (2): pp.171-181	Purse B.V., Mellor P.S., Rogers D.J., Samuel A.R., Mertens P.P.C., Baylis M.	586
2.	The atomic structure of the bluetongue virus core (1998). <i>Nature</i> , 395 (6701): pp.470-478.	Grimes J.M., Burroughs J.N., Gouet P., Diprose J.M., Malby R., Ziéntara S., Mertens P.P.C., Stuart D.I.	457
3.	The Pathology and Pathogenesis of Bluetongue (2009). <i>Journal of Comparative Pathology</i> , 141 (1) : pp. 1-16	Maclachlan N.J., Drew C.P., Darpel K.E., Worwa G.	305
4.	Bluetongue epidemiology in the European Union (2008). <i>Emerging Infectious Diseases: Philosophical Transactions of the Royal Society B</i> : 14 (4): pp.539-544	Saegerman C., Berkvens D., Mellor P.S.	299
5.	Bluetongue in Europe: Past, present and future (2009). <i>Biological Sciences</i> , 364 (1530): pp. 2669-2681	Wilson A.J., Mellor P.S.	290
6.	Bluetongue virus in the mediterranean basin 1998-2001( 2002). <i>Veterinary Journal</i> , 164 (1): pp.20-37	Mellor P.S., Wittmann E.J.	276
7.	Genetic characterization of toggenburgorbivirus, a new bluetongue virus, from goats, Switzerland (2008). <i>Emerging Infectious Diseases</i> , 14 (12): pp. 1855-1861	Hofmann M.A., Renzullo S., Mader M., Chaignat V., Worwa G., Thuer B.	243
8.	Bluetongue virus detection by two real-time RT-qPCRs targeting two different genomic segments (2007). <i>Journal of Virological Methods</i> , 140 (Feb): pp.115-123	Toussaint J.F., Sailleau C., Breard E., Zientara S., De Clercq K.	237
9.	Identification of the serotype-specific and group-specific antigens of bluetongue virus (1981). <i>Onderstepoort Journal of Veterinary Research</i> , 48 (2): pp. 51-58	Huisman H., Erasmus B.J	230
10.	Assignment of the genome segments of bluetongue virus type 1 to the proteins which they encode (1984). <i>Virology</i> , 135 (1): pp.207-217	Mertens P.P.C., Brown F., Sangar D.V.	229