Global Research Output of Cell Biology Research: A Scientometric Approach

Akshaykumar Honakeri
Research Scholar
Department of Library and Information Science
Karnatak University, Dharwad – 580 003
Email: akshayhonakeri13@gmail.com
ORCID: 0009-0002-2325-6001

Gururaj S. Hadagali
Professor
Department of Library and Information Science
Karnatak University, Dharwad – 580 003
Email: gururajhadagali123@gmail.com
ORCID: 0000-0003-1372-4721

Abstract

The present study analyses the global publication output of Cell Biology research as reflected in the Scopus database during the period from 2010 to 2024. This study emphasizes global research trends most prolific authors and journals in the field of cell biology. A total of 137,782 research articles and 5,507,005 citations were analysed with an average of nearly 40 citations per paper. To extract the data the authors have used keyword search using Cell Biology and years was limited from 2010 to 2024. The findings of the study revealed a stable increase in cell biology research output, with peak output witnessed in recent years, although earlier publications reported for greater citation impact. The United States of America and People's Republic of China occupied the top position. India has placed eighth position in cell biology research output. .

Keywords
Cancer Treatment; Cell Biology; Immunotherapy; Molecular Biology; Regenerative Medicine;Research Output;Scientometrics

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INTRODUCTION

Cell Biology is the primary division of biological sciences that emphasis on the investigation of cells, the basic structural and functional parts of life. All living things are made up of cells, and comprehending their dynamics, structure, and function is essential to understand the processes that underlie growth, development, and illness (Parker et al, 2022). Over the last few decades, developments in molecular biology, microscopy, and genomics have improved cell biology, allowing research scholars and scientists to investigate cellular procedures at molecular and subcellular levels with remarkable clarity.

The study of cell biology comprises a diverse range of subjects, such as the study of cell structure and organization, intercellular and intracellular cell signaling pathway, cell cycle and its regulation, apoptosis or programmed cell death, functions of cell organelles, and intercellular communication. Additionally, cell biology enables the base for accepting compound physiological approaches and for expanding therapeutic techniques in the field of medicine, such as types of cancer treatment, regenerative medicine, and immunotherapy (O'Connor, Adams and Fairman, 2010). Because of the dynamic enlargement of research in molecular and cellular biology, there has been an explosive growth in publications in cell biology field, contemplating both the multifaceted and collaborative type of cell biology research. Scientometric and bibliometric studies have emerged as significant tools to outline research tendency, identification of most prolific authors, journals, and countries, and disclose upcoming topics and collaboration networks in the field (Lee, 2003). These investigations assist researchers, librarians, policymakers, and funding agencies to know the growth of knowledge, research output, and probable gaps in the relevant literature. In view of the key role of cell biology in progressing life sciences, it is necessary to study the worldwide research productivity and trends scientifically. This study seeks to conduct a scientometric evaluation of cell biology research to emphasize publication patterns, key contributors, research areas, and the overall growth of the field over time. Thus, this research offers an overview of the knowledge background in cell biology, contributing intuitions for upcoming research direction and strategic planning.

REVIEW OF LITERATURE

Naheem (2020) conducted a study on global research output in synthetic biology, analyzing 12,012 papers from 2005 to 2019 sourced from the Web of Science. The findings indicated a dramatic increase in annual publications, from 202 in 2005 to 1,534 in 2019, with contributions from scholars across 96 nations, predominantly the USA, UK, and China. The Massachusetts Institute of Technology was the leading institution, while Fussenegger, M. from the Swiss Federal Institute of Technology emerged as the most prolific author. Sankar (2021) examined food microbiology research output from 2001 to 2020, assessing 2,571 records. The study highlighted that research articles dominated publications with 598 documents, spanning 766 journals and involving 9,013 authors from 2,797 institutions across 107 countries. The International Journal of Food Microbiology was noted as the top publication source.

Guven (2021) analyzed global publications on ophthalmic genetics from 1975 to 2019, identifying original research articles as the majority. The USA contributed 45.39% of the total publications, with the University of Pennsylvania noted as the leading institution. Key terms included family, cell, and photoreceptor. Surulinathi et al. (2021) investigated the 526 most cited papers in animal cell disease, revealing distribution across 208 journals and contributions from 3,340 researchers in 39 countries. The citation scores ranged significantly, with peaks observed from 2000 to 2008. Nam et al. (2022) scrutinized 978 studies on deep learning in biomedical science, focusing on trends in convolutional neural networks and associated fields. Parida et al. (2022) conducted an analysis of 3,397 articles published in Nature Reviews Molecular Cell Biology over twenty years, identifying Heinrichs, A as a significant contributor and noting that review articles constituted the majority. Sedghi and Ghaffari Heshajin (2023) analyzed genetic research by Iranian authors and evaluated citation patterns using HistCite software, while Hanci and Sevgi (2023) investigated highly cited immunology articles, revealing the Annual Review of Immunology as a prominent journal. Lim et al. (2023) focused on autism genetics research from 2018 to 2022, outlining 12 primary themes within the field.

Recent work by Hami, Niazi, and KhazaeeNasirabadi (2023) identified a recent increase in retracted immunology articles, with the USA contributing the most, and Ghosh et al. (2024) highlighted research on the human microbiome, identifying Frontiers in Microbiology as a leading journal. Zhao et al. (2024) examined genetics and Major Depressive Disorder publications, detailing a steady growth in articles post-2013 and identifying significant contributors and collaborative networks. Chen and Cheng (2025) studied natural killer cells and psoriasis, confirming increasing research trends, with the Rockefeller University noted as a key institution. Farid et al. (2025) mapped trends in milk microbiology, highlighting advances in detection methods and common bacterial pathogens. The studies collectively indicate the prominence of genetics, immunology, and microbiology within the scientific landscape, emphasizing the need for broader assessments of cell biology research spanning diverse subfields and fostering international collaborations from 2010 to 2024.

OBJECTIVES OF THE STUDY

The primary objective of the present study is to analyse the global publications productivity in the field of Cell Biology research for the period from 2010 to 2024 (15 years period). The other objectives of the study are to:

1. analyse the global publication and citation trends in the field of Cell Biology for a period of fifteen years from 2010 to 2024.
2. determine the top authors, institutions and highly preferred journals in the field of Cell Biology
3. analyse the highly cited papers in the field of Cell Biology

MATERIALS AND METHODS

The data was extracted from one of the premier and widely covered citations databases i.e. Scopus database on Cell Biology for the period of fifteen years from 2010 to 2024. The Search string formulated to extract the bibliographic records: Key=(Cell Biology) AND PUBYEAR= (2010-2024). The search string was formulated to extract the bibliographic records with the term “Cell Biology” used as a keyword. The citation data for the extracted publications were collected on 3rd week of December, 2025. A total of 1,37,782 records were found for World publications and 5403 for India on Cell Biology. The basic indicators have been used to process the data and provided in the successive paragraphs.

ANALYSIS AND DISCUSSIONS

Global Publications in the field of Cell Biology

An overall 1,37,782 publications were recorded for Cell Biology Research globally which were indexed in Scopus database for the period from 2020 to 2024. The highest number of publications were published during 2024 (12750), followed by 12201 publications during 2021. The publications productivity in the field of Cell Biology was increasing except for the year 2021. The average publications count for Cell Biology for the selected period was 9185. For 1,37,782 publications a total of 5507005 citations were received. The average citations per paper was almost 40 for Cell Biology for the period of 15 years from 2010 to 2024. The average citations per year was 367133. The publications published during 2014 have received the highest citations i.e. 507838. The average citations per paper received was 72.87 (4611 publications and 336017 citations). It is observed from the study that there is an increasing trend in terms of publications were concerned and older publications have received almost highest citations.

Table 1: Global publications in the field of Cell Biology

Sl. No.	Year	Total Publications (TP)	Total Citations (TP)	Average Citations per paper
1	2010	4611	336017	72.87
2	2011	5935	397610	66.99
3	2012	6941	420736	60.62
4	2013	7381	428137	58.01
5	2014	8275	507838	61.37
6	2015	8845	460840	52.10
7	2016	8815	428105	48.57
8	2017	9074	459861	50.68
9	2018	9372	444686	47.45
10	2019	10291	418100	40.63
11	2020	10757	384453	35.74
12	2021	12201	360688	29.56
13	2022	10953	220432	20.13
14	2023	11581	152139	13.14
15	2024	12750	87363	6.85
	Total	**137782**	**5507005**	**44.31**

Top 15 countries in the field of Cell Biology

The table 2 depicts the publications productivity of top 15 countries in the field of Cell Biology for the period from 2010 to 2024. The data reveals that the United States of America (USA) has the highest publications i.e. 43520 for the period of 15 years, followed by Peoples Republic of China with 34277 publications stands second, with 10580 publications Germany in the top three positions. India in eighth position with 5403 publications. Among the top 15 countries, seven countries belong to Europe continent and five Asian countries. Among the citations received, the USA at the top position with 2426333 citations and 55.75 ACPP, followed by People's Republic of China has received an overall of 1117178 citations with 32.59 ACPP, Germany with 608057 citations stands third. India with 173444 stands fourteenth position among the countries in terms of total citations received. Among the ACPP, Netherlands stands first with 62.05, followed by Switzerland with 58.96, Germany with 57.47 ACPP. India with 32.10 ACCP was in the fifteenth position.

Table 2: Top 15 countries in the field of Cell Biology

Sl. No.	Country	Total Publications (TP)	Total Citations (TP)	Average Citations per Paper (ACPP)
1	United States of America (USA)	43520	2426333	55.75
2	People's Republic of China	34277	1117178	32.59
3	Germany	10580	608057	57.47
4	United Kingdom	10568	589357	55.76
5	Japan	6821	238249	34.98
6	Italy	5957	246385	41.36
7	France	5863	273815	46.70
8	India	5403	173444	32.10

9	Canada	5177	271648	52.47
10	South Korea	4724	224997	47.62
11	Spain	4236	213692	50.44
12	Australia	4198	223824	53.31
13	Netherlands	3213	199368	62.05
14	Switzerland	3187	187928	58.96
15	Iran	3108	103515	33.30
	Total	**150832**	**7097790**	**47.05**

Publications productivity of India in the field of Cell Biology

The table 3 shows the publications productivity of India's Cell Biology research for the period of fifteen years. A total of 5403 publications were observed for fifteen years from 2010 to 2024. The highest publications were received for the year 2024 with 740 publications and least for the year 2010 with 94 publications. There is a gradual increase in the number publications year by year. A total of 173442 citations were received for the period of fifteen years with an average citations per paper i.e. 32.10. The highest citations were received for the year 2010 i.e. 10504 (for 94 publications and the highest ACPP of 111.74). A fluctuation trend was observed in the citations and ACPP for fifteen years period.

Table 3: Publications productivity of India in the field of Cell Biology

Sl. No.	Year	Total Publications (TP)	Total Citations (TC)	Average Citations per Paper (ACPP)
1	2010	94	10504	111.74
2	2011	127	12752	100.40
3	2012	176	8023	45.58
4	2013	238	7748	32.55
5	2014	234	7051	30.13
6	2015	348	14291	41.06
7	2016	326	14119	43.30
8	2017	321	12878	40.11
9	2018	346	15595	45.07
10	2019	410	14506	35.38
11	2020	436	16736	38.38
12	2021	523	13997	26.76
13	2022	533	13329	25.00
14	2023	551	6841	12.41
15	2024	740	5072	6.85
	Total	**5403**	**173442**	**32.10**

Top 15 Authors in the field of Cell Biology

The table 4 depicts the top fifteen authors in India in the field of Cell Biology. Reis, R.L. affiliated to the Universidade do Minho has emerged as the top author in the field of Cell Biology with 203 publications and 15087 citations (an overall 63 index and 74.32 ACPP), followed by Kaplan, D.L. of Tufts School of Engineering, USA has a total of 176 publications and 10718 citations, whereas, Boccaccini, A.R. of Friedrich-Alexander-Universitat Erlangen-Numberg of Germany was in top three position with 154 publications and 8392 citations. Out of fifteen authors, four authors belong to USA and three belong to China. The author authors Khademhosseini,

A. of Terasaki Institute for Biomedical Innovation (USA) has 19959 citations to his credit and also has the highest H-index (69) and ACPP 170.59. Badyalak, S.F. of the University of Pittsburgh (USA) has the second highest ACPP of 141.87 (9789 citations). Chang, J. of Shanghai Institute of Ceramics, Chinese Academy of Sciences has the third highest ACPP of 125.88. The top fifteen authors have published a total of 2020 publications with 122214 citations.

Table 4: Top 15 Authors in the field of Cell Biology

Sl. No.	Name of Author	Affiliation	Country	Total Publications (TP)	Total Citations (TP)	H-Index	Average Citations Per Paper (ACPP)
1	Reis, R.L.	Universidade do Minho	Portugal	203	15087	63	74.32
2	Kaplan, D.L.	Tufts School of Engineering	USA	176	10718	60	60.90
3	Boccaccini, A.R.	Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	154	8392	51	54.49
4	Ramakrishna, S.	National University of Singapore	Singapore	147	11642	63	79.20
5	Khademhosseini, A.	Terasaki Institute for Biomedical Innovation	USA	117	19959	69	170.59
6	Fussenegger, M.	Universität Basel	Switzerland	113	5415	40	47.92
7	Jewett, M.C.	Department of Bioengineering	USA	92	5918	43	64.33
8	Kim, H.W.	Dankook University	South Korea	87	5646	39	64.90
9	Moroni, L.	Universiteit Maastricht	Netherlands	87	4676	39	53.75
10	Chang, J.	Shanghai Institute of Ceramics, Chinese Academy of Sciences	China	78	9819	57	125.88
11	Dai, J.	Institute of Biomedical Engineering, Chinese Academy of Medical Sciences and Peking Union Medical College	China	77	4420	39	57.40
12	Arai, F.	The University of Tokyo	Japan	72	782	16	10.86
13	O'Brien, F.J.	Royal College of Surgeons in Ireland	Ireland	70	3840	38	54.86
14	Badylak, S.F.	University of Pittsburgh	USA	69	9789	45	141.87
15	Chen, X.	Changchun Institute of Applied Chemistry, Chinese Academy of Sciences	China	68	4932	40	72.53
			Total	**2020**	**122214**		

Top 15 Prolific Institutions in the field of Cell Biology

The Ministry of Education of People's Republic of China top the list among the top fifteen prolific institutions in the field of Cell Biology with 4001 publications. The institution has received a total of 149007 citations, followed by the Chinese Academy of Sciences, People's Republic of China occupied second position with 3355 publications, the Harvard Medical School, the USA taken third position with 2404 publications. The Harvard Medical School, Massachusetts, USA has occupied the first position in terms of citations received 236052 and the highest h-index of 220, followed by the Chinese Academy of Sciences, People's Republic of China with 155758 citations, followed by Ministry of Education, China with 149007 citations. The Massachusetts Institute of Technology, USA with 184 h-index stands second position and the first position with 116.93 ACPP, followed by the Stanford University, California, USA with 105.50 ACPP stands second position. Out of fifteen prolific institutions, six belong to China, five belongs to USA, two belongs to France.

Table 5: Top 15 Prolific Institutions in the field of Cell Biology

Sl. No.	Name of Institution	City	Country	Total Publications (TP)	Total Citations (TP)	H-Index	Average Citations Per Paper (ACPP)
1	Ministry of Education	Beijing	China	4001	149007	146	37.24
2	Chinese Academy of Sciences	Beijing	China	3355	155758	169	46.43
3	Harvard Medical School	Massachusetts	USA	2404	236052	220	98.19
4	CNRS Centre National de la Recherche Scientifique	Paris	France	2394	97804	138	40.85
5	INSERM	Paris	France	1683	83397	127	49.55
6	University of Chinese Academy of Sciences	Beijing	China	1375	58249	113	42.36
7	National Institutes of Health NIH	Maryland	USA	1297	85032	136	65.56
8	Sichuan University	Sichuan	China	1207	52275	102	43.31
9	University of California, San Diego	California	USA	1194	87012	142	72.87
10	Massachusetts Institute of Technology	Massachusetts	USA	1191	139263	184	116.93
11	University of Toronto	Toronto	Canada	1137	77674	126	68.31
12	Shanghai Jiao Tong University	Shanghai	China	1122	46858	103	41.76
13	Stanford University	California	USA	1112	117316	153	105.50
14	Shanghai Jiao Tong University School of Medicine	Shanghai	China	1100	44663	102	40.60
15	University of Cambridge	Cambridgeshire	United Kingdom	1086	84334	140	77.66
			Total	**25658**	**1514694**		**63.14**

Top 15 Highly Preferred Journals in the field of Cell Biology

The data about the top fifteen highly preferred journals in the field of Cell Biology is presented in table 6. It reveals that the *Journal of Biological Chemistry* published by American Society for Biochemistry and Molecular Biology Inc. with 2653 publications count bagged first position with 111093 citations, followed by the *PLOS Computational Biology* published by Public Library of Science with 2147 publications and 69954 citations and *Iscience* published by Elsevier has 1994 publications to its credit with 25875 citations were in second and third positions respectively. The journal *Biomaterials* has received the highest citations i.e. 169366, h-index 120 and 100.87 ACPP, followed by the journal *ActaBiomaterialia* has received 135116 citations. Among the sources preferred, the journal *ActaBiomaterialia* has the second highest h-index of 165 and 77.92 ACPP, whereas, *Nature Communications* of Springer Nature has the third highest ACPP of 77.29 value. The Impact Factor is given for each journal for the year 2024.

Table 6: Top 15 Highly Preferred Journals in the field of Cell Biology

Sl. No.	Name of Journal	Publisher	Impact Factor (IF) *SNIP 2024	Total Publications (TP)	Total Citations (TP)	H-Index	Average Citations Per Paper

							(ACPP)
1	Journal of Biological Chemistry	American Society for Biochemistry and Molecular Biology Inc.	0.998	2653	111093	126	41.87
2	PLOS Computational Biology	Public Library of Science	1.137	2147	69954	105	32.58
3	Iscience	Elsevier	1.000	1994	25875	53	12.98
4	Methods in Molecular Biology	Springer Nature	0.868	1918	16532	48	8.62
5	PLOS One	Public Library of Science	1.065	1838	72103	100	39.23
6	International Journal of Molecular Sciences	Multidisciplinary Digital Publishing Institute (MDPI)	1.177	1756	41534	77	23.65
7	ActaBiomaterialia	ActaMaterialia Inc.	1.574	1734	135116	165	77.92
8	Biomaterials	Elsevier	1.783	1679	169366	190	100.87
9	Cell Reports	Elsevier	1.552	1532	28552	66	18.64
10	STAR Protocols	Elsevier	0.445	1454	6118	24	4.21
11	Nature Communications	Springer Nature	3.150	1418	109598	152	77.29
12	Materials Science and Engineering C	Elsevier	7.300	1128	64065	113	56.80
13	Journal of Biomedical Materials Research Part A	John Wiley & Sons	0.775	1116	39635	80	35.52
14	ACS Applied Materials and Interfaces	American Chemical Society	1.264	1081	56663	112	52.42
15	Journal of Visualized Experiments	MyJoVE Corporation	0.345	1001	19550	64	19.53
			Total	**24449**	**965754**		

Note:

- SNIP - Source Normalized Impact per Paper.
- Coverage discontinued in Scopus - from 1993 to 2021 for Sl. No. - 12

Top 10 Highly Cited Research Papers in the field of "Cell Biology"

The table 7 depicts the top ten highly cited research papers in the field of Cell Biology. The data indicates that Love, M.I, Huber, W. and Anders, S. has received a total of 64000 citations for their work on 'Moderated estimation of fold change and dispersion for RNA-seq data with DESeq2' published in the year 2014 in *Genome Biology*, followed by Jumper, J et al. have received 28388 citations for their work on 'Highly accurate protein structure prediction with AlphaFold' published during 2021 in *Nature* journal. Out of top ten highly cited papers, two journals each belong to *Genome Biology* and *Nature*. Two papers were published in the years 2013 and 2015 respectively.

Table 7: Top 10 Highly Cited Research Papers in the field of Cell Biology

Rank	Author (s)	Title	Year of Publication	Journal Details	Total Citations (TC)
1	Love, M.I.; Huber, W.; Anders, S.	Moderated estimation of fold change and dispersion for RNA-seq data with DESeq2	2014	Genome Biology, 15(12), 550	64000
2	Jumper, John; Evans, Richard; Pritzel, Alexander; Green, Tim; Figurnov, Michael; +29 authors	Highly accurate protein structure prediction with AlphaFold	2021	Nature, 596(7873), pp. 583–589	28388
3	Anders, Simon; Huber, Wolfgang	Differential expression analysis for sequence count data	2010	Genome Biology, 11(10), R106	12489
4	Mali, Prashant; Yang, Luhan; Esvelt, Kevin M.; Aach, John; Guell, Marc; +3 authors	RNA-guided human genome engineering via Cas9	2013	Science, 339(6121), pp. 823–826	7856
5	Selkoe, Dennis J.; Hardy, John	The amyloid hypothesis of Alzheimer's disease at 25 years	2016	EMBO Molecular Medicine, 8(6), pp. 595–608	4816
6	Roadmap Epigenomics Consortium; Kundaje, Anshul; Meuleman, Wouter; +93 authors	Integrative analysis of 111 reference human epigenomes	2015	Nature, 518(7539), pp. 317–329	4673
7	Chandrashekar, Darshan S.; Bashel, Bhuwan; Balasubramanya, Sai AkshayaHodigere; +4 authors	UALCAN: A Portal for Facilitating Tumor Subgroup Gene Expression and Survival Analyses	2017	Neoplasia United States, 19(8), pp. 649–658	4655
8	Supek, Fran; Bošnjak, Matko; Škunca, Nives; Šmuc, Tomislav	Revigo summarizes and visualizes long lists of gene ontology terms	2011	Plos One, 6(7), e21800	4641
9	Buenrostro, Jason D.; Giresi, Paul G.; Zaba, Lisa C.; Chang, Howard Y.; Greenleaf, William J.	Transposition of native chromatin for fast and sensitive epigenomic profiling of open chromatin, DNA-binding proteins and nucleosome position	2013	Nature Methods, 10(12), pp. 1213–1218	4625
10	Yáñez-Mó, María; Siljander, Pia R.-M.; Andreu, Zoraida; +57 authors	Biological properties of extracellular vesicles and their physiological functions	2015	Journal of Extracellular Vesicles, 4(2015), pp. 1–60	4621

CONCLUSION

This research presents a comprehensive summary of the global research output of cell biology during 2010 - 2024, highlighting remarkable growth in terms of publications and citation count. The balanced raise in research articles was observed predominantly in current years shows the growing extent and interdisciplinary environment of cell biology research. The domination of countries such as the United States of America and People Republic of China highlight their well-built research communications and continued investment in biomedical sciences, whereas European countries reveal high citation impact throughout the study period with greater average citations per paper. The study also shows that older research publications tend to build up high citations, underscoring the long-term influence of initial research in the field.

Furthermore, the study identifies renowned authors, institutions, and publications that have notably subjective cell biology research. High-impact journals include *Journal of Biological Chemistry*, *Biomaterials*, and *Nature Communications*, as well as prominent American and Chinese universities have emerged as significant platforms for the distribution of knowledge. In order to map research tendency, scholarly influence, and information hubs in cell biology, this research makes wide-ranging scientometric evidence. As a result, it presents research scholars, policymakers, libraries and academic institutions with significant insights to force upcoming research directions.

REFERENCES

1) Chen, L., & Cheng, L. (2025). New hope for the treatment of recurrent and refractory psoriasis: NK cell immunotherapy—A scientometric analysis. *Frontiers in Immunology*, *16*, 1656398.
2) Farid, A., Khan, M. U., Wang, Z., ZhiJie, W., BaoQiu, C., KaiYue, W., & Chen, Z. (2025). Mapping research trends in milk microbiology: Rapid detection methods and bibliometric analysis. *LWT*, 118478.
3) Ghosh, K., Sharma, D., & Upadhyay, A. K. (2024). Scientometric Analysis of Human Microbiome Research during 2002-2023. *Library of Progress-Library Science, Information Technology & Computer*, *44*.
4) Guven, S. (2021). Global publication trends in ophthalmic genetics and gene therapy research: A Scientometric analysis. *Revista Brasileira de Oftalmologia*, *80*(2), 100-106.
5) Hami, A., Niazi, M. J., & Khazaee Nasirabadi, M. H. (2023). Analysis of Retracted Articles in the Field of Immunology: A Scientometric Study. *J Med LibrInfSci*, *4*, 1-10.
6) Hanci, S. Y., & Savigi (2023). Evaluation of the 101 most cited immunology articles: A bibliometric analysis. *Medicine*, *102*(29), e34375.
7) Lee, C. K. (2003). A scientometric study of the research performance of the Institute of Molecular and Cell Biology in Singapore. *Scientometrics*, *56*(1), 95-110.
8) Lim, M., Carollo, A., Dimitriou, D., & Esposito, G. (2022). Recent developments in autism genetic research: A scientometric review from 2018 to 2022. *Genes*, *13*(9), 1646.
9) Naheem, K. T. (2022). A Scientometric Analysis of Global Synthetic Biology Literature. *Qualitative and Quantitative Methods in Libraries*, *11*(3), 455-471.
10) Nam, S., Kim, D., Jung, W., & Zhu, Y. (2022). Understanding the research landscape of deep learning in biomedical science: scientometric analysis. *Journal of medical Internet research*, *24*(4), e28114.
11) O'Connor, C. M., Adams, J. U., & Fairman, J. (2010). Essentials of cell biology. *Cambridge, MA: NPG Education*, *1*(54), 5.
12) Parida, D. K., Singh, K., Nayak, S., Patel, A. K., & Patel, A. K. (2022). Publication trends in nature reviews molecular cell biology: A scientometric analysis based on Scopus database. *Pearl: A Journal of Library and Information Science*, *16*(1), 29-40.
13) Parker, D. M., Vorster, J. A., Quinn, L., & Blackie, M. A. (2022). Hybrid approaches to teaching: Re-imagining the teaching of a foundational science course during a global pandemic. *Critical Studies in Teaching and Learning*, *10*(2), 42-56.
14) Sankar, M. (2021). Food Microbiology Research output through Web of Science: A Study. *International Journal of Research in Library Science (IJRLS)*, *7*(3), 134-141.
15) Sedghi, S., & Ghaffari Heshajin, S. (2023). Citation analysis and mapping of genetics research in Iran. *Global Knowledge, Memory and Communication*.
16) Surulinathi, M., Rani, Y. A. S., Srinivasaragavan, S., Elaveni, B., &Jayasuriya, T. (2021). Animal Cell Diseases: A

Scientometric Mapping of Highly Cited papers. *Library Philosophy and Practice*, 1-16.

17) Zhao, Z., Li, Y., Wang, P., Zhang, R., & Nie, Z. (2023). Research hotspots and trends in the relationship between genetics and major depressive disorder: a scientometric analysis from 2003 to 2023. *Medicine*, *102*(51), e36460.