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A bibliometric analysis of global Ebola research

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Ebola Virus Disease (EVD), a severe and potentially lethal infection, has emerged as a global threat [1]. In light of the current epidemic, which has rapidly evolved since March 2014, most of the affected countries such as Guinea, Liberia and Sierra Leone have reported over 21,000 cases with approximately 8300 reported deaths (as of December 2014). Furthermore, the unprecedented spread of imported cases to other nations such as Mali, Nigeria, Senegal, Spain, United Kingdom and United States of America (USA), has generated great concern prompting not only an important steady stream of media coverage [2] but also a groundbreaking impact on research and publications on the disease.

In order to assess the current impact on Ebola related scientific production across the world, a bibliometric analysis was conducted using available information deposited at major biomedical and multidisciplinary journals-indexing databases, such as Science Citation Index (SCI), Scopus and Medline (using GoPubMed®). As our search strategy, data on indexed articles was retrieved from those databases using the term "Ebola" as a main operator for analytical purposes.

A total of 7262 Ebola-associated items were retrieved in our search. At Scopus, 2922 articles were recovered (12.3% from Congo, 7.2% USA and 5.4% Guinea), followed by SCI with 2297 articles (55.2% from USA, 11.2% Germany and 7.9% Canada) and Medline with 2043 articles (27.9% from USA, 11.7% Congo and 6.5% Guinea) (Table 1), with the USA returning the greatest level of output. In addition, 7.3%, 16.7% and 14.8% of the articles respectively were published in 2014 (up to November).

For Medline, the annual median number of articles up to 2013 was 43 (interquartile range [IQR] 9–83). However throughout 2014, but before October, 302 articles were subsequently published totalizing 619 on December 1st, 2014. Similarly, at Scopus, the annual median number of published articles up to 2013 was 57 (IQR 12-131), steadily increasing to 212 as of October 2014 and 517 on December 1, 2014.

This study has demonstrated the leading role that USA plays in Ebola research. Between 1977 and 2014, 7.9% of published research indexed on Scopus was from the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). However, during 2014 trends have shifted with 2.9% of the scientific output emanating from the National Institute of Allergy and Infectious Diseases and 2.5% from USAMRIID. This is not surprising given that United States has

Table 1 Top twenty countries with scientific production on Ebola research at SCI, Scopus and/or Medline (up to December 1, 2014).

Rank	Country	Number of articles	Database with highest number of articles
1	United States	1267	SCI
2	Congo	360	Scopus
3	Germany	257	SCI
4	Canada	183	SCI
5	France	175	SCI
6	Guinea	158	Scopus
7	United Kingdom	152	SCI
8	Sudan	147	Scopus
9	Japan	146	SCI
10	Uganda	115	Scopus
11	Gabon	88	Medline
12	Russia	76	SCI
13	Belgium	65	SCI
14	Switzerland	56	SCI
15	China	55	SCI
16	South Africa	52	Scopus
17	Philippines	52	Scopus
18	Australia	50	SCI
19	Spain	46	SCI
20	Netherlands	44	SCI

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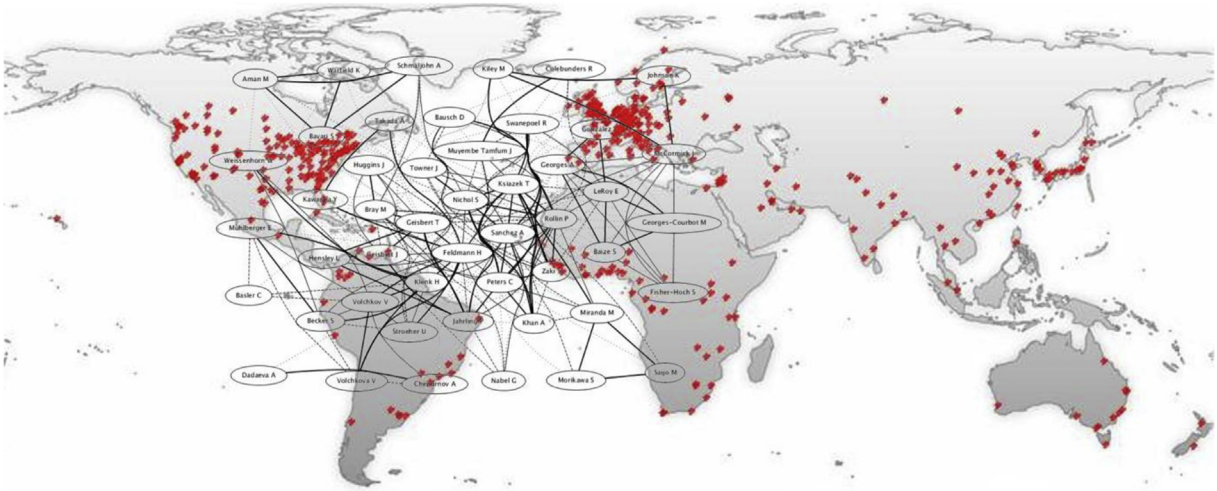

Figure 1 Major international research cooperation networks on Ebola (from GoPubMed®).

played an important role in fostering international cooperation on Ebola research and control.

During 2014, Lancet (42 articles), Nature, BMJ, Science and New England Journal of Medicine, have published 24.5% of the articles indexed in Scopus. Up to December 2013, only 346 articles indexed on Medline dealt with Ebola vaccines, yet just in 2014 (January to December) 126 articles embraced the subject. The large impact on scientific output in reference to Ebola research reflects its global influence as a potentially devastating disease. That said, the global map of scientific collaboration networks and production (Fig. 1) clearly demonstrates the dramatic prioritization in search for a suitable vaccine.

The world is experiencing the largest epidemic of EVD known in extension and duration to date, since the virus was first identified back in 1976 [1], with cases being reported beyond African borders [2]. Our results herein have demonstrated the ongoing expansion of clinical, epidemiological and virological literature in reference to Ebola, a situation clearly triggered by the menace posed by this deadly disease. Concurrently, and of great relevance is the sharp increase in the number of outputs related to vaccine candidates and the immunological aspects of EVD. Although not particularly affected by a large number of cases in this current outbreak, this analysis has demonstrated the preeminent role, which the United States has played historically and continues to play on Ebola research, along with other countries (Table 1). Also, cooperation played a key role amongst different nations, particularly between African, European and North American countries (Fig. 1).

Bibliometric assessments in travel medicine and infectious diseases [3—5] are of utmost importance not only to correlate the needs for research in certain conditions such as EVD, but also, as shown here, to provide an accurate overview of scientific output over time and its future impact.

Finally, as has been stated, it's time to translate the research findings generated over the past decade into effective and palpable pharmaceutical products aimed at controlling tropical viruses with epidemic potential [6] and to prioritize major interventions directed to reduce and control the negative impacts of infectious diseases such as EVD, which given the context of travel and migration can potentially affect any country in the world.

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Conflicts of interest

The authors have no conflict of interest to disclose.

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