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Uplifting RNA Science in Africa: A Call to Action

Fadil Bidmos,[1] Mame Massar Dieng,[2,3] Doreen Lugano,[4] Elsa Hien,[5] Favour Oluwapelumi Oyelami,[6] Haruna Muwonge,[7] Deusdedit Tusubira,[8] Peter Chinedu Agu,[9] Cecilia Ofor Ogechi,[10] Angela Mumbua Musyoka,[11] Ilemobayo Victor Fasogbon,[11] Patrick Maduabuchi Aja,[11] Mabrouka Maamra,[12] Yahya Choonara,[13,14] Kehinde Ross[15,16]

[1] Department of Infectious Disease, Faculty of Medicine, Imperial College London, London, United Kingdom.

[2] Program in Biology, Division of Science and Mathematics, New York University Abu Dhabi, Abu Dhabi, United Arab Emirates.

[3] Laboratory of Viral Interactomes, GIGA Institute, University of Liege, Liege, Belgium.

[4] KEMRI-Wellcome Trust Research Programme, P.O. Box 230 Kilifi, Kenya.

[5] Department of Cell and Molecular Biology, Uppsala University , Uppsala, Sweden.

[6] The Shine-Dalgarno Centre for RNA Innovation, The John Curtin School of Medical Research, Australian National University, Canberra, ACT 2601, Australia.

[7] Department of Physiology, School of Biomedical Sciences, College of Health Sciences, Makerere University, Kampala, Uganda.

[8] Department of Biochemistry, Mbarara University of Science and Technology, P.O. Box 1410, Mbarara, Uganda.

[9] Department of Biochemistry, College Science, Evangel University, Akaeze, Ebonyi State, Nigeria.

[10] Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.

[11] Department of Biochemistry, Faculty of Biomedical Sciences, Kampala International University-Western Campus, Uganda.

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[12] School of Chemical, Materials and Biological Engineering, University of Sheffield, Sheffield, United Kingdom

[13] Wits Advanced Drug Delivery Platform Research Unit, Department of Pharmacy and Pharmacology, School of Therapeutic Science, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, Parktown 2193, South Africa

[14] Infectious Diseases and Oncology Research Institute (IDORI), Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa.

[15] School of Pharmacy and Biomolecular Sciences, Liverpool John Moores University, Liverpool, United Kingdom.

[16] Institute for Health Research, Liverpool John Moores University, Liverpool, United Kingdom

Correspondence

Kehinde Ross

School of Pharmacy and Biomolecular Sciences

Liverpool John Moores University

Liverpool

L3 3AF

Email: o.k.ross@ljmu.ac.uk

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ORCIDs

Fadil Bidmos: https://orcid.org/0000-0003-2843-409X

Mame Massar Dieng: https://orcid.org/0000-0002-3573-6697

Doreen Lugano https://orcid.org/0009-0000-9542-0558

Elsa Hien https://orcid.org/0009-0009-4318-5643

Favour Oluwapelumi Oyelami: https://orcid.org/0000-0003-2812-9140

Haruna Muwonge: https://orcid.org/ 0000-0003-3964-2169

Deusdedit Tusubira: https://orcid.org/ 0000-0002-4698-424X

Peter Chinedu Agu: https://orcid.org/0000-0003-4739-2040

Angela Mumbua Musyoka: https://orcid.org/0009-0001-4444-256X

Ilemobayo Victor Fasogbon: https://orcid.org/0000-0003-4362-9004

Patrick Aja: https://orcid.org/0000-0001-7805-9027

Mabrouka Maamra: https://orcid.org/0000-0003-0077-9299

Yahya E. Choonara: https://orcid.org/0000-0002-3889-1529

Kehinde Ross: http://orcid.org/0000-0003-0252-1152

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Abstract

The 21st century has witnessed the emergence of an entire new class of therapeutic and prophylactic medicines based on RNA. These transformative advances have arisen from decades of fundamental and applied research efforts to understand, exploit, and modify the properties of RNA to improve lives and livelihoods for patients and broader societal stakeholders. However, the contributions of African scientists, businesses and policymakers to the RNA research ecosystem have been minimal. This, despite the opportunities for exploitation of RNA-based medicines in specific health issues endemic to the region, such as the neglected tropical diseases schistosomiasis, lymphatic filariasis and Buruli ulcer, as well as chronic respiratory disorders (asthma, chronic obstructive pulmonary disorder) that disproportionately impact low and middle countries. Here, we outline some of the challenges faced by the incipient RNA bioscience research community in Africa, which remains hindered by a deficiency of strategic vision and insufficient momentum, an underdeveloped culture of collaboration, and persistent constraints in resources and infrastructure.

Overcoming these issues requires a re-imagining of how the global RNA research community and African scholars mobilise resources for co-production of RNA-related knowledge and innovation. Potential solutions include forging equitable partnerships with institutions in the Global North, strengthening local, regional, and transnational collaborative networks in RNA science, and developing grassroots platforms that expand RNA education, research training, and communitywide networking across Africa. Together, these approaches offer a pathway to build sustainable capacity, nurture scientific leadership, and accelerate the growth of the continent's RNA bioscience ecosystem.

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Introduction

The emergence of RNA as a transformational catalyst for human progress is evident from the recent Nobel prizes that have garlanded the field. These include the Nobel Prize in Physiology or Medicine awarded to Andrew Fire and Craig Mello in 2006, Nobel Prize in Chemistry to Emmanuelle Charpentier and Jennifer Doudna in 2020, the Nobel Prize in Physiology or Medicine to Katalin Karikó and Drew Weissman in 2023, followed by the same award to Victor Ambros and Gary Ruvkun in 2024 (Couzin 2006; Ledford and Callaway 2020; Callaway and Naddaf 2023; Callaway and Sanderson 2024). These awards for the discovery of RNA interference, CRISPR (clustered regularly interspaced short palindromic repeats)-based gene editing, mRNA COVID-19 vaccines and microRNA-dependent regulation of gene expression, respectively, reflect the culmination of activities of hundreds of scientists who have gone before. More importantly, these breakthroughs can address critical challenges facing the continent, from pandemic response preparedness to agricultural resilience, positioning RNA science as a catalyst for redefining health and economic development in Africa.

The momentum around RNA's potential continues to accelerate. The Australian Academy of Science and the Australian RNA Production Consortium (ARPC) already recognised the need for a national strategy to harness the enormous potential of RNA science and research in 2021 (see https://www.science.org.au/news-events/news-views/national-roundtable-bring-together-experts-set-future-priorities-rna-science-research). More recently, a report from the U.S. National Academies of Sciences, Engineering, and Medicine lay out a bold 15-year roadmap to advance RNA science and biotechnology by focusing on RNA modifications—a frontier that could unlock new therapies, diagnostics, and synthetic biology applications (National Academies of Sciences and Medicine 2024). Together, these milestones underscore RNA's ascendancy as a central pillar of 21st-century innovation, bridging fundamental discovery and societal impact. This train should not be missed by Africa's scientists.

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The initial impetus for this *Perspective* arose during the RNA Society Annual Meeting in Singapore in 2023. Several of the authors (DL, EH, FO, KR) met for the first time during this meeting and were drawn together by our shared African heritage. On the other hand, when the RNA Society meeting was held in San Diego California in 2025, there appeared to be stronger representation of researchers of African heritage, including both Black Americans and several young researchers who had recently moved from Africa to North America to pursue PhD studentships. This suggests that, despite comparative resource constraints associated with higher education in parts of Africa compared to the USA or Canada, the higher education framework in Africa can deliver highly skilled graduates who can flourish in the Global North. However, there are no databases or associations tracking the involvement of African nationals in RNA research beyond Africa — or indeed within Africa—to our knowledge. Therefore, the contributions of African higher education institutions to the talent pipeline may be under-recognised.

However, there remains an urgent need to accelerate the participation of African scientists in RNA research. As shown in Figure 1, the contribution of Africa to the global RNA research literature has been minimal. It is unsurprising then that African delegates are generally underrepresented at leading RNA conferences. This is more than a missed opportunity: it highlights the persistent disparity between global scientific progress and Africa's ability to contribute to and benefit from these advances. Realizing this potential requires more than passive engagement. It demands strategic and systemic investments to strengthen Africa's RNA research ecosystem. The central challenge is no longer whether Africa should participate in RNA science, but rather how to establish the necessary infrastructure, expertise, and collaborative frameworks to become an active innovator in this field. In this Perspective, we outline key problems, opportunities, and actionable strategies to foster Africa's integration into the global RNA research landscape.

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THE PROBLEM

The Problem 1: A Lack of Vision or a Lack of Momentum?

Several strategic RNA-focussed initiatives that have supported the development of RNA science in the Global North over the last few decades (Table 1). In contrast, there is a scarcity of RNA-focussed research institutes in Africa. It is quite possible that African policymakers in tertiary education, economic growth, and industrial innovation have a vision for a stronger RNA-related developmental framework, as both economic wealth and research policy influence scientific productivity (Allik et al. 2020; Rodríguez-Navarro and Brito 2022). However, for reasons that are likely to be manifold and complex, the visionary leadership that would establish RNA-focussed research institutes across African countries has yet to emerge. Indeed, even with the success of companies like Afrigen, a South African start-up focussed on the production of mRNA vaccines through a centre of excellence and training (the Centre for mRNA Technology and Transfer), there are challenges. Mainly, that reliance on technology transfer from outside Africa creates vulnerabilities in relation to intellectual property (IP) rights, especially around specific reagents and products but also in manufacturing processes, and the cost that comes with these. The initial reluctance of Moderna and Pfizer/BioNTech to engage in technology transfer to the Afrigen mRNA vaccine manufacturing hub in Africa is a case in point, as documented elsewhere (Paremoer and Pollock 2022; Herder and Benavides 2024). Hence, there is a need for fundamental and translational bioscience across Africa and LMICs more generally focussed on expanding the innovation pipeline that secures IP for more stakeholders across the Global South.

There is also the challenge receiving reagents from the Global North to Africa, which together with other factors such as the vast distances between populous African cities with academic hubs and the limited transport networks between these localities, conspire to reduce the innovation momentum needed to accelerate the efficiency and competitiveness of African scientists. For instance, many African countries do not have trade agreements that would subsidise laboratory consumables and, consequently, pay more for reagents out of their limited

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budgets. Secondly, researchers in Africa rarely have access to freezer programmes for molecular biology reagents and often wait longer for deliveries to reach them, with supplies sometimes only arriving towards the end of grant funding. Such slow procurement timelines appear to be linked to logistical inefficiencies, delays with customs and limited direct access to manufacturers (Mukhwana et al. 2024). As a result, experiments are delayed and the time available to try new things and optimise different protocols is reduced.

In addition, securing timely visits from engineers to fix specialised equipment can be more challenging in Africa because manufacturers and authorised service providers are often located outside the continent or in a few regional hubs, resulting in longer response times and delays associated with visa requirements and logistical constraints. As such, even though the emergence of modular manufacturing pods for end-to-end RNA manufacturing, including those from Centillion or RiboPro, has the potential to transform the RNA medicines landscape across Africa (Shahab et al. 2025), these will need to be supported with human capacity building to ensure local availability of technical support personnel. Efforts to establish such RNA manufacturing capabilities may be at risk of competition from or dependence on pharmaceutical giants, and may therefore need to be underpinned with policy initiatives similar to those outlined recently in relation to the growth of Africa' s pharmaceutical sector (Pedersen and Wellmann 2024).

The Problem 2: A Lack of Collaboration

Over the last few years, the establishment of the African Life Sciences RNA Salon and, more recently, the RNA Salon Kenya, have been tremendous vehicle for promoting RNA-related education and knowledge exchange in both West Africa (Nigeria) and East Africa (Uganda, Kenya), with speakers drawn from around the world, including several members of the RNA Society. However, a strategic research ecosystem that facilities strong networking and sharing of ideas and expertise within local and regional contexts is somewhat lacking. For example, a placement

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at the Kenya Medical Research Institute (KEMRI), Nairobi, was pivotal in introducing one of the authors (A.M.M.) to the central roles of RNA in molecular virology and disease diagnostics. However, the infrastructure to capitalise on the skills and knowledge by sharing them further within her home institution was lacking. Further, a co-authorship network analysis suggests a dearth of trans-African collaborations compared to African collaborations with the Global North (Figure 2). Importantly, to find each other and form a network, individual researchers need to be visible to each other and limited travel funds may contribute to limited visibility. What is needed, therefore, is a more strategic approach to developing local and regional clusters of RNA knowledge exchange, collaborative grant writing and co-publishing RNA-related papers to push RNA research further. These actions will require investment in both infrastructure and human resources to drive a systemic uplift in engagement with RNA bioscience in African to accelerate progress, alongside efforts to improve the online profiles of African scientists in order to facilitate networking.

The Problem 3: A Lack of Resources

RNA science at both the fundamental and translational level is expensive. Despite the tremendous fall in next generation RNA sequencing costs, typical bulk RNAseq, single cell RNAseq, spatial transcriptomics and the plethora of variations of these techniques remain out-of-reach for most laboratories in Africa. In addition, with the exception of a few institutions supported by global partners (MRC research units in The Gambia and Uganda, KEMRI Wellcome Trust Research Programme in Kenya, Institute Pasteur in Senegal, Le Centre de Recherche Médicale et Sanitaire (CERMES) in Niger, Noguchi Memorial Institute in Ghana and the Biomedical Research Institute at Stellenbosch University, South Africa), few can afford the capital investment needed to establish regional centres of excellence for RNAseq and other omics technologies. It is no surprise, then, that the participation of African laboratories in RNA science has been underwhelming, as African countries spend only 0.45% of their gross domestic

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product on research, development and innovation (RDI) activities, compared to the global average of 1.7% (Kariuki et al. 2023). Further, because the market for RNA research products is small, there are local supply challenges that impede research progress even when funding is available.

POTENTIAL SOLUTIONS

Solution 1: Partnerships with the Global North

African researchers in the field of RNA biology, value partnerships with the Global North and witness firsthand the power of international collaboration and knowledge sharing in advancing RNA science on the continent. The role of RNA-based therapeutics in human health and disease, in particular for infectious diseases and cancers that disproportionately affect LMICs is witnessing significant growth and has been highlighted in discussions of opportunities and challenges in developing RNA-based therapies (Xiao et al. 2025). Hence, global platforms that can facilitate knowledge exchange such as the RNA Salon Series by the RNA Society and the VaxHub Network (VaxHub Network) are critical to building capacity and advancing RNA science on the African continent. They foster deeper meaningful collaboration and knowledge sharing, with a strong focus on supporting emerging researchers in the field of RNA science. A key component is access to research infrastructure and the related training on their use. Many researchers from LMICs face significant challenges in accessing state-of-the-art equipment to advance their ideas. Several policy briefs by various scientific councils highlight the need for capacity building and knowledge sharing between African research institutions and the Global North, including RNA science.

To address this gap, more RNA institutes in the Global North could offer complimentary online courses could be incentivised to provide LMIC researchers with opportunities to enhance their skills at the forefront of the field. e.g. online delivery. This could also be an opportunity to develop fruitful and equitable research partnerships by coupling research exchange visits with

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training delivery. However, courses are only useful if the training can be implemented in the context of the ongoing research problems of the trainees, and bringing the right people together may be a challenge. Zhu and co-workers also published on the importance of international collaboration in advancing and driving progress in RNA research for therapeutics (Zhu et al. 2022). Further, government departments and high-net-worth individuals across Africa and in the African diaspora should foster new international collaborations specifically aimed at providing funds for the brightest and best talents to train in world-leading RNA research and innovation laboratories across the Global North. Notably, although necessity-driven applied research tackling disease like HIV, COVID19 and tuberculosis dominate RNA-related in Africa (Figure 3), it will be important to increase the proportion of African RNA research at the fundamental discovery-innovation interface. Strong mentoring relationships could prove particularly pivotal in this regard, not only to achieve sustained capacity building but also to ensure that emerging innovations are exploited fully to drive economic growth and sociocultural progress.

Solution 2: Local, regional and transnational collaborations in RNA science

To advance RNA science across Africa, boosting collaboration at local, regional, and transnational levels is critical. Given the diversity of backgrounds and the uneven distribution of research infrastructure across the African continent, collaboration provides a practical pathway to share resources, develop expertise, and address health challenges that are unique to African populations (Dine et al. 2024). Collaborations between academics of African descent both within and outside the continent can play a vital role in building sustainable research networks. As an exemplar, the HIC-Vac network (focused on human infection challenge studies) and the BactiVac network (for bacterial vaccines) are already demonstrating the value of cross-regional partnerships (Barnes et al. 2023; MacLennan et al. 2025). These initiatives not only support LMIC-led research priorities but also offer catalyst project awards and training opportunities that enable early-career researchers to thrive. BactiVac-supported partnerships, for example, have

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enabled African-led studies in Kenya (Elias et al. 2023) and Zambia (Silwamba et al. 2022), generating vaccine-relevant epidemiological and genomic data while supporting transfer of specialist methods and expertise between institutions. Likewise, short-term laboratory fellowships, such as those offered by the Africa Research Excellence Fund (AREF), can be pivotal for the generation of preliminary data that strengthen joint grant applications, while longer-term doctoral training and full research partnerships can be secured from global funders like the Wellcome Trust or the Crick Africa Network, which supports high-level training for African biomedical scientists through career acceleration and technology development fellowships. Leveraging institutional seed funds — like Imperial College London's Global Connect Fund (which supports interdisciplinary and educational collaborations, including through its Ghana hub), Africa's RNA researchers abroad can catalyse early-stage interactions with those within the continent and prepare high-impact joint bids.

The International Centre for Genetic Engineering and Biotechnology (ICGEB) is also worth highlighting as another partner for accelerating collaborative progress given its emphasis on scientific training and technology transfer. There are 24 African countries among the Member States of the ICGEB as well as a component laboratory in Capetown, South Africa (https://www.icgeb.org/capetown/).

Other university or government-backed mechanisms that support similar forms of cooperation include the World Bank's Africa Centres of Excellence initiative, with institutions like the West African Centre for Cell Biology of Infectious Pathogens (WACCBIP) in Ghana fostering cutting-edge research and regional training programs in collaboration with global partners (Amfo and Awandare 2024). These centres provide a foundation for long-term, co-developed research networks. Meanwhile, African Union heads of state endorsed a commitment for all African governments to allocate at least 1 % of GDP to research and development, though most countries currently fall well short of that target (Simpkin et al. 2019). This is a challenge for policy makers around the world as the solutions and opportunities that can be unlocked by further investment

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in RDI across Africa has the potential to deliver unanticipated dividends that benefit stakeholders far beyond Africa itself.

Hence the need for policy pressure that pushes governments to invest in local training of early-career researchers primarily within African universities, with a focus on research, innovation and impact. To ensure that African-trained early-career researchers to gain a full complement of skills, their studies could include an overseas exchange component, during which they gain hands-on experience in the labs of international collaborators—regardless of heritage. Equally crucial is bidirectional exchange: international researchers could also visit African laboratories to gain context-specific insights that could deepen their understanding of the motivations, hurdles and opportunities associated with being a researcher in Africa. Such reciprocal mobility strengthens mutual understanding, builds preliminary data and trust, and paves the way for impactful, jointly led research proposals.

There is already a wealth of brilliant, high-impact research being conducted within African institutions, across infectious diseases, genomics, and increasingly, RNA science. However, these efforts often remain under-recognised by peers in the diaspora. A more intentional effort is needed from African researchers abroad to familiarise themselves with ongoing work on the continent. This process can begin with direct engagement with well-established institutions — particularly those with functional websites — or by engaging with centres funded by organisations like the MRC and the Wellcome Trust. Establishing these connections not only opens up opportunities for collaboration but also helps correct the longstanding imbalance where knowledge and recognition flow in one direction. In addition, alignment with genomics and statistical genetics programmes based on African populations represents a significant opportunity for RNA researchers in sub-Saharan Africa as the large datasets from such projects provide a rich resource for RNA studies linked to human genomic biodiversity. A selection of bioinformatics centres with such programmes is presented in Table 2.

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Solution 3: Grassroots platforms to promote RNA education, research training, and networking across Africa

Systemic challenges persist in the pursuit of scientific excellence by all who can contribute to the greater good through this epistemological endeavour (Zwart et al. 2024). Against this backdrop, the concept of *epistemic inclusion* has emerged as a key pillar to responsible research and innovation (Zwart et al. 2024). However, robust engagement of societal actors with the vision of participatory research inherent to epistemic inclusion arguably necessitates a basic level of understand and trust in regard to the scientific process. Therefore, cultivating a generation of African RNA enthusiasts has the potential to significantly accelerate RNA-focused research agenda across Africa. The RNA Salon Kenya and the African RNA Salon, both sponsored by the RNA Society and Lexogen, have provided an inspiring exemplar of how such enthusiasm for RNA science can nurture knowledge-sharing and empowerment. By enabling RNA enthusiasts to organise RNA symposia and community-building activities that connect early-career scientists across Africa to regional and international RNA expertise. But for even deeper impact, many more such RNA clubs are needed to trigger a continent-wide increase in engagement with the latest RNA science. Further, in future, major RNA-focussed conferences should be hosted in Africa more frequently to accelerate the dispersion of knowledge and emergence of new collaborations that propel RNA science to the forefront of academic endeavours across the continent.

CONCLUSIONS

Promoting RNA research efforts in Africa is crucial to addressing health challenges that disproportionately and dangerously affect the continent. Investment in RNA research will allow African researchers to contribute to global efforts of developing innovative contextually relevant solutions to improve health outcomes and reduce disease burdens mainly in infectious diseases and cancers. Increased strategic funding will need to be aligned with policy so that RNA research efforts can also drive economic growth and capacity building in Africa, fostering a new generation

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of scientists and entrepreneurs born from new therapeutic markets created. Mentorship, research funding, and collaborative platforms remain critical, but with resilience, resourcefulness, and a vision for African-led solutions in RNA science, we can contribute to global health equity and advance our Sustainable Development Goals.

METHODS

Data source and retrieval

All publication data were retrieved from PubMed using its standard search and download tools (the Entrez E-utilities). Three sets of records were collected, spanning 1999–2026 (2026 data are incomplete, as they were retrieved in May 2026): (i) an Africa dataset of all records that mention "RNA" in the title or abstract and list at least one author affiliated with one of the 54 African Union member states (n = 9,633 raw records); (ii) the total number of RNA-related records published worldwide each year, used to work out Africa's share of global output; and (iii) a comparison sample of up to 350 RNA-related records per year from anywhere in the world, used as a global benchmark (n = 9,713 candidate records). Searching for "RNA" in the title or abstract captures papers on RNA methods and biology generally, but may miss some papers on RNA viruses (e.g., HIV, COVID-19) that do not use the word "RNA" itself.

Country and region classification

The country of each author's institution was identified from the affiliation text listed on each record, matching different names or abbreviations that refer to the same country (e.g., individual US states or "USA" = United States; "Korea" = South Korea; "UAE" = United Arab Emirates) to one standard country name. Each record was then labelled Africa, Rest of World (RoW), or Unknown. This gave a confirmed Africa dataset of 9,218 records (415 records were excluded because their African affiliation could not be reliably identified) and, after removing 205 records with an African affiliation and 541 records with no identifiable affiliation from the global comparison sample, a confirmed RoW dataset of 8,967 records. These two datasets (9,218 Africa; 8,967 Rest of World) were used for all comparisons reported below.

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Publication trend analysis

Africa's annual publication count and its share of global RNA research output (Figure 1) were calculated by comparing the Africa dataset with the worldwide yearly totals. Both figures are complete counts from PubMed, not samples, so they reflect the true scale of the gap between Africa and the rest of the world. The final year shown (2026) is incomplete, since PubMed had not finished indexing 2026 publications at the time of data collection.

Co-authorship network analysis

A network diagram (Figure 2) was constructed to represent co-authorship relationships between countries, based on Africa-dataset papers with authors from two or more countries. The network was modelled as a weighted, undirected graph, in which each country is represented as a node and an edge connects two countries whenever they co-authored a paper, with edge weight and line thickness reflecting co-publication frequency. A country's number of connections ("degree") reflects the breadth of its collaborations, independent of its total publication volume. Two versions of the same network are presented, each foregrounding African countries by a different criterion: Panel A ranks the seven African countries by total publications, whereas Panel B ranks them by collaboration breadth, providing the basis for evaluating the extent of African countries' collaboration with non-African, relative to African, partners; both panels also display the same 15 most-connected non-African countries, so that a few very large non-African countries do not crowd out the African countries being compared. Both panels were generated using identical layout settings for consistency, with African countries shown in red and line thickness reflecting co-publication frequency.

Keyword and topic-orientation analysis

To compare research topics between Africa and the rest of the world, the keywords and subject terms listed on each paper were cleaned and standardised: variant forms of the same term (e.g., "HIV-1", "HIV-2") were merged into a single term, whereas genuinely distinct terms (e.g., "mRNA vaccine" and "mRNA") were retained separately. Keyword frequency (Figure 3, Panel A) was

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calculated as the number of times each keyword appeared per 100 papers within each group, focusing on the 25 most common RNA- and precision-medicine-related keywords. Each paper was further classified by research orientation (Figure 3, Panel B) as Innovation-frontier (e.g., mRNA/siRNA therapeutics, gene editing) or Necessity-driven (e.g., HIV, malaria, tuberculosis, COVID-19, drug resistance) based on its keywords; papers matching both categories were labelled Mixed, and the majority of papers matching neither category were excluded from this comparison. The global comparator sample (350 papers per year) was deliberately sized to approximate the Africa dataset, enabling a fair comparison between groups without distortion from differences in absolute sample size; this parity does not imply that Africa's overall RNA research output is comparable in scale to that of the rest of the world, for which Figure 1 remains the appropriate reference. Because PubMed ranks results by relevance, the global comparator sample may include a marginally higher proportion of highly relevant RNA papers than a purely random sample would.

Computational environment

All analyses were performed in Python, using standard scientific computing packages including pandas, NumPy, Matplotlib, NetworkX, and SciPy. A fixed random seed was used when generating the network diagrams, ensuring that re-running the analysis reproduces an identical layout.

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REFERENCES

Allik J, Lauk K, Realo A. 2020. Factors Predicting the Scientific Wealth of Nations. *Cross-Cult Res* **54**: 364–397.

Amfo NAA, Awandare GA. 2024. Equitable Collaborations: Key to Sustainable Futures. In *The New Road to Success: Contributions of Universities towards more Resilient Societies*,

Downloaded from rnajournal.cshlp.org on November 10, 2026 - Published by Cold Spring Harbor Laboratory Press

Vol 14 (ed. AM Cauce, Y Flückiger, I Popović). Association Glion Colloquium, Switzerland.

Barnes MVC, Mandla A, Smith E, Maskuniitty M, Openshaw PJM, contributors HI-Vm. 2023. Human infection challenge in the pandemic era and beyond, HIC-Vac annual meeting report, 2022. *Immunother Adv* **3**: ltad024.

Callaway E, Naddaf M. 2023. Pioneers of mRNA COVID vaccines win medicine Nobel. *Nature* **622**: 228–229.

Callaway E, Sanderson K. 2024. Medicine Nobel awarded for gene-regulating 'microRNAs'. *Nature* **634**: 524–525.

Couzin J. 2006. Nobel Prize in Physiology or Medicine. Method to silence genes earns loud praise. *Science* **314**: 34.

Dine RD, Elkheir LYM, Raimi MO, Alemayehu M, Mohamed SY, Turzin JK, Arogundade FQ, Ochola EA, Nasiyo AM, Mwawanga RQ et al. 2024. Ten simple rules for successful and sustainable African research collaborations. *PLoS Comput Biol* **20**: e1012197.

Elias SC, Muthumbi E, Mwanzu A, Wanjiku P, Mutiso A, Simon R, MacLennan CA. 2023. Complementary measurement of nontyphoidal Salmonella-specific IgG and IgA antibodies in oral fluid and serum. *Heliyon* **9**: e12071.

Herder M, Benavides X. 2024. 'Our project, your problem?' A case study of the WHO's mRNA technology transfer programme in South Africa. *PLOS Glob Public Health* **4**: e0003173.

Kariuki T, Murimuta E, Kadzamira G. 2023. Innovative approaches for unlocking R&D funding in Africa. World Economic Forum.

Ledford H, Callaway E. 2020. Pioneers of revolutionary CRISPR gene editing win chemistry Nobel. *Nature* **586**: 346–347.

MacLennan CA, Cunningham AF, Dean JE, Pope S, Balandyte-Shergill E, Pillaye J, Greenwood BM, Adegbola RA, BactiVac Network Group of A. 2025. BactiVac, the Bacterial Vaccines Network. *Vaccine* **57**: 127210.

Mukhwana A, Oluwaseyi Shorinola O, Ndlovu D-F, Osaso J. 2024. Slow, difficult and expensive: How the lab supplies market is crippling African science. In *Nature Index*.

National Academies of Sciences E, Medicine. 2024. *Charting a Future for Sequencing RNA and Its Modifications: A New Era for Biology and Medicine*. The National Academies Press, Washington, DC.

Paremoer L, Pollock A. 2022. "A passion to change the landscape and drive a renaissance": The mRNA Hub at Afrigen as decolonial aspiration. *Front Public Health* **10**: 1065993.

Pedersen J, Wellmann A. 2024. Do as Everyone Else: Policies and Strategies for the Growth of Africa's Pharmaceutical Sector.

Rodríguez-Navarro A, Brito R. 2022. The link between countries' economic and scientific wealth has a complex dependence on technological activity and research policy. *Scientometrics* **127**: 2871–2896.

Shahab MA, Stover NM, Al-Mahayni H, Srisuma P, Wang J, Shin S, Dighe A, Trout BL, Myerson AS, Braatz RD. 2025. End-to-end digital twin software for continuous mRNA manufacturing. *International journal of pharmaceutics* **686**: 126301.

Silwamba S, Chilyabanyama ON, Liswaniso F, Chisenga CC, Chilengi R, Dougan G, Kwenda G, Chakraborty S, Simuyandi M. 2022. Field evaluation of a novel, rapid diagnostic assay, and molecular epidemiology of enterotoxigenic E. coli among Zambian children presenting with diarrhea. *PLoS neglected tropical diseases* **16**: e0010207.

Simpkin V, Namubiru-Mwaura E, Clarke L, Mossialos E. 2019. Investing in health R&D: where we are, what limits us, and how to make progress in Africa. *BMJ Glob Health* **4**: e001047.

Xiao B, Wang S, Pan Y, Zhi W, Gu C, Guo T, Zhai J, Li C, Chen YQ, Wang R. 2025. Development, opportunities, and challenges of siRNA nucleic acid drugs. *Mol Ther Nucleic Acids* **36**: 102437.

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Zhu Y, Zhu L, Wang X, Jin H. 2022. RNA-based therapeutics: an overview and prospectus. *Cell death & disease* **13**: 644.

Zwart H, Mendes AB, Blok V. 2024. Epistemic inclusion: a key challenge for global RRI. *J Responsible Innov* **11**.

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Figure 1: Africa's contribution to the global RNA research literature, 1999–2026. (A) Annual publication counts for Africa (red) and the rest of the world (grey); the final year (2026) is incomplete because PubMed had not finished indexing 2026 publications at the time of data retrieval (May 2026). (B) Africa's publications as a percentage share of global RNA-related output each year.

Figure 2: Co-authorship network among countries publishing RNA-related research, constructed from Africa papers listing ≥ 2 unique countries. Red nodes and edges denote African countries and their collaborations; line thickness reflects co-publication frequency. (A) The seven African countries with the highest total publication output, i.e. which countries produce the most RNA-related research. (B) The seven African countries with the broadest collaboration networks, i.e. which countries are most internationally networked regardless of publication volume, as described in Co-authorship network analysis. The two rankings agree on five countries (South Africa, Egypt, Nigeria, Kenya and Uganda) but diverge on the remaining two: Tunisia and Ethiopia are prolific enough to rank in the top seven by publication count but not by degree, whereas Sudan and Ghana, despite far lower output, rank in the top seven by degree because a disproportionate share of their papers arise from large multi-country consortium and disease-surveillance studies (e.g. HIV/TB trial networks), each of which adds several new partner countries at once. Both panels also show the 15 most-connected non-African countries for reference. Across all Africa-touching co-authorship edges, 3,055 of 3,435 (89%) connect an African country to a non-African partner, indicating that Africa's international RNA co-authorship network is predominantly extra-continental rather than intra-African.

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Figure 3: Keyword and topic-orientation comparison between Africa (n = 9,218) and the rest of the world (n = 8,967), 1999–2026. (A) Frequency of the 25 most common RNA- and precision-medicine-related keywords, expressed per 100 papers in each group and sorted by combined frequency across both groups. (B) Proportion of papers classified by research orientation as Innovation-frontier, Necessity-driven, or Mixed. Necessity-driven topics (e.g., HIV, malaria, tuberculosis) make up a larger share of the Africa dataset, while Innovation-frontier topics (e.g., mRNA/siRNA therapeutics, gene editing) are proportionally more common in the rest-of-world sample.

Table 1: Selected RNA Research Centers

Country	Centre / Institute	Host Institution	Founded	URL
Australia	UNSW RNA Institute	University of New South Wales	2021	https://www.unsw.edu.au/institutes/rna
Australia	The Shine-Dalgarno Centre for RNA Innovation	Australian National University	2023	https://jcsmr.anu.edu.au/research/centres/sdcri
Austria	Max Perutz Labs	University of Vienna	2005	https://www.maxperutzlabs.ac.at/
Canada	McGill Centre for RNA Sciences	McGill University	2022	https://www.mcgill.ca/rna/
China	Center for Excellence in Molecular Cell Science	Chinese Academy of Sciences	2020	http://english.cemcs.cas.cn/
China	Center for RNA Medicine	Zhejiang University	2022	https://ism.zju.edu.cn/89712/list.htm

China	Beijing Advanced Center of RNA Biology	Peking University	2023	http://beacon.pku.edu.cn/en/index.html
Denmark	Center for RNA Therapeutics Towards Metabolic Disease	Aarhus University	2023	https://inano.au.dk/about/research-centers-and-projects/rna-meta/research
Germany	Helmholtz Institute for RNA-based Infection Research	Helmholtz	2017	https://www.helmholtz-hiri.de/
Japan	RNA Frontier Science Division	Osaka University	2019	https://otri-rna.jp/
Korea	Center for RNA Research	Institute for Basic Science, Seoul National University	2012	https://centers.ibs.re.kr/html/rna_en/
Netherlands	Dutch Center for RNA Therapeutics	LUMC, Radboudumc, later including Erasmus MC	2020	https://rnatherapy.nl/

Poland	RNA Research Center Poznan	Adam Mickiewicz University	2011	https://ibmib.web.amu.edu.pl/rna-research-center/
Poland	Dioscuri RNA Centre	The International Institute of Molecular and Cell Biology	2021	https://www.iimcb.gov.pl
Spain	Centre for Genomic Regulation	CRG Barcelona	2000	https://www.crg.eu/
Singapore	National Initiative for RNA Biology and Its Applications	National University of Singapore (NUS), Nanyang Technological University (NTU), and Agency for Science, Technology and Research (A*STAR)	2025	https://nirba.sg/
UK	UK RNA Biofoundry	CPI RNA Centre of Excellence	2025	https://www.uk-cpi.com/uk-biofoundry

UK	Wellcome Sanger Institute	Sanger	1992	https://www.sanger.ac.uk/
USA	Center for RNA Biology	The Ohio State University	2012	https://rna.osu.edu/
USA	Center for RNA Biology	University of Rochester Medicine	~2005	https://www.urmc.rochester.edu/rna-biology
USA	Center for RNA Science and Therapeutics	Case Western Reserve University	~1995	https://case.edu/medicine/rnacenter/
USA	Harvard Initiative for RNA Medicine	Harvard	2014	https://hms.harvard.edu
USA	RNA Innovation Center	Johns Hopkins University	2024	https://rnainnovation.jhu.edu/
USA	RNA Institute	SUNY Albany	2010	https://www.albany.edu/rna
USA	RNA Therapeutics Institute	UMass	2009	https://www.umassmed.edu/rti

USA	RNA Bioscience Initiative	Colorado	2016	https://medschool.cuanschutz.edu/rbi
USA	UCSD RNA Center	University of California. San Diego	~2021	https://rnacenter.ucsd.edu/
USA	UCSC RNA Center	University of California, Santa Cruz	1992	https://rnacenter.ucsc.edu/
USA	University of Florida RNA Genomic Medicine Centre	University of Florida	2022	https://rna.scripps.ufl.edu/
USA	Yale Center for RNA Science and Medicine	Yale University	~2011	https://medicine.yale.edu/rnacenter/

Table generated mainly wiith the use of ChatGPT, with founding dates estimated in some cases. With apologies to any institutions that may have been missed.

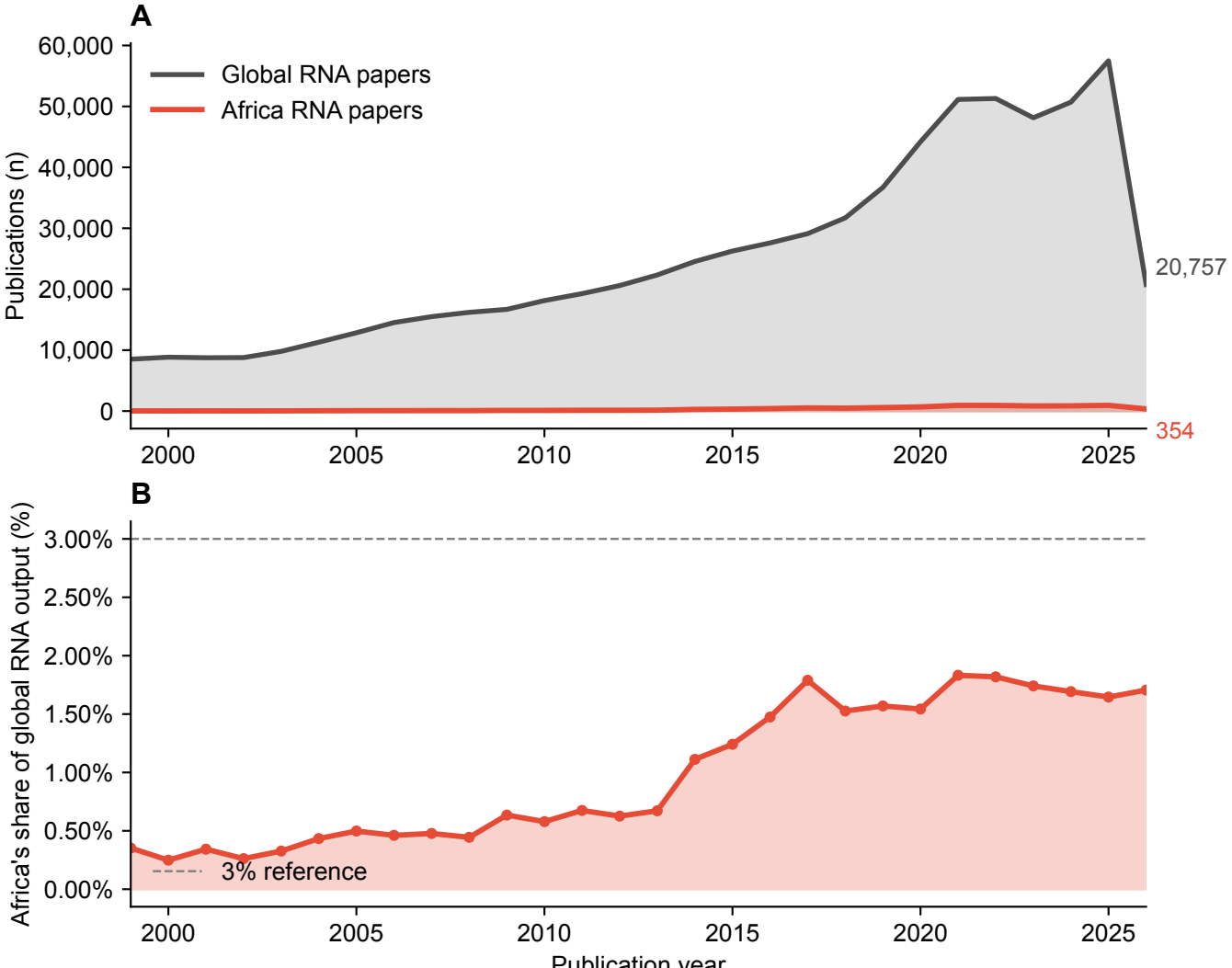
Table 2: Selected RNA Research Centers

Initiative	Institution	Key Focus & Relevance	URL
African Bioinformatics Institute	Pan-African	https://bioinformaticsinstitute.africa/	ABI aims to position African scientists, institutions, and communities at the forefront of the global bioinformatics revolution through the support of bioinformatics research based on African biological data and tailored to the continent's key health, agricultural, and environmental priorities
H3Africa Initiative	Pan-African	Continental framework driving research infrastructure, genomics data analysis, genetic epidemiology, and statistical genetics capacity.	https://h3africa.org/ Specific bioinformatics training programs include Eastern Africa Network for Bioinformatics Training (EANBIT), Nurturing Genomics and Bioinformatics Research Capacity in Africa (BRECA), West African

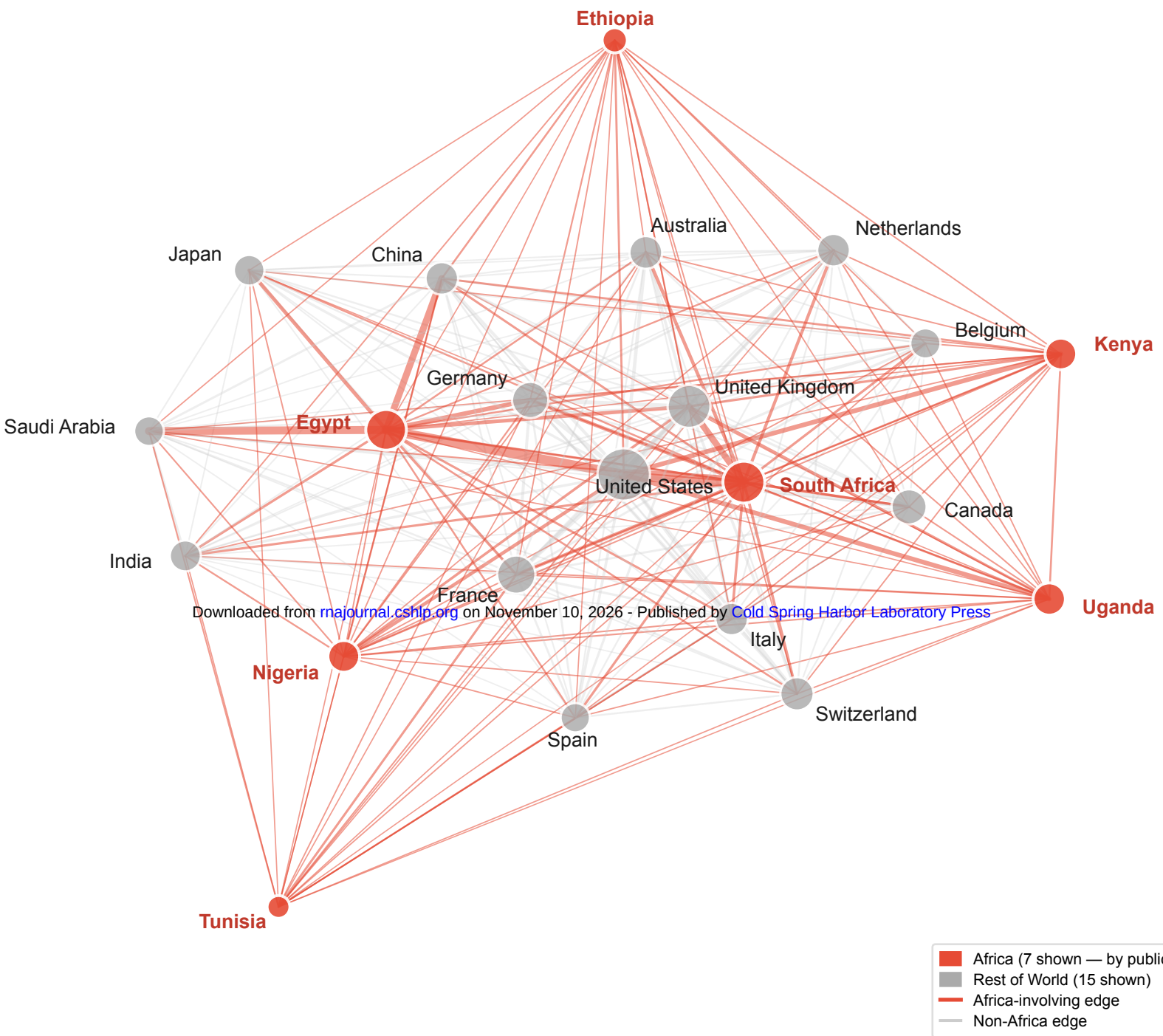
			Center of Excellence for Global Health Bioinformatics Research Training and West African Sustainable Leadership and Innovation Training in Bioinformatics Research.
Africa Pathogen Genomics Initiative (Africa PGI)	Africa Centres for Disease Control and Prevention (Pan-African)	Public health initiative focused on pathogen sequencing, genomic surveillance, biostatistics, and molecular epidemiology.	https://africacdc.org/africa-pathogen-genomics-initiative-africa-pgi/
African Genome Variation Project (AGVP)	Wellcome Sanger / African Partners	Foundational framework establishing genomic diversity patterns, fine-mapping tools, and reference panels across diverse African ethnic groups.	https://www.sanger.ac.uk/collaboration/african-genome-variation-project/
African Genomics Program (AGP)	Roche & African Academic Partners	Public-private initiative building clinical biobanks and population	https://www.roche.com/stories/african-genomics-program

		data resources for target discovery and local precision medicine.	
GeneMAP (Genetic Medicine of African Populations)	University of Cape Town / Pan-African	Research initiative dedicated to gene mapping, single-gene and complex disease genetics, and training geneticists.	https://genemap.africa/

Table generated mainly wiith the use of ChatGPT and Google Gemini. With apologies to any institutions that may have been missed.

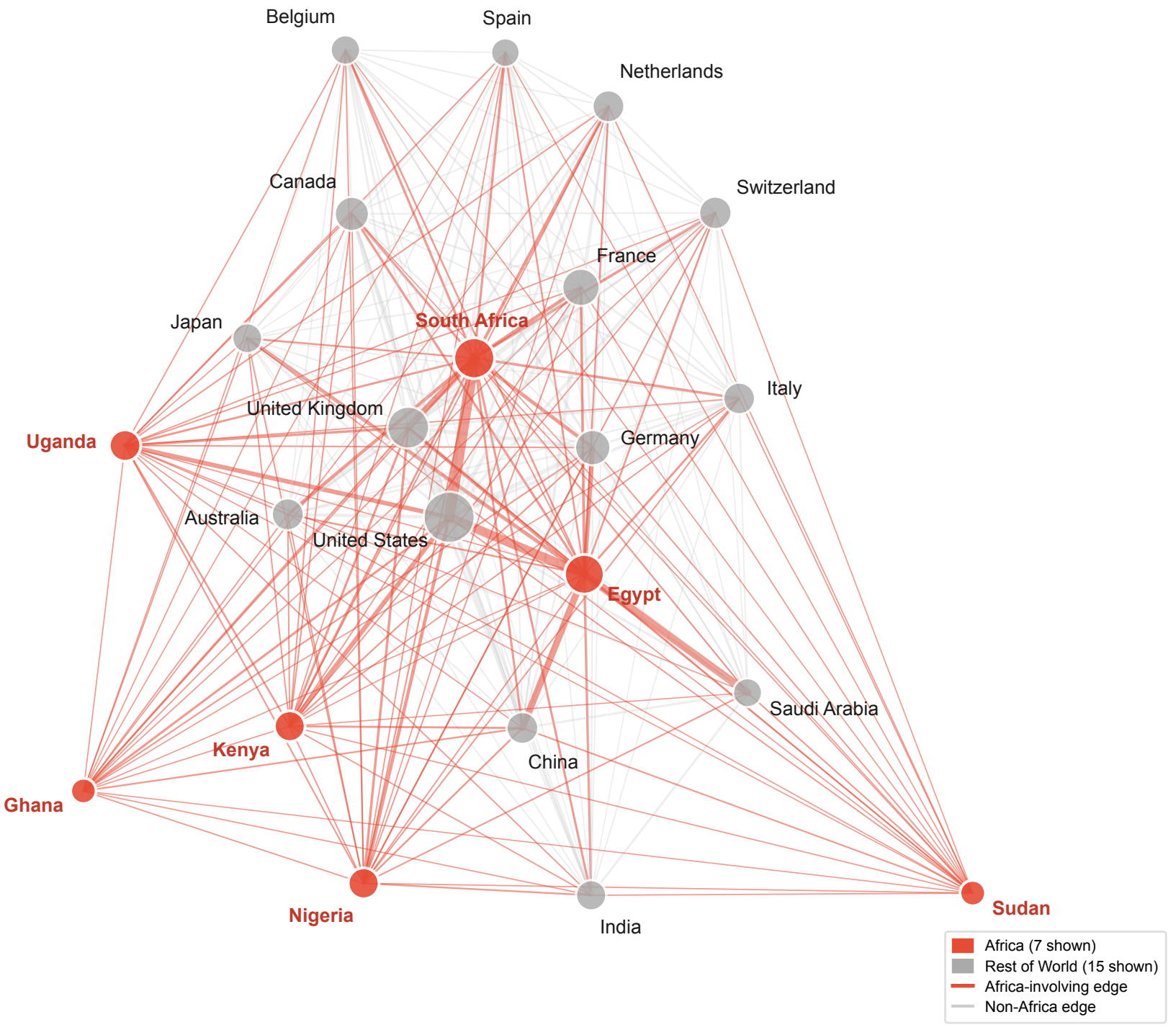

A
Global RNA papers
Africa RNA papers
Publications (n)
60,000
50,000
40,000
30,000
20,000
10,000
0
20,757
354
2000
2005
2010
2015
2020
2025
B
Africa's share of global RNA output (%)
3.00%
2.50%
2.00%
1.50%
1.00%
0.50%
0.00%
3% reference
2000
2005
2010
2015
2020
2025
Publication year

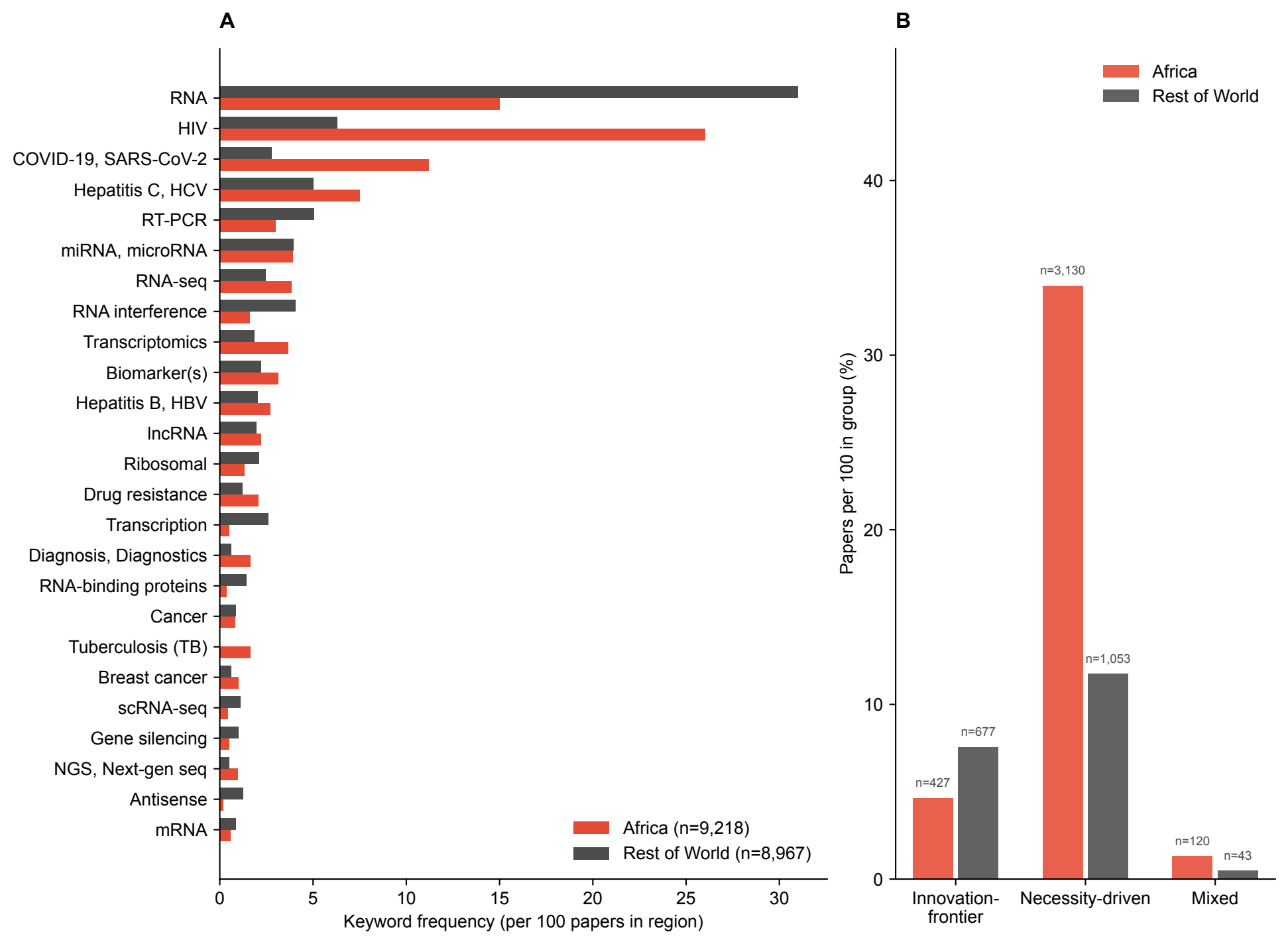
A



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B




A
RNA
HIV
COVID-19, SARS-CoV-2
Hepatitis C, HCV
RT-PCR
miRNA, microRNA
RNA-seq
RNA interference
Transcriptomics
Biomarker(s)
Hepatitis B, HBV
lncRNA
Ribosomal
Drug resistance
Transcription
Diagnosis, Diagnostics
RNA-binding proteins
Cancer
Tuberculosis (TB)
Breast cancer
scRNA-seq
Gene silencing
NGS, Next-gen seq
Antisense
mRNA
Africa (n=9,218)
Rest of World (n=8,967)
0
5
10
15
20
25
30
Keyword frequency (per 100 papers in region)
B
Africa
Rest of World
Papers per 100 in group (%)
0
10
20
30
40
n=427
n=677
n=3,130
n=1,053
n=120
n=43
Innovation-frontier
Necessity-driven
Mixed

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