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Research and recommended resources on Zika virus, pathology, and control

Rajkumar Rajendram, Victor R. Preedy, and Vinood B. Patel

Abbreviations
- COVID-19: Coronavirus Disease 2019
- US: United States of America
- WHO: World Health Organization

Introduction

As with many of the greatest scientific advances, the discovery of the Zika virus was at least partly serendipitous. The virus was first isolated from a rhesus macaque monkey, in 1947, during studies conducted in the Zika Forest of Uganda, to identify the vector of yellow fever (Dick, Kitchen, & Haddow, 1952; Musso & Gubler, 2016; Sikka et al., 2016). The “filterable transmissible agent” isolated from its serum was named after the Zika Forest (Dick et al., 1952).

It was first suggested that Zika could infect humans after the results of a serological survey in Uganda were published in 1952 (Dick et al., 1952). Further serendipity in 1962 resulted in the first confirmation of an acute human infection. In 1964, Simpson, reported his observations after accidentally infecting himself with Zika while isolating the virus from mosquitoes (Simpson, 1964).

The Zika virus is a member of the genus Flaviviridae of viruses (Musso & Gubler, 2016; Sikka et al., 2016). Related to viruses that cause dengue, yellow fever, Japanese encephalitis, and West Nile fever (Musso & Gubler, 2016; Sikka et al., 2016) it is spread by Aedes mosquitoes (e.g., A. aegypti, A. albopictus) (Musso & Gubler, 2016; Sikka et al., 2016). The Zika virus replicates in the mosquito’s salivary glands and is present in the mosquito’s saliva. The virus can infect human epidermal keratinocytes, skin fibroblasts, and Langerhans cells if inoculated into human skin by an infected mosquito (Musso & Gubler, 2016; Sikka et al., 2016). The virus then spreads to lymph nodes and enters the bloodstream (Chan, Choi, Yip, Cheng, & Yuen, 2016).

Within the first 60 years of Zika’s discovery (i.e., until 2007), epidemic infections were unheard of. Less than 20 cases of confirmed human infection were described between 1952 and 2007 (Musso & Gubler, 2016; Sikka et al., 2016). However, in retrospect, because the clinical presentation of Zika is nonspecific (Chan et al., 2016; Musso & Gubler, 2016), these sporadic cases are likely to have represented only the very tip of the iceberg of this infection. Many cases are likely to have been either managed symptomatically or misdiagnosed as dengue, Japanese encephalitis, or another flaviviral infection endemic to the regions where Zika virus is prevalent.

Since 2007, several large epidemics of Zika virus infection have left their mark around the world. The most recent epidemic began in April 2015 in Brazil, and spread to other several countries in North and South America (Musso & Gubler, 2016; Sikka et al., 2016).

Infection with Zika usually causes mild if any symptoms. This illness known as Zika fever or Zika virus disease is like a very mild form of dengue fever (Chan et al., 2016; Musso & Gubler, 2016). At the time of writing this chapter in late 2019, although several specific vaccines and antivirals are under development; the illness cannot be prevented and there is no specific treatment. However, supportive treatment (e.g., paracetamol, fluids, and rest) may relieve the symptoms associated with a mild Zika fever (Chan et al., 2016).
Unfortunately, in some people, infection with Zika virus can have severe consequences. For example, Guillain-Barré syndrome is a rare sequela of Zika infection (Chan et al., 2016; Musso & Gubler, 2016; Sikka et al., 2016) and a woman infected while pregnant can pass the infection on to the fetus in utero (Chan et al., 2016; Musso & Gubler, 2016; Sikka et al., 2016). This may be ruinous because the consequences of in utero infection with Zika include devastating birth defects such as microcephaly and severe malformations of the brain (Chan et al., 2016; Musso & Gubler, 2016; Sikka et al., 2016).

During the most recent epidemic, an estimated 1.5 million people were infected by Zika, in North and South America and over 3500 cases of microcephaly were reported (Chan et al., 2016; Musso & Gubler, 2016; Sikka et al., 2016). In February 2016, the WHO declared this situation a Public Health Emergency of International Concern (Sikka et al., 2016). Several countries issued travel warnings with specific guidance aimed at pregnant women (Sikka et al., 2016). In November 2016, the WHO declared that Zika virus was no longer a global emergency (WHO, 2016). However, the WHO still considers the virus to be “a highly significant, long-term problem” (WHO, 2016).

While there are many important differences between Zika virus and Coronavirus 2019 (COVID-19), the local, regional, national, and international responses to these viral pandemics were broadly similar. Observations on the efficacy of public health initiatives during Zika epidemics greatly facilitated the initiation of these policies (e.g., quarantines, restriction of local and international travel, closure of schools, physical distancing measures, and educational campaigns) during the global COVID-19 pandemic.

There has been an explosion in the knowledge and understanding of the Zika virus since it was first isolated in 1947. The recent epidemics of Zika virus infection have piqued international interest; further fuelling research in this rapidly developing field. It is now difficult even for experienced scientists to remain up-to-date.

Scientists, academics, or scholars are often interested to know which research centers are most active, and what type of material is being published. Other queries related to what resources the experienced scientists would suggest remaining up to date.

To assist colleagues who are interested in the characteristics of research in the area of Zika induced pathology, transmission, and control, we have compiled a section on bibliometric statistics. To assist colleagues who are interested in understanding more about this field, we have produced tables containing up-to-date resources in this chapter. The experts who assisted with the compilation of the data on research and the tables of resources are acknowledged below.

**Bibliometric statistics**

Figs. 1–4 illustrate the most current data on research relevant to the Zika virus. At the time of writing, there were about 10,000 publications listed in Scopus, Elsevier, relevant to Zika virus most of which have been published since 2015. Figs. 1–2 illustrate the type (Fig. 1) and specific subject areas (Fig. 2) of these important publications. Figs. 3 and 4 show the countries (Fig. 3) and research centers (Fig. 4) which contributed to this lifesaving work.

**FIG. 1** Types of documents published on Zika virus transmission, effects, and control. This figure represents the analysis of approximately 9961 documents published between 2015 and 2020. Generated from Scopus.
FIG. 2 Subject areas of documents published on Zika virus transmission, effects, and control. This figure represents the analysis of documents published between 2015 and 2020. Generated from Scopus.

FIG. 3 Country/Region of publication of articles on Zika virus transmission, effects, and control. This figure represents the country ascribed to the author’s country or region. Generated from Scopus.

FIG. 4 Documents published on Zika virus by affiliation. Total documents published on Zika virus over the past 5 years (up to 2020). Key: Centers for Disease = Centers for Disease Control and Prevention; Universidade de Sao = Universidade de Sao Paulo—USP; UT Medical Branch a = University of Texas Medical Branch at Galveston; Universidade Federal = Universidade Federal do Rio de Janeiro; National Institutes of = National Institutes of Health NIH; National Center for = National Center for Emerging and Zoonotic Infectious Diseases; Hainan Medical Univ = Hainan Medical University. Generated from Scopus.
Resources

Tables 1–6 list the most up-to-date information on the regulatory bodies (Table 1), journals (Table 2), books (Table 3), professional societies (Table 4), online resources and platforms (Table 5), and other resources for health care professionals or patients (Table 6) who are relevant to an evidence-based approach to Zika virus.

| TABLE 1 Regulatory bodies and relevant organizations. |
|-----------------------------------------------------|-------------------------------------------------|
| ASEAN Plus Three Field Epidemiology Training Network (ASEAN+3 FETN) http://www.aseanplus3fetn.net/ |
| ASEAN-Emergency Operation Centre (EOC) Network https://asean.org/ |
| Brazilian Health Ministry https://www.saude.gov.br/component/tags/tag/combate-aedes |
| Bureau of Epidemiology (Thailand)-Zika http://www.boe.moph.go.th/boedbl/surdata/disease.php?ds=87 |
| Centers for Disease Control and Prevention (CDC)-Zika Virus https://www.cdc.gov/zika/ |
| Centers for Disease Control and Prevention-Zika Virus Statistics and Maps https://www.cdc.gov/zika/reporting/index.html |
| European Centre for Disease Prevention and Control (EDCD) https://www.ecdc.europa.eu/en/zika-virus-disease |
| Evandro Chagas Institute (IEC) https://www.iec.gov.br/saiba-mais-virus-zika/ |
| Fiocruz www.fiocruz.br |
| Fundação Oswaldo Cruz—FIOCRUZ https://portal.fiocruz.br/zika |
| Instituto Nacional de Saude da Mulher, Criança e Adolescente www.iff.fiocruz.br |
| John Hopkins Center for Health Security https://www.centerforhealthsecurity.org/ |
| Ministry of Health of Brazil https://www.saude.gov.br/saude-de-a-z/zika-virus |
| Ministry of Health-New Zealand https://www.health.govt.nz/your-health/conditions-and-treatments/diseases-and-illnesses/zika-virus |
| National Health Service (NHS) https://www.nhs.uk/conditions/zika/ |
| National Institute of Allergy and Infectious Diseases (NIAID) https://www.niaid.nih.gov/diseases-conditions/addressing-zika |
| Nextstrain https://nextstrain.org/zika |
| National Institute of Allergy and Infectious Diseases (NIAID) https://www.niaid.nih.gov/diseases-conditions/zika-virus |
| Organização das Nações Unidas (ONU)—Brazil https://nacoesunidas.org/tema/zika/ |
| Oswaldo Cruz Foundation https://rededengue.fiocruz.br/ |
| Pan American Health Organization (PAHO)-Zika https://www.paho.org/hq/index.php?option=com_topics&view=article&id=427&Itemid=41484&lang=en |
**TABLE 1  Regulatory bodies and relevant organizations—cont’d**

| Organization                                                                 | Website                                                                 |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Public Health Agency of Canada (PHAC)                                        | https://www.canada.ca/en/public-health/services/diseases/zika-virus.html |
| Portal PEBMED                                                                 | https://pebmed.com.br/tag/zika/                                          |
| Southeast Asian Ministers of Education—Tropical Medicine and Public Health Network (SEAMEO TROPMED) | https://seameotropmednetwork.org/                                        |
| UNICEF                                                                       | https://www.unicef.org                                                   |
| US Department of Health & Human Services (HHS)                              | https://www.hhs.gov/op/opa/reproductive-health/zika/index.html           |
| World Health Organization (WHO)                                             | https://www.who.int                                                       |
| Zika virus Caribbean                                                          | http://www.zika-virus.com/                                               |
| ZIKAVID                                                                      | https://zikavid.org                                                      |

This table lists the regulatory bodies and organizations involved with Zika virus and associated specialities or interests. The links were accurate at the time of going to press but may move or alter. There are also lists of sites in Tables 4–6.

**TABLE 2  Journals relevant to Zika virus.**

- PLOS Neglected Tropical Diseases
- Scientific Reports
- Viruses
- Emerging Infectious Diseases
- PLoS One
- Lancet Infectious Diseases
- Lancet
- Journal of Virology
- Antiviral Research
- Frontiers in Microbiology
- Morbidity and Mortality Weekly Report
- American Journal of Tropical Medicine and Hygiene
- Journal of Infectious Diseases
- Nature
- Nature Communications
- Science
- Travel Medicine and Infectious Disease
- New England Journal of Medicine
- Parasites and Vectors
- BMJ Clinical Research Ed
- PLOS Pathogens

*Continued*
TABLE 2 Journals relevant to Zika virus—cont’d

| Journals                                                                 |
|-------------------------------------------------------------------------|
| Eurosurveillance                                                        |
| Annals of Tropical Medicine and Public Health                          |
| Emerging Microbes and Infections                                       |
| Frontiers in Immunology                                                 |
| International Journal of Infectious Diseases                           |
| Cell Host and Microbe                                                   |
| Journal of Medical Entomology                                           |
| Acta Tropica                                                            |
| BMC Infectious Diseases                                                |

Journals publishing original research and review articles related to Zika virus. Included in this list are the top 30 journals which have published the most number of articles on Zika virus over the past 5 years. Data derived from Scopus. Some journals and specific articles are also listed in Table 6.

TABLE 3 Relevant books and selected articles.

| Books                                                                 |
|-----------------------------------------------------------------------|
| Bradley’s Neurology in Clinical Practice (7th ed.). Neuroimmunology (Chapter 51). Daroff R B, Jankovic J, Mazziotta J C, Pomeroy S L. Elsevier, 2016 |
| Chikungunya and Zika Viruses: Global Emerging Health Threats. Higgs S, Vanlandingham D L, Powers A. Academic Press, 2018 |
| Current Topics in Zika. Rodriguez-Morales A J. IntechOpen, 2018 |
| Dengue, Zika e Chikungunya: Diagnostica, Tratamento e Prevencao. De Souza L J. Rubio, 2016 |
| Ecological Aspects for Application of Genetically Modified Mosquitoes. Takken W, Scott T W. Kluwer Academic, 2003 |
| Epidemics and Society: From the Black Death to the Present. Snowden F M. Yale University Press, 2019 |
| Genetic Control of Malaria and Dengue. Adelman Z N. Academic Press, 2016 |
| Global Virology I—Identifying and Investigating Viral Diseases. Shapshak P, Sinnott J T, Somboonwit C, Kukn J H. Springer, 2015 |
| Health Program Planning: An Educational and Ecological Approach (4th ed.). Green LW, Kreuter M W. McGraw-Hill Higher Education, 2005 |
| Locating Zika: Social Change and Governance in an Age of Mosquito Pandemics. Bardosh K. Routledge, 2019 |
| Mosquito-Borne Diseases. Implications for Public Health. Benelli G, Mehlhorn H. Springer, 2018 |
| New Advances on Zika Virus Research. Martinez-Sobrido L, Almazan F. MDPI AG, 2019 |
| One Health: People, Animals, and the Environment Atlas R M, Maloy S. ASM Press, 2014 |
| Sintrone Congenita do Virus da Zika, Microcefalia e Outras Alteracoes do Neurodesenvolvimento: Guia Pratico para Profissionais da Educacao. Lyra P V, Almeida E. Appris, 2019 |
| Sindrome De Guillain-Barre Asociado A Infeccion Por Virus Del Zika. Merida A L. EAE, 2018 |
| The Zika Virus Handbook: A Doctor Explains All You Need to Know About the Pandemic. Alton J. Doom and Bloom, 2016 |
| Theoretical Foundation of Health Education and Health Promotion (3rd ed.). Sharma, M. Jones and Bartlett Publishers. 2008 |
| Viral Polymerases. Structures, Functions and Roles as Antiviral Drug Targets. Gupta S P. Academic Press, 2018 |
| World Epidemics: A Cultural Chronology of Disease from Prehistory to the Era of Zika. Snodgrass M E. McFarland Publishing, 2017 |
| Zhaika Bingdu Bing Jiqi Fangzhi (Chinese). Zhou Z. Science Press, 2017 |
| Zhaika Bingdu Yu Zhaika Bingdu Bing (in Chinese). Gao G F. People’s Medical Publishing House, 2019 |
| Zika in Focus: Postnatal Clinical, Laboratorial and Radiological Aspects. Aragao F M V V. Springer, 2017 |
| Zika Virus Methods and Protocols. Kobinger G, Racine T. Springer, 2020 |
| Zika Virus and Diseases: From Molecular Biology to Epidemiology. da Silva S R, Cheng F, Gao S-J. Wiley Blackwell, 2018 |
| Title                                                                 | Authors                                              | Publisher/Media                      | Year   |
|----------------------------------------------------------------------|------------------------------------------------------|--------------------------------------|--------|
| Zika Virus Disease From Origin to Outbreak                            | Qureshi A I.                                         | Academic Press                       | 2018   |
| Zika Virus Disease: Prevention and Cure                               | Sharma S.                                           | Virology Research Progress           | 2017   |
| Zika Virus Infection, Vaccinology, and Anti-Zika Drug Discovery:      | Marta Diaz-Menendez, Crespillo-Andjar C.             | Springer                             | 2017   |
| Computer-Assisted Strategies to Combat the Menace                     | Basak S C, Bhattacharjee A K, Nandy A.               | Nova Science Publishers              | 2019   |
| Zika Virus. An Overview                                               | Petersen LR, Jamieson DJ, Powers AM, Honein MA.      | Springer                             | 2016   |
| Zika: From the Brazilian Backlands to Global Threat                   | Diniz D. Zed Books                                  |                                      | 2017   |
| Zika: The Emerging Epidemic                                           | McNeil D G, W. W. Norton & Company                  |                                      | 2016   |
| A Review of the Ongoing Research on Zika Virus Treatment              | da Silva S, Martins D O S, Jardim A C.               | Viruses                              | 2018   |
| ATR-FTIR spectroscopy with chemometric algorithms of multivariate    | Santos M C D, Nascimento Y M, Monteiro J D, et al.   | Analytical Methods                   | 2018   |
| classification in the discrimination between healthy vs. dengue vs.   |                                                      |                                      |        |
| chikungunya vs. Zika clinical samples                                |                                                      |                                      |        |
| Discordant Congenital Zika Syndrome Twins Show Differential In Vitro | Caires-Jnior LC, Goulart E, Melo US, et al.          | Nature Communications                 | 2018   |
| Viral Susceptibility of Neural Progenitor Cells.                     |                                                      |                                      |        |
| Does Immunity After Zika Virus Infection Cross-Protect Against Dengue| Ribeiro, G S, Kikuti M, Tauro L B, et al.            | Lancet Global Health                  | 2018   |
| Enhtomo-Virological Surveillance Strategy for Dengue, Zika and       | Dos Reis IC, Gibson G, Ayllon T, et al.              | Acta Tropica                          | 2019   |
| Chikungunya Arboviruses in Field-Caught Aedes Mosquitoes in an       |                                                      |                                      |        |
| Endemic Urban Area of the Northeast of Brazil.                        |                                                      |                                      |        |
| Improved Reverse Transcription-Polymerase Chain Reaction Assay for   | Nunes A R D, Alves B E B, Pereira H W B, et al.      | Mem Inst Oswaldo Cruz                | 2018   |
| the Detection of Flaviviruses With Semi-Nested Primers for           |                                                      |                                      |        |
| Discrimination Between Dengue Virus Serotypes and Zika virus.        |                                                      |                                      |        |
| Innate Immune Response in Patients With Acute Zika Virus Infection.  | da Silva M H M, Moises R N C, Alves B E B et Med    |                                      |        |
| Immunol2019.                                                        |                                                      |                                      |        |
| New Advances on Zika Virus Research.                                  | Martinez-Sobrido L, Almazan F.                       | Viruses                              | 2019   |
| New Spectrum of the Neurologic Consequences of Zika.                 | Medina M, Medina-Montoya M.                          |                                      | 2017   |
| Safety, tumor reduction and clinical impact of Zika virus infection  | Kaid C, Madi R, Astray R, et al.                     | Mol Ther                              | 2020   |
| in dogs with advanced-stage brain tumors.                            |                                                      |                                      |        |
| The AZ of Zika Drug Discovery.                                       | Mottin M, Borba J V V B, Braga R C, et al.           | Drug Discov Today                     | 2018   |
| Zika Virus in Vietnam, Laos, and Cambodia: Are There Health Risks    |                                                      |                                      |        |
| for Travelers?                                                       |                                                      |                                      |        |
| Zika Virus Infection in Vietnam: Current Epidemic, Strain Origin,    | Chu DT, Ngoc VTN, Tao Y.                            | Eur J Clin Microbiol Infect Dis       | 2017   |
| Spreading Risk, and Perspective.                                     |                                                      |                                      |        |
| Zika Virus Pathogenesis and Tissue Tropism.                          | Miner J J, Diamond M S. Cell Host Microbe           |                                      | 2017   |
| Mottin R, et al.                                                      |                                                      |                                      |        |
| Zika Virus Selectively Kills Aggressive Human Embryonal CNS Tumor    | Kaid C, Goulart E, Caires-Jnior LC, et al.           | Cancer Res                            | 2018   |
| Cells In Vitro and In Vivo.                                          |                                                      |                                      |        |
| Zika Virus-Induced Microcephaly and Its Possible Molecular Mechanism | Faizan M I, Abdullah M, Ali S et al.                |                                      | 2017   |
| Zika Virus: Emergence, Phylogenetics, Challenges, and Opportunities. | Rajah M M, Pardy R D, Condotta S A, et al.          | ACS Infect Dis                        | 2016   |

This table lists books and papers on Zika virus pathology, transmission and control.
### Table 4: Professional societies and other organizations.

| Organization                                                                 | Website                                |
|------------------------------------------------------------------------------|----------------------------------------|
| Agencia Nacional de Saúde Suplementar (ANS)—Brazil                          | http://www.ans.gov.br                  |
| American Society for Microbiology                                           | https://jcm.asm.org                    |
| American Society for Reproductive Medicine (ASRM)                           | https://www.asrm.org/                  |
| American Society for Virology (ASV)                                         | www.asv.org                            |
| American Society of Tropical Medicine and Hygiene                           | https://www.astmh.org/                 |
| Association of Health Care Journalists                                      | https://healthjournalism.org/          |
| Brazilian College of Radiology                                               | https://cbr.org.br/                    |
| Brazilian Society of Immunology                                              | https://sbi.org.br/                    |
| Brazilian Society of Infectious Diseases                                     | https://www.infectologia.org.br/       |
| Brazilian Society of Microbiology                                           | https://sbmicrobiologia.org.br/        |
| Canadian Society for Virology (CSV)                                         | https://www.csv-scv.ca/en/home          |
| Infectious Diseases Society of America (IDSA)                               | https://www.idsociety.org              |
| Sociedade Brasileira de Medicina Tropical                                   | https://www.sbmt.org.br/portal/        |
| Society for Maternal and Fetal Medicine                                     | https://www.smfm.org                   |
| The American Society of Tropical Medicine and Hygiene                       | https://www.ajtmh.org                  |
| The Brazilian Society for Virology (BSV)                                    | https://sbv.org.br/sbv/                |

This table lists some societies and organizations devoted to understanding Zika virus pathology, transmission and control. See also Tables 1, 3, and 6. Please note, occasionally the location of the websites or web address changes. In these cases the use of the “Search” tabs should be explored at the parent address or site.

### Table 5: Resources and emerging technologies relevant to the Zika virus.

| Resource                                                                 | Website                                                                 |
|-------------------------------------------------------------------------|------------------------------------------------------------------------|
| ACOG/The American College of Obstetricians and Gynecologists           | https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2019/09/management-of-patients-in-the-context-of-zika-virus |
| AdvaGen Biotech                                                         | http://advagen.tecnologia.ws/produtos/detalhado/403/KIT-ZIKA-v-IgG    |
| ADVIA Centaur Zika test                                                 | https://www.siemens-healthineers.com/laboratory-diagnostics/assays-by-diseases-conditions/infectious-disease-assays/zika-test |
| Artic Network                                                           | https://artic.network                                                   |
| **TABLE 5** Resources and emerging technologies relevant to the Zika virus—cont’d |
|---------------------------------------------------------------|
| **BMC**: Springer Nature |
| https://www.biomedcentral.com/ |
| **Centers for Disease Control and Prevention (CDC):** and Brazilian Ministry of Health. Zika Outcomes and Development in Infants and Children (ZODIAC) |
| https://www.cdc.gov/pregnancy/zika/research/zodiac.html |
| **Centers for Disease Control and Prevention (CDC): Pregnancy** |
| https://www.cdc.gov/pregnancy/zika/research/index.html |
| **EUROIMMUN Medizinische Labordiagnostika AG** |
| https://www.zika-diagnostics.com/ |
| **Federal University of Rio Grande do Sul** |
| https://zikavid.org |
| **IAEA Factsheet: The Zika Virus Mosquitoes** |
| https://www.iaea.org/sites/default/files/16/11/zika-virus-mosquitos-how-can-sterile-insect-technique-help.pdf |
| **LIAISON XL Zika Capture IgM II Control Set** |
| https://www.diasonin.com/sites/default/files/allegati/ese_zika_flyer_capture_igm_ii_low.pdf |
| **LiverTox Clinical and Research Information on Drug-Induced Liver Injury** |
| https://www.ncbi.nlm.nih.gov/books/NBK547852/ |
| **MagBiosense** |
| www.MagBiosense.com |
| **Nanopore Tech** |
| https://nanoporetech.com |
| **Nature Biotechnology** |
| https://www-nature.ez17.periodicos.capes.gov.br/articles/nbt0806-931 |
| **Nature immunology: Emerging viral diseases from a vaccinology perspective: preparing for the next pandemic** |
| https://www.nature.com/articles/s41590-017-0007-9.pdf?origin=ppub |
| **NPI Vaccines: Vaccinology in the twenty-first century** |
| https://europepmc.org/article/PMC/pmc5707890 |
| **OpenZika** |
| http://openzika.ufg.br/ |
| **Quibasa-Bioclin: Virus PCR Kit** |
| https://www.bioclin.com.br/bio-gene-zika-virus-PCR-k203-6.html |
| **Repositório Institucional da Fiocruz** |
| https://www.arca.fiocruz.br/handle/icict/31339 |
| **RTI** |
| https://www.rti.org/emerging-issue/zika-virus-research |
| **Vaccine: Vaccine development for emerging virulent infectious diseases** |
| https://www.sciencedirect.com/science/article/pii/S0264410X17301962 |
| **World Community Grid -OpenZika** |
| https://www.worldcommunitygrid.org/research/zika/overview.do |
| **ZIKAlliance, A global Alliance for Zika virus Control and Prevention** |
| https://zikalliance.tghn.org |
| **Zika. Virus Zika no Brasil. A resposta do SUS. Brasil. Ministerio da Saude. Secretaria de Vigilancia em Saude** |
| https://bvsms.saude.gov.br/bvs/publicacoes/virus_zika_brasil_resposta_sus.pdf |

This table lists some internet resources and emerging technologies relevant to Zika virus-induced pathology, transmission, and control. See also Tables 1 and 6. Please note, occasionally the location of the websites or web address changes. In these cases the use of the “Search” tabs should be explored at the parent address or site.
| **TABLE 6** Other resources relevant to Zika virus that may be of interest to health care professionals or patients. |
|---------------------------------------------------------------|
| **American Journal of Infection Control; Article on Zika virus** |
| https://www.ajicjournal.org/article/S0196-6553(16)30823-9/abstract |
| **Biblioteca Virtual em Saude—Ministério da Saude** |
| http://bvsms.saude.gov.br/bvs/publicacoes/virus_zika_brasil_resposta_sus.pdf |
| **BBC Media Action** |
| http://downloads.bbc.co.uk/mediaaction/pdf/practicebriefings/ebola-lessons-learned.pdf |
| **Cell Press: Zika; Research and Resources to combat the Pandemic** |
| http://info.cell.com/selections-zika |
| **Centres for Disease Control and Prevention (CDC): Healthcare Exposure to Zika and Infection Control** |
| https://www.cdc.gov/zika/hc-providers/infection-control.html |
| **Centers for Disease Control and Prevention (CDC): Zika Virus** |
| https://www.cdc.gov/zika/index.html |
| **Centres for Disease Control and Prevention (CDC): Zika Virus Action Plan** |
| https://www.cdc.gov/zika/zap/pdfs/Crisis-and-Emergency-Risk-Communication.pdf |
| **Centres for Disease Control and Prevention (CDC): Zika Virus: For Professionals** |
| https://www.cdc.gov/zika/vector/for-professionals.html |
| **Clinical Infectious Diseases** |
| https://academic.oup.com/cid |
| **Demographic Consequences of the Zika Epidemic (Decode Zika)—The University of Texas at Austin** |
| https://liberalarts.utexas.edu/zika/ |
| **DOAJ Directory of Open Access Journals: Article on Zika Virus Microcephaly** |
| https://doaj.org/article/bcc9337d64a7413c91e939e6cb498e7a?frbrVersion=4 |
| **Environmental Health Insights: Article on Zika Virus** |
| https://journals.sagepub.com/doi/full/10.4137/EHI.S40953 |
| **European Centre for Disease Prevention and Control (ECDC): Article on Zika Virus** |
| https://www.ecdc.europa.eu/en/publications-data/zika-virus-and-safety-substances-human-origin-guide-preparedness-activities-0 |
| **European Centre for Disease Prevention and Control (ECDC): Article on Zika virus** |
| https://www.ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/zika-preparedness-planning-guide-aedes-mosquitoes.pdf |
| **Eurosurveillance Europe’s Journal on Infectious Disease Surveillance, Epidemiology, Prevention and Control: Article on Zika Virus** |
| https://www.eurosurveillance.org/content/10.2807/1560-7917.ES2014.19.41.20929?track=RSS |
| **Ezequiel Dias Foundation (FUNED)** |
| http://www.funed.mg.gov.br/a_funed/ |
| **Faculty of Pharmacy of the Federal University of Rio Grande do Sul (UFRGS)** |
| https://projetoinfozika.wixsite.com/infozika |
| **Global Health: Science and Practice** |
| https://www.ghspjournal.org/content/7/1/116.short |
| **Guidelines of the Brazilian Society of Infectious Diseases for Zika virus infection management** |
| https://www.infectologia.org.br/admin/zcloud/125/2016/07/Guia_Manejo_Zika_SBI.pdf |
| **Health Education and Behavior: Article on Zika Virus** |
| https://journals.sagepub.com/doi/abs/10.1177/1090198118760687 |
| **Health Systems Research Institute** |
| https://www.hsri.or.th/en/researcher |
| **Instituto de Pesquisa Economica Aplicada (IPEA): Article on Zika Virus** |
| https://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=32492 |
| **Journal of Clinical Virology** |
| https://www.journals.elsevier.com/journal-of-clinical-virology |
### TABLE 6 Other resources relevant to Zika virus that may be of interest to health care professionals or patients—cont’d

| Resource                                                                 | URL                                                                 |
|-------------------------------------------------------------------------|----------------------------------------------------------------------|
| Journal of Community Health                                            | https://www.springer.com/journal/10900                               |
| The Lancet                                                              | https://www.thelancet.com/campaigns/zika                              |
| The Lancet Infectious Diseases: Article on Zika Virus                   | https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(16)00073-6/fulltext |
| Mayo Clinic-Zika Virus                                                  | https://www.mayoclinic.org/diseases-conditions/zika-virus/diagnosis-treatment/drc-20353645 |
| New England Journal of Medicine (NEJM): Collection of Articles on Zika Virus | https://www.nejm.org/zika-virus                                      |
| Nuucleo de Medicina Tropical da Universidade de Brasilia               | http://medicinatropical.unb.br/                                     |
| Pan American Health Organization (PAHO)                                | https://www.paho.org/hq/index.php?option=com_topics&view=id=427&Itemid=41484&lang=en |
| Pan American Health Organization/World Health Organization: Article on Zika Virus | https://www.paho.org/hq/dmdocuments/2016/2016-cha-zika-guide-risk-comm-engag.pdf |
| Pan American Health Organization/World Health Organization              | https://www.paho.org/bra/index.php?option=com_content&view=category&layout=blog&id=1294&Itemid=882 |
| Patient Platform                                                        | https://patient.info/doctor/zika-virus-pro                           |
| PLoS Neglected Tropical Diseases: Article on Zika Virus                 | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4920388/                |
| Proceedings of the National Academy of Sciences of the United States of America (PNAS) | https://www.pnas.org                                                  |
| Public Health Agency of Canada: Article on Zika Virus                   | https://www.rcdnh.com/wp-content/uploads/2016/12/zika-virus-info-health-prof-renseignements-prof-sante-eng.pdf |
| Public Health England                                                   | https://www.gov.uk/guidance/zika-virus-and-immunocompromised-patients |
| Revista da Associacao Medica Brasileira: Article on Zika Virus          | https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-42302016000200108 |
| Revista do Instituto de Medicina Tropical de Sao Paulo/Instituto De Medicina Tropical De Sao Paulo: Article on Zika Virus | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6453419/                |
| SciELO Analytics: Article on Zika Virus                                  | https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-74382018000300389 |
| The Journal of Infectious Disease: Article on Zika Virus                | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5853257/                |
| The Journal of Infectious Disease: Article on Zika Virus                | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5853392/                |
| The Second Century Fund (C2F), Chulalongkorn University                | https://www.research.chula.ac.th/                                    |
| UCSF Health System Obstetrics Services                                  | https://obgyn.ucsf.edu/maternal-fetal-medicine/zika-virus-frequently-asked-questions-our-patients |
| UMA—Uniao de Maes de Anjos                                              | https://www.facebook.com/uniaodemaeasdeanjos/                        |
| Universiti Kebangsaan Malaysia                                           | http://www.ukm.my/zakat/Latest_News/hukum-mengenai-virus-zika        |

Continued
**TABLE 6** Other resources relevant to Zika virus that may be of interest to health care professionals or patients—cont’d

| Resource                                                                 | URL                                                                 |
|-------------------------------------------------------------------------|----------------------------------------------------------------------|
| University of Helsinki, Helsinki, Finland                               | [https://www.helsinki.fi/en/researchgroups/viral-zoonoses-research-unit/research](https://www.helsinki.fi/en/researchgroups/viral-zoonoses-research-unit/research) |
| World Health Organization (WHO) Charter                                 | [http://www.euro.who.int/__data/assets/pdf_file/0004/129532/Ottawa_Charter.pdf](http://www.euro.who.int/__data/assets/pdf_file/0004/129532/Ottawa_Charter.pdf) |
| World Health Organization (WHO), Zika Virus Disease, Zika Epidemiology Update | [https://www.who.int/emergencies/diseases/zika/en/](https://www.who.int/emergencies/diseases/zika/en/) |
| World Health Organization (WHO), Risk Communication in the Context of Zika Virus | [https://apps.who.int/iris/bitstream/handle/10665/204513/WHO_ZIKVRCCE_16.1_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/204513/WHO_ZIKVRCCE_16.1_eng.pdf?sequence=1&isAllowed=y) |
| World Health Organization (WHO), Zika Epidemiology Global overview      | [https://www.who.int/emergencies/diseases/zika/zika-epidemiology-update-july-2019.pdf?ua=1](https://www.who.int/emergencies/diseases/zika/zika-epidemiology-update-july-2019.pdf?ua=1) |
| World Health Organization (WHO), Zika Virus Fact Sheet                  | [https://www.who.int/news-room/fact-sheets/detail/zika-virus](https://www.who.int/news-room/fact-sheets/detail/zika-virus) |
| World Health Organization (WHO), Zika virus vectors and risk of spread in the WHO European Region | [http://www.euro.who.int/__data/assets/pdf_file/0007/304459/WEB-news_competence-of-Aedes-aegypti-and-albopictus-vector-species.pdf](http://www.euro.who.int/__data/assets/pdf_file/0007/304459/WEB-news_competence-of-Aedes-aegypti-and-albopictus-vector-species.pdf) |
| World Health Organization (WHO)/Pan American Health Organization        | [https://www.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=39159&Itemid=270&lang=en](https://www.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=39159&Itemid=270&lang=en) |
| World Health Organization (WHO)—History of the Zika Virus              | [https://www.who.int/emergencies/zika-virus/timeline/en/](https://www.who.int/emergencies/zika-virus/timeline/en/) |
| Zika and Other Arbovirus Infection Cohort Studies—ZARICS                | [https://www.zarics.unb.br/](https://www.zarics.unb.br/)               |

This table lists some other resources of interest or relevance for health care professionals or patients in relation to Zika virus. See also Tables 1, 4, and 5. Please note, occasionally the location of the websites or web address changes.

**Policy and procedure**

The recommended resources listed in this chapter will be of great interest to those developing policies and procedures on the research into the prevention and treatment of Zika. Some examples of current policies in this field are listed below.

- National Institutes of Allergy and Infectious Diseases, United States of America. Zika Virus. ["https://www.niaid.nih.gov/diseases-conditions/zika-virus](https://www.niaid.nih.gov/diseases-conditions/zika-virus)
- World Health Organization. WHO Zika virus research agenda. [https://www.who.int/reproductivehealth/zika/zika-virus-research-agenda/en/](https://www.who.int/reproductivehealth/zika/zika-virus-research-agenda/en/)
- World Health Organization. International Health Regulation Procedures concerning public health emergencies of international concern (PHEIC). [https://www.who.int/ihr/procedures/pheic/en/](https://www.who.int/ihr/procedures/pheic/en/)

**Mini-dictionary of terms**

*Epidemic*: A usually sudden increase in the occurrence a disease in excess of the levels expected for that region’s population.

*Flaviviridae*: This is a family of RNA viruses that contain positive-strand RNA. They are primarily spread to birds and mammals using ticks and mosquitoes as vectors.

*Public Health Emergency of International Concern*: An unusual but serious event that risks public health risk and may need coordinated international action to prevent to international spread of disease.

*Zika virus*: A member of the Flaviviridae genus of viruses. It causes the condition known as Zika fever, Zika virus disease or Zika. This is usually a mild self-limiting disease.

**Key facts**

- The Zika virus was first isolated from a rhesus macaque monkey, in 1947.
- The virus was named after the Zika Forest of Uganda.
Until 2007, epidemic Zika infections were unheard of. However, as the clinical presentation of Zika is non-specific many cases may have been managed symptomatically or misdiagnosed.

Since 2007, several large epidemics of Zika virus infection have occurred.

The WHO considers that the Zika virus is “a highly significant, long-term problem.”

**Summary points**

- Zika virus is a member of the virus family Flaviviridae.
- Infection with Zika (Zika fever or Zika virus disease) usually causes mild if any symptoms.
- The illness cannot be prevented and there is no specific treatment.
- Guillain-Barré syndrome is a rare consequence of Zika infection.
- A woman infected while pregnant can pass the infection to the fetus in utero. In utero infection can result in devastating birth defects.
- There has been an explosion in the knowledge and understanding of the Zika virus since it was first isolated in 1947.
- It is now difficult even for experienced scientists to remain up-to-date on Zika virus pathology and control.

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