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induction of the humoral immune response against envelope proteins can protect against the dengue virus if a high concentration of neutralising antibodies is generated. However, the response will be limited in terms of longevity, safety, and boosting capacity if it is not accompanied by sufficient T-cell-mediated immunity. Combining humoral and cellular responses is a promising way to induce an immune response with good longevity, safety, and efficacy. Vaccine formulations that combine these characteristics are under investigation in ongoing clinical trials. However, it is not clear if only the cellular response of the immune response would be able to control the virus.

Few dengue vaccine formulations that are based on non-structural proteins are being investigated in clinical trials. Modern vaccine platforms, such as those based on RNA for COVID-19, would be ideal to test the possibility of controlling dengue virus using only non-structural proteins as antigens. Moreover, this method could deliver engineered antigens that combine with only the essential epitopes (even B-cell or T-cell epitopes) to induce a safe and efficient immune

response. Additionally, genetic-based vaccines (RNA or DNA), viral vectors, or even recombinant proteins could deliver essential antigens capable of inducing better immune responses. The essential targets can be found in whole proteins or protein subunits or be united as polyepitopes. Further research is necessary in this field.

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*Jaime Henrique Amorim, Alexander Birbrair
jaime.amorim@ufob.edu.br

Laboratory of Infectious Agents and Vectors, Center of Biological Sciences and Health, Federal University of Western Bahia, Barreiras, CEP 47810-047, BA, Brazil (JHA); Department of Pathology, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil (AB)

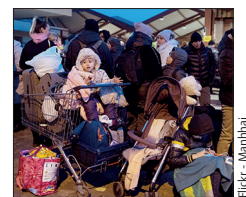
- 1 WHO. Dengue and severe dengue. 2022. https://www.who.int/health-topics/dengue-and-severe-dengue#tab=tab_1 (accessed March 8, 2022).
- 2 Pinheiro-Michelsen JR, Souza RdSO, Santana IVR, et al. Anti-dengue vaccines: from development to clinical trials. *Front Immunol* 2020; **11**: 1252.
- 3 Guzman MG, Harris E. Dengue. *Lancet* 2015; **385**: 453–65.
- 4 Pinheiro JR, Camilo Dos Reis E, Souza RdSO, et al. Comparison of neutralizing dengue virus B cell epitopes and protective T cell epitopes with those in three main dengue virus vaccines. *Front Immunol* 2021; **12**: 715136.
- 5 Coronel-Martinez DL, Park J, López-Medina E, et al. Immunogenicity and safety of booster CYD-TDV dengue vaccine after alternative primary vaccination schedules in healthy individuals aged 9–50 years: a randomised, controlled, phase 2, non-inferiority study. *Lancet Infect Dis* 2022; published online March 29. [https://doi.org/10.1016/S1473-3099\(21\)00706-4](https://doi.org/10.1016/S1473-3099(21)00706-4).

Health-care provision for displaced populations arriving from Ukraine

More than 4.2 million people, including 208 000 non-Ukrainians, have fled Ukraine to other European countries in recent weeks,¹ with the majority being women, children, and older people.² The current crucial objectives are to ensure that people can safely leave the conflict zone and access basic facilities such as housing, food, water, sanitation, and emergency care. However, going forward, it is important for the governments of receiving countries and transit countries to develop clear short-term and long-term strategies for the provision of health services.³ These strategies must include access to vaccination, maternal and child care services, screening programmes, and care for chronic conditions and mental health.

Many EU and European Economic Area (EEA) countries have long since been grappling with questions about what level of health care should be offered to forcibly displaced migrants and other migrant groups, when and where in the migration

trajectory provision should be made (ie should it be at borders, reception centres, once settled, via specialist or routine services, or left to non-governmental organisations), and what their subsequent level of right to access the mainstream health-care system should be. Overall, European countries do not have a uniform approach to the provision of health care for these populations, with some countries more inclusive than others, and wide discrepancies between policy and practice. In a recent survey of 25 355 people, who were mostly migrants from non-EU or non-EEA countries residing in European cities,⁴ 78% had no entitlement to access health services, most pregnant women were not able to access antenatal services, and 91% were living below the poverty line—highlighting that thousands of migrants in Europe are currently excluded from accessing basic primary health care. In addition, migrants are often overlooked in health programmes, with high levels of drop-out and poor linkage to care.



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Panel: Current key considerations for health systems in host countries

- Universal access to health systems in host countries is paramount.
- Facilitate access to health-care professionals immediately on arrival to address interruptions in supply of medicines and avoid excess morbidity and mortality from cardiovascular diseases (ie, heart attack, stroke), chronic respiratory diseases, diabetes, mental health, and chronic infectious diseases (tuberculosis, HIV, hepatitis B and C).
- Ensure full access to vaccination systems in host countries as a key priority. Ukraine has historic and current low childhood vaccination coverage; therefore, consider offering routine and catch-up vaccinations (with a focus on measles, mumps, rubella; and tetanus, diphtheria, and polio) to all new arrivals (children, adolescents, and adults).
- Ensure access to COVID-19 vaccines given the current low coverage in Ukraine.
- The majority of people displaced will be women and children. Ensure access to appropriate services such as antenatal care, health visitors, and vaccination.
- Careful consideration should be given to mental distress and trauma, which are common during humanitarian crises, and the impact of the migration process on peoples' wider health.
- Health-care professionals will need to invest time and effort into building trust with displaced communities to design and deliver health and vaccine services.

In March, 2022, the European Centre for Disease Prevention and Control (ECDC) published a technical report that focuses on infectious disease vulnerabilities among displaced populations from Ukraine; the report summarises key infectious diseases that might be particularly relevant for this group.⁵ In the case of displaced people from Ukraine, as well as newly arrived migrants in general,⁶ the ECDC report highlights the importance of a holistic approach to providing health care, echoing previous research, with key considerations for host health systems summarised in the panel.^{7,8} To align with the principles of Universal Health Coverage and the Right to Health, such an approach requires that all migrants should have the same level of health care access as host populations. The key health risks in the next 3 months for the people displaced from Ukraine include morbidity and mortality from cardiovascular diseases (ie, heart attack and stroke), chronic respiratory diseases, diabetes, mental health distress, and chronic infectious diseases (ie, tuberculosis, HIV, hepatitis B and C) due to disruption to the supply of medication

and poor access to health-care professionals.⁹ In 2020, Ukraine reported the second-highest number of tuberculosis cases in the WHO European region, and 27.2% of new tuberculosis cases were multidrug resistant (Ukraine is included in the ten countries globally with the highest rates of multidrug-resistant tuberculosis).¹⁰ As has been observed during other humanitarian crises, the risk for tuberculosis increases when people are placed in crowded settings and have poor access to health services, making tuberculosis a crucial concern for migrants coming from Ukraine. Data from 2020 highlight that cases of tuberculosis and HIV coinfection in Ukraine are among the highest in Europe (23% of coinfections are among new and relapsed tuberculosis cases), which should be considered by health-care providers. In addition, careful consideration should be given to mental distress and trauma because of the uncertainties of a life as a refugee and long stays in camp and transit conditions.¹¹

Addressing vaccine-preventable infectious diseases such as polio, measles, and COVID-19 will be an important priority.^{5,9} An outbreak of polio was reported in Ukraine in 2021, with the country reporting the second-highest number of measles cases in Europe in the same year. Childhood vaccination coverage in Ukraine is among the lowest in the WHO European region,^{5,9} which could mean that catch-up vaccinations for older age groups are warranted, with a focus on measles, mumps, rubella, tetanus, diphtheria, and polio.⁶ Temporary reception centres across Europe are known to have had outbreaks involving adults who missed vaccinations, doses, and boosters in their home countries as children.¹² For individuals who express uncertainty about the vaccinations they have had, ECDC recommends considering them as unvaccinated and offering a new course of routine vaccines.^{5,6} COVID-19 vaccine uptake in Ukraine has to date been low, with only 34% population coverage with two doses (and 2% coverage with the booster dose), and there are high levels of vaccine hesitancy; therefore, host countries will need to devise strategies to ensure access to COVID-19 vaccines.^{9,13}

A holistic and patient-centred approach to health is vital, and several countries, including Ireland and Poland, have promised free access to health services for Ukrainians. When organising health service delivery, health-care professionals will need to invest time and

effort into building trust with displaced communities. The EU's decision to offer temporary protection for 1 year to people fleeing Ukraine, which implies the right to residency, to work, and to free health care, is essential.¹⁴ Yet, this policy raises many unanswered questions about the levels of provision currently afforded to the thousands of other forcibly displaced migrants who are already in the EU. Opening national borders and providing refuge to Ukrainians must go hand in hand with building sustainable and long-term access to health care for all migrant groups, informing and training health-care professionals, and ensuring that displaced populations are aware of their rights and the routes to receiving care.

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*Alena Kamenshchikova, Ioana Margineau, Shazia Munir, Felicity Knights, Jessica Carter, Ana Requena-Mendez, Yusuf Ciftci, Rosemary A James, Miriam Orcutt, Karl Blanchet, Apostolos Veizis, Bernadette Kumar, Teymur Noori, *Sally Hargreaves*
s.hargreaves@sgul.ac.uk

Department of Health, Ethics and Society, School of Public Health and Primary Care, Maastricht University, Maastricht, Netherlands (AK); Department of Global Health, London School of Hygiene & Tropical Medicine, London, UK (AK); Rijksuniversiteit Groningen, University Medical Centrum Groningen, Department of Pharmacy and Clinical Pharmacology, Groningen, Netherlands (IM); Refugee and Asylum Seeker Services, Health Inclusion Team, Guy's & St Thomas' NHS Foundation Trust, London, UK (SM); The Migrant Health Research Group, Institute for Infection and Immunity, St George's, University of London, London, UK (SH, FK, JC); The Lancet Migrant Regional Hub, London, UK (SH); Barcelona Institute for Global Health, ISGlobal, Hospital Clinic-University of Barcelona, Barcelona, Spain (AR-M); Department of Medicine Solna, Karolinska Institutet, Stockholm, Sweden (AR-M); Department of Infectious Diseases, Karolinska University Hospital, Stockholm, Sweden (AR-M); Doctors of the World UK, Medecins du Monde Network, London, UK (YC); The Lancet Migration European Regional Hub, London, UK (RA, KB, BK); Geneva Centre of Humanitarian Studies, Geneva, Switzerland (RA, KB); Institute for Global Health, University College London, London, UK (MO); INTERSOS Hellas, Thessaloniki,

Greece (AV); Norwegian Institute of Public Health, Folkehelseinstituttet, Oslo, Norway (BK); European Centre for Disease Prevention and Control, Stockholm, Sweden (TN)

- 1 Migration Data Portal. Refugees and Asylum Seekers. 2022. <https://www.migrationdataportal.org/ukraine/crisis-movements> (retrieved April 6, 2022).
- 2 UN High Commissioner for Refugees. UNHCR warns of rising needs in Ukraine and neighbouring countries, calls for cessation of hostilities. 2022. <https://www.unhcr.org/uk/news/briefing/2022/3/623453f14/unhcr-warns-rising-needs-ukraine-neighbouring-countries-calls-cessation.html> (accessed March 24, 2022).
- 3 WHO. Prioritizing the health of refugees and migrants: an urgent, necessary plan of action for countries and regions in our interconnected world. 2022. <https://www.euro.who.int/en/media-centre/sections/press-releases/2022/prioritizing-the-health-of-refugees-and-migrants-an-urgent-necessary-plan-of-action-for-countries-and-regions-in-our-interconnected-world> (accessed March 24, 2022).
- 4 Medecins du Monde, UCL. 2021 observatory report. 2021. <https://www.doctorsoftheworld.org.uk/wp-content/uploads/2022/03/2021-Observatory-Report.pdf?download=1> (accessed March 24, 2022).
- 5 ECDC. Operational public health considerations for the prevention and control of infectious diseases in the context of Russia's aggression towards Ukraine. 2022. <https://www.ecdc.europa.eu/en/publications-data/operational-public-health-considerations-prevention-and-control-infectious> (accessed March 10, 2022).
- 6 ECDC. Public health guidance on screening and vaccination for infectious diseases in newly arrived migrant within the EU/EEA. 2018. <https://www.ecdc.europa.eu/en/publications-data/public-health-guidance-screening-and-vaccination-infectious-diseases-newly> (accessed March 10, 2022).
- 7 Noori T, Hargreaves S, Greenaway C, et al. Strengthening screening for infectious diseases and vaccination among migrants in Europe: what is needed to close the implementation gaps? *Travel Med Infect Dis* 2021; **39**: 101715.
- 8 Knights F, Munir S, Ahmed H, Hargreaves S. Providing initial health assessments for newly arrived migrants, refugees, and asylum seekers. *BMJ* 2022 (in press).
- 9 Health Cluster Ukraine. Public health situation analysis—short form. 2022. <https://reliefweb.int/sites/reliefweb.int/files/resources/ukraine-phsa-shortform-030322.pdf> (accessed March 10, 2022).
- 10 WHO. TB profile, Ukraine. 2022. https://worldhealthorg.shinyapps.io/tb_profiles/?_inputs._entity_type=%22country%22&lan=%22EN%22&iso2=%22UA%22 (accessed March 9, 2022).
- 11 Bjertrup PJ, Bouhenia M, Mayaud P, Perrin C, Ben Farhat J, Blanchet K. A life in waiting: refugees' mental health and narratives of social suffering after European Union border closures in March 2016. *Soc Sci Med* 2018; **215**: 53–60.
- 12 Deal A, Halliday R, Crawshaw AF, et al. Migration and outbreaks of vaccine-preventable diseases in Europe. *Lancet Infect Dis* 2021; **21**: e387–98.
- 13 ECDC. Guidance for the prevention and control of COVID-19 in temporary reception centres in the context of the large numbers of people fleeing Ukraine. 2022. <https://www.ecdc.europa.eu/en/publications-data/guidance-prevention-control-covid-19-temporary-reception-centres-people-fleeing-ukraine> (accessed March 24, 2022).
- 14 European Council. Ukraine: council unanimously introduces temporary protection for persons fleeing the war. 2022. <https://www.consilium.europa.eu/en/press/press-releases/2022/03/04/ukraine-council-introduces-temporary-protection-for-persons-fleeing-the-war/> (accessed March 10, 2022).