

Contents lists available at ScienceDirect

### Journal of Clinical Virology



journal homepage: www.elsevier.com/locate/jcv

## Evolution of an influenza pandemic in 13 countries from 5 continents monitored by protein microarray from neonatal screening bloodspots



E. de Bruin<sup>a,\*</sup>, J.G. Loeber<sup>a</sup>, A. Meijer<sup>a</sup>, G. Martinez Castillo<sup>b</sup>, M.L. Granados Cepeda<sup>c</sup>, M. Rosario Torres-Sepúlveda<sup>d</sup>, G.J.C. Borrajo<sup>e</sup>, M. Caggana<sup>f</sup>, Y. Giguere<sup>g</sup>, M. Meyer<sup>h</sup>, M. Fukushi<sup>i</sup>, A.R. Rama Devi<sup>j</sup>, I. Khneisser<sup>k</sup>, L. Vilarinho<sup>1</sup>, U. von Döbeln<sup>m</sup>, T. Torresani<sup>n</sup>, J. Mackenzie<sup>o</sup>, I. Zutt<sup>a</sup>, M. Schipper<sup>a</sup>, L.H. Elvers<sup>a</sup>, M.P.G. Koopmans<sup>a,p</sup>

<sup>a</sup> Laboratory for Infectious Diseases and Perinatal Screening, Center for Infectious Disease Control, National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands

<sup>d</sup> Universidad Autónoma de Nuevo León, Departamento de Genética, Facultad de Medicina, Monterrey, Mexico

<sup>e</sup> Fundación Bioquímica Argentina, Programa de Detección de Errores Congénitos, La Plata, Argentina

<sup>f</sup>New York State Department of Health, Biggs Laboratory, Albany, USA

<sup>g</sup> Programme Québécois de Dépistage Néonatal Sanguin, CHU de Québec, Québec, Canada

<sup>h</sup> North West University, Potchefstroom Campus, Potchefstroom, South Africa

<sup>i</sup> Sapporo City Institute of Public Health, Sapporo, Japan

<sup>j</sup> Rainbow Children Hospital, Hyderabad, India

<sup>k</sup> Neonatal Screening Laboratory, Medical Genetic Unit, Saint Joseph University, Beirut, Lebanon

<sup>1</sup>Neonatal Screening Unit, Genetics Department, National Institute of Health Dr Ricardo Jorge, Porto, Portugal

<sup>m</sup> Karolinska University Hospital Huddinge, Centre for Inherited Metabolic Disease, Stockholm, Sweden

<sup>n</sup> Universitäts Kinderklinik, Zürich, Switzerland

<sup>o</sup> Yorkhill Hospital, Scottish Newborn Screening Laboratory, Glasgow, United Kingdom

<sup>P</sup> Department of Virology, Erasmus Medical Center, Rotterdam, The Netherlands

#### ARTICLE INFO

Article history: Received 18 April 2014 Received in revised form 17 June 2014 Accepted 20 June 2014

Keywords: Influenza virus Pandemic Dried bloodspots Protein microarray Neonatal screening

#### ABSTRACT

Background: Because of lack of worldwide standardization of influenza virus surveillance, comparison between countries of impact of a pandemic is challenging. For that, other approaches to allow internationally comparative serosurveys are welcome.

Objectives: Here we explore the use of neonatal screening dried blood spots to monitor the trends of the 2009 influenza A (H1N1) pdm virus by the use of a protein microarray.

Study design: We contacted colleagues from neonatal screening laboratories and asked for their willingness to participate in a study by testing anonymized neonatal screening bloodspots collected during the course of the pandemic. In total, 7749 dried blood spots from 13 countries in 5 continents where analyzed by using a protein microarray containing HA1 recombinant proteins derived from pandemic influenza A (H1N1) 2009 as well as seasonal influenza viruses.

Results: Results confirm the early start of the pandemic with extensive circulation in the US and Canada, when circulation of the new virus was limited in other parts of the world. The data collected from sites in Mexico suggested limited circulation of the virus during the early pandemic phase in this country. In contrast and to our surprise, an increase in seroprevalence early in 2009 was noted in the dataset from Argentina, suggestive of much more widespread circulation of the novel virus in this country than in Mexico.

Conclusions: We conclude that this uniform serological testing of samples from a highly standardized screening system offers an interesting opportunity for monitoring population level attack rates of widespread diseases outbreaks and pandemics.

© 2014 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/3.0/).

Abbreviations: DBS, dried blood spot; HAI, hemagglutination inhibition test; MNT, microneutralization test.

Corresponding author at: National Institute for Public Health and the Environment, P.O. Box 1, 3720, BA Bilthoven, The Netherlands. Tel.: +31 302743738. E-mail address: erwin.de.bruin@rivm.nl (E. de Bruin).

http://dx.doi.org/10.1016/i.jcv.2014.06.020

1386-6532/© 2014 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/3.0/).

<sup>&</sup>lt;sup>b</sup> Unidad de Genetica, Hospital Espanol, Centro de Estudios Neonatales y Geneticos, Mexico State, Mexico

<sup>&</sup>lt;sup>c</sup> Instituto Naciional de Perinatologia, Mexico State, Mexico

#### 1. Background

In April 2009, a novel influenza A (H1N1) pdm virus emerged from Mexico, and guickly spread all over the world, causing a pandemic. It was estimated that the pandemic affected tens of millions of persons, but such estimates are difficult to obtain [1]. Surveillance across countries is not standardized, making direct comparison between countries of impacts of a pandemic based on case detection rates very difficult [2]. Population-based serological surveys can be helpful to get a better picture of the attack rate of an outbreak or widespread epidemic, and comparative analysis of age-structured seroprevalence data with notifications based on clinical parameters has helped determine population impact across age groups. To set up an active serological surveillance for influenza virus, serum samples should be collected on a regular basis, but this is not done routinely in most countries. As a result, the first population-based serological studies were reported eight-to-nine months after the initial start of the pandemic [2], when testing residual sera from diagnostic laboratories provided valuable information [3,4].

A second challenge when performing serological studies is the variability between laboratories, when using the gold standard test methods that employ biological reagents such as animal red blood cells (in hemagglutination inhibition assays (HAI)) or living cells (microneutralization test (MNT)) [5]. A review of studies from individual countries suggested differences in the proportion of persons with influenza A (H1N1) pdm cross-reactive antibodies prior to the pandemic in different countries, but it is difficult to disentangle test variation from true differences. Evaluation of such studies in the wake of the 2009 pandemic concluded that there is a need for more standardized approaches to serosurveys, including the laboratory testing, to determine the real impact of the pandemic more easily [6–8].

Dried blood spot (DBS) cards have been used for decades in neonatal screening [9]. The highly standardized, easy way of sampling and the stability of the DBS, once dried, are major advantages of this screening sample method [10]. The use of DBS for diagnostics is thus expanding, with applications based on detection of viral genome, antibodies and other molecules such as antiviral drugs [11,12].

#### 2. Objectives

Here, we explored the possible use of routinely collected dried blood spot cards from neonatal screening programs for serological surveillance of influenza virus by the use of protein microarray [13].

#### 3. Study design

Following notification of the emergence of a novel influenza virus strain in humans, we contacted colleagues from neonatal screening laboratories and asked for their willingness to participate in a study to monitor the trends of the influenza A (H1N1) pdm virus by testing anonymized neonatal screening bloodspots. In total, 15 laboratories worldwide agreed to participate. A study protocol was drafted and each participant checked compliance against local medical ethical rules. Laboratories were located in 13 different countries from 5 different continents (Supplemental Information 1). Participating laboratories agreed to collecting 10 randomly selected anonymized DBS per week, in concordance with policies of local ethical committees. The collection period differed per country (Table 1). After collection, DBS were stored at temperature (4 °C to room temperature) and humidity controlled environment, before

Download English Version:

# https://daneshyari.com/en/article/6120524

Download Persian Version:

https://daneshyari.com/article/6120524

Daneshyari.com