Blood donors and COVID-19 surveillance

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The Danish Blood Donor Study

BLOOD DONORS AND THE STUDY OR SURVEILLANCE OF INFECTIOUS DISEASES

Donor Transaminase and Recipient Hepatitis

Impact on Blood Transfusion Services

Harvey J. Alter, MD; Robert H. Purcell, MD; Paul V. Holland, MD;
David W. Alling, MD; Deloris E. Koziol, MT(ASCP)

• **To assess the relationship of donor alanine aminotransferase (ALT) level to recipient hepatitis, 283 transfused patients were prospectively followed up after open heart surgery; hepatitis developed in 12.7%, of which 97% was non-A, non-B. The ALT tests on 3,359 donors to these patients indicated that risk of hepatitis was significantly associated with the level of donor ALT; 29% of 52 patients receiving at least 1 unit of blood with an ALT level greater than 53 IU/L had hepatitis develop (20.7 cases per 1,000 units), compared with 9% of 231 recipients of only blood with an ALT level of 53 IU/L or less (7.8 cases per 1,000 units). Calculation of corrected efficacy predicts that, at an exclusion level equivalent to 2.25 SDs above the mean log for normal subjects, ALT testing of donors could prevent 29% of posttransfusion hepatitis at the loss of 1.6% of donor units.**

(*JAMA* 1981;246:630-634)

were tested by solid-pha
noassay.

**Criteria for Diag
of Posttransfusion**

Hepatitis was diagnosed
two and 26 weeks after
patient with a normal pr
level demonstrated a rise
ALT to 2.5 times the upper
(110 IU/L), followed one
later by an elevation at lea
upper limit of normal (88
causes of transaminase el
drug toxic hepatitis, anes
ism, anoxia, shock, congest

The search for the Australia Antigen in transfusion recipients led to the discovery of HBV

A Serum Antigen (Australia Antigen) in Down's Syndrome, Leukemia, and Hepatitis

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DAVID A. HUNGERFORD, PH.D., W. THOMAS LONDON, M.D.,
and ALTON I. SUTNICK, M.D., F.A.C.P.
Philadelphia, Pennsylvania

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Current Trends Update on Acquired Immune Deficiency Syndrome (AIDS) --United States

Between June 1, 1981, and September 15, 1982, CDC received reports of 593 cases of acquired immune deficiency syndrome (AIDS).* Death occurred in 243 cases (41%).

Analysis of reported AIDS cases shows that 51% had Pneumocystis carinii pneumonia (PCP) without Kaposi's sarcoma (KS) (with or without other "opportunistic" infections (OOI) predictive of immunodeficiency); 30% had KS without PCP (with or without OOI); 7% had both PCP and KS (with or without OOI); and 12% had OOI with neither PCP nor KS. The overall mortality rate for without KS (47%) was more than twice that for cases of KS without PCP (21%), while the rate for cases of both PCP and KS (68%) was more than three times as great. The mortality rate for OO KS nor PCP was 48%.

The incidence of AIDS by date of diagnosis (assuming an almost constant population at risk) has roughly doubled every half-year since the second half of 1979 (Table 1). An average of one to tw diagnosed every day. Although the overall case-mortality rate for the current total of 593 is 41%, the rate exceeds 60% for cases diagnosed over a year ago.

Almost 80% of reported AIDS cases in the United States were concentrated in six metropolitan areas, predominantly on the east and west coasts of the country (Table 2). This distribution was not reflection of population size in those areas; for example, the number of cases per million population reported from June 1, 1981, to September 15, 1982, in New York City and San Francisco was times greater than that of the entire country. The 593 cases were reported among residents of 27 states and the District of Columbia, and CDC has received additional reports of 41 cases from 10 countries.

Approximately 75% of AIDS cases occured among homosexual or bisexual males (Table 3), among whom the reported prevalence of intravenous drug abuse was 12%. Among the 20% of knowr cases (males and females), the prevalence of intravenous drug abuse was about 60%. Haitians residing in the United States constituted 6.1% of all cases (2), and 50% of the cases in which both h activity and intravenous drug abuse were denied. Among the 14 AIDS cases involving males under 60 years old who were not homosexuals, intravenous drug abusers, or Haitians, two (14%) had A.** (3)

ORIGINAL ARTICLE

Investigational Testing for Zika Virus among U.S. Blood Donors

Paula Saá, Ph.D., Melanie Proctor, B.S., Gregory Foster, B.A.,
David Krysztof, M.B.A., Colleen Winton, B.A., Jeffrey M. Linnen, Ph.D.,
Kui Gao, Ph.D., Jaye P. Brodsky, B.S., Ronald J. Limberger, Ph.D.,
Roger Y. Dodd, Ph.D., and Susan L. Stramer, Ph.D.

West Nile Virus among Blood Donors in the United States, 2003 and 2004

Susan L. Stramer, Ph.D., Chyang T. Fang, Ph.D., Gregory A. Foster, B.S.,
Annette G. Wagner, M.S., Jaye P. Brodsky, B.S., and Roger Y. Dodd, Ph.D.

Hepatitis E virus in blood components: a prevalence and transmission study in southeast England

Patricia E Hewitt, Samreen Ijaz, Su R Brailsford, Rachel Brett, Steven Dicks, Becky Haywood, Iain T R Kennedy, Alan Kitchen, Poorvi Patel, John Poh, Katherine Russell, Kate I Tettmar, Joanne Tossell, Ines Ushiro-Lumb, Richard S Tedder

Lancet 2014; 384: 1766–73

Summary

Background The prevalence of hepatitis E virus (HEV) genotype 3 infections in the English population (including

TRANSFUSION COMPLICATIONS

Screening of blood donors for chronic *Coxiella burnetii* infection after large Q fever outbreaks

Ed Slot,[1] Boris M. Hogema,[1] Michel Molier,[1] and Hans L. Zaaijer[1,2]

WHY USE BLOOD DONORS FOR SURVEILLANCE?

What we want for surveillance:

- To screen a population or a subset of a population for an infection
- The population must be well-defined
- The participation rate must be high
- The incidence/prevalence must mirror the background population
- The population must be constant over time

What we have:

- Blood donors comprise about 5% of citizens aged 17-70
- The population is healthy but well characterised
- Blood donations are geographically well distributed
- The blood bank infrastructure is well-suited for large-scale population studies

INFECTION FATALITY RATE

The seroprevalence in donors April-May 2020 was used to estimate the cumulated number of infected individuals in the background population.

Together with the background population mortality we calculated the IFR in 17-69-year-old Danes:

89/100,000 infections (~1‰)

We then invited retired donors for a seroprevalence survey and estimated the IFR in ≥70-year-old Danes:

5000/100,000 infections (=5%)

Clinical Infectious Diseases

MAJOR ARTICLE

Estimation of SARS-CoV-2 Infection Fatality Rate by Real-time Antibody Screening of Blood Donors

Christian Erikstrup,[1,2] Christoffer Egeberg Hother,[3] Ole Birger Vestager Pedersen,[4] Kåre Mølbak,[5] Robert Leo Skov,[5] Dorte Kinggaard Holm,[6] Susanne Gjørup Sækmose,[4] Anna Christine Nilsson,[6] Patrick Terrence Brooks,[3] Jens Kjærgaard Boldsen,[1,2] Christina Mikkelsen,[3,7] Mikkel Gybel-Brask,[3] Erik Sørensen,[3] Khoa Manh Dinh,[1,2] Susan Mikkelsen,[1,2] Bjarne Kuno Møller,[1,2] Thure Haunstrup,[8] Lene Harritshøj,[3] Bitten Aagaard Jensen,[8] Henrik Hjalgrim,[9] Søren Thue Lillevang,[6] and Henrik Ullum[3]

[1]Department of Clinical Immunology, Aarhus University Hospital, Aarhus, Denmark, [2]Department of Clinical Medicine Aarhus University, Aarhus, Denmark, [3]Department of Clinical Immunology, Copenhagen University Hospital, Copenhagen, Denmark, [4]Department of Clinical Immunology, Zealand University Hospital, Naestved, Denmark, [5]Infection Control, Statens Serum Institut, Copenhagen, Denmark, [6]Department of Clinical Immunology, Odense University Hospital, Odense, Denmark, [7]Novo Nordisk Foundation Center for Basic Metabolic Research, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark, [8]Department of Clinical Immunology, Aalborg University Hospital, Aalborg, Denmark, and [9]Department of Epidemiology Research, Statens Serum Institut, Copenhagen, Denmark

Clinical Infectious Diseases

MAJOR ARTICLE

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Infection Fatality Rate Among Elderly Danes: A Cross-sectional Study on Retired Blood Donors

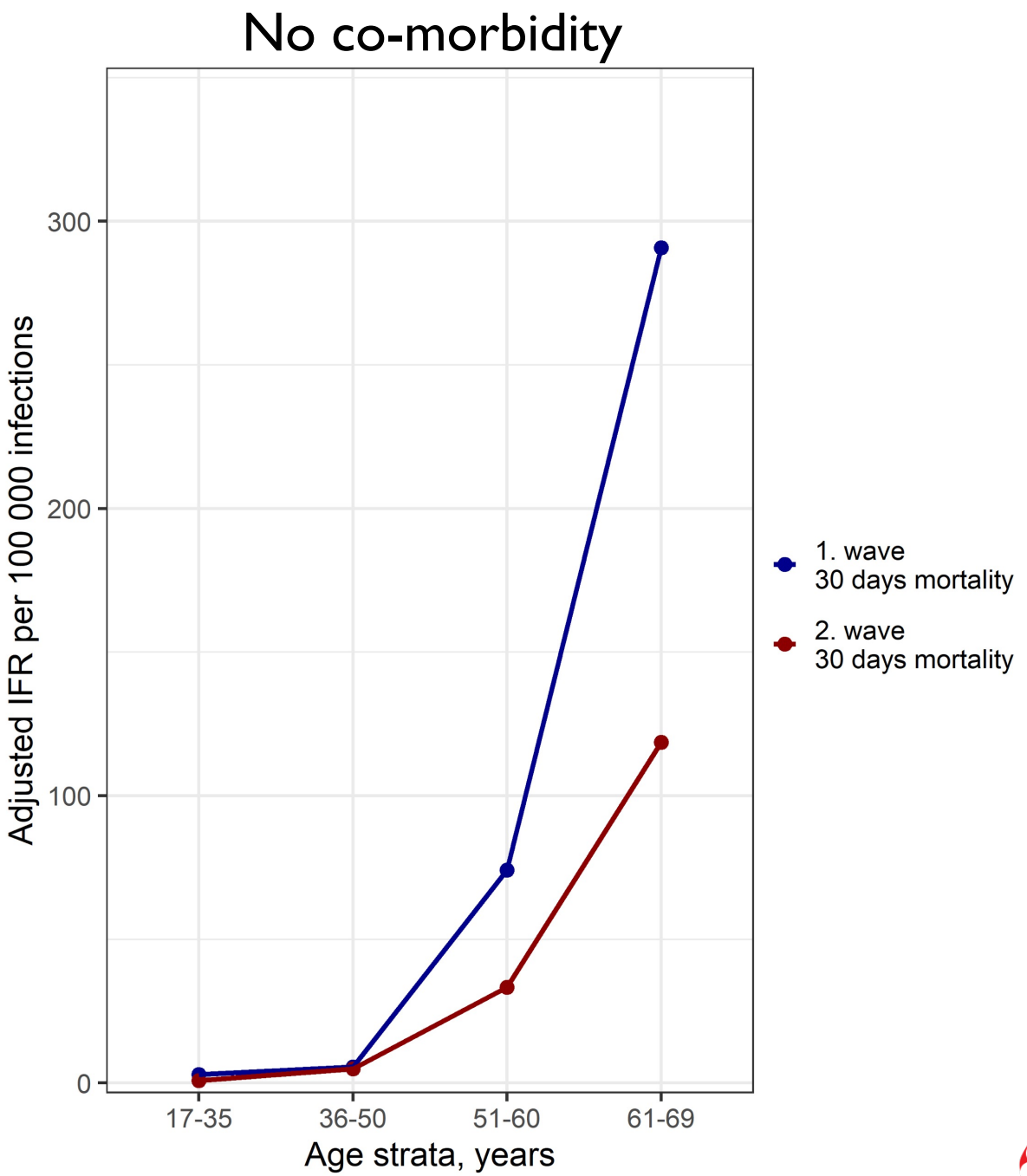
Ole Birger Pedersen,[1,2] Janna Nissen,[3] Khoa Manh Dinh,[4] Michael Schwinn,[3] Kathrine Agergård Kaspersen,[4,5] Jens Kjærgaard Boldsen,[4,5] Maria Didriksen,[3] Joseph Dowsett,[3] Erik Sørensen,[3] Lise Wegner Thørner,[3] Margit Anita Hørup Larsen,[3] Birgitte Grum-Schwensen,[1] Susanne Sækmose,[1] Isabella Worlewenut Paulsen,[1] Nanna Lond Skov Frisk,[1] Thorsten Brodersen,[1] Lasse Skafte Vestergaard,[6] Klaus Rostgaard,[7] Kåre Mølbak,[6] Robert Leo Skov,[6] Christian Erikstrup,[4,a] Henrik Ullum,[2,3,a] and Henrik Hjalgrim[2,7,8,a]

RECALCULATION OF INFECTION FATALITY RATE

More than 200,000 donations have been tested for SARS-CoV-2 antibodies (Wantai total Ig)

IFR for 1st (peak in March 2020) and 2nd (peak in December) wave.

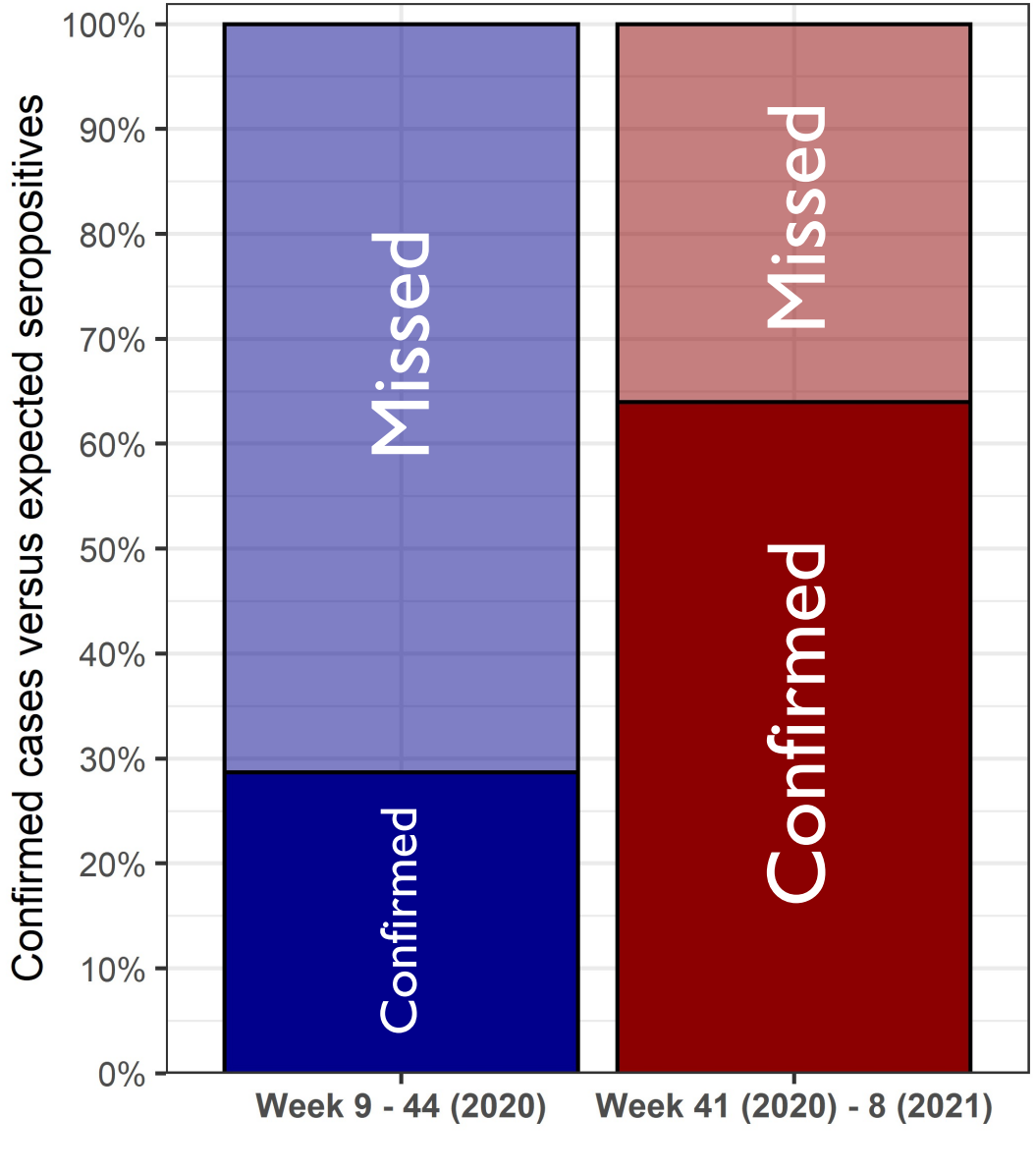
Using register data from age and comorbidity stratified COVID-19 – related mortality in Denmark.



VIRAL TESTS - HOW MANY INFECTIONS DO WE MISS?

The seroprevalence was used to estimate the percentage of infections not detected by PCR and antigen tests

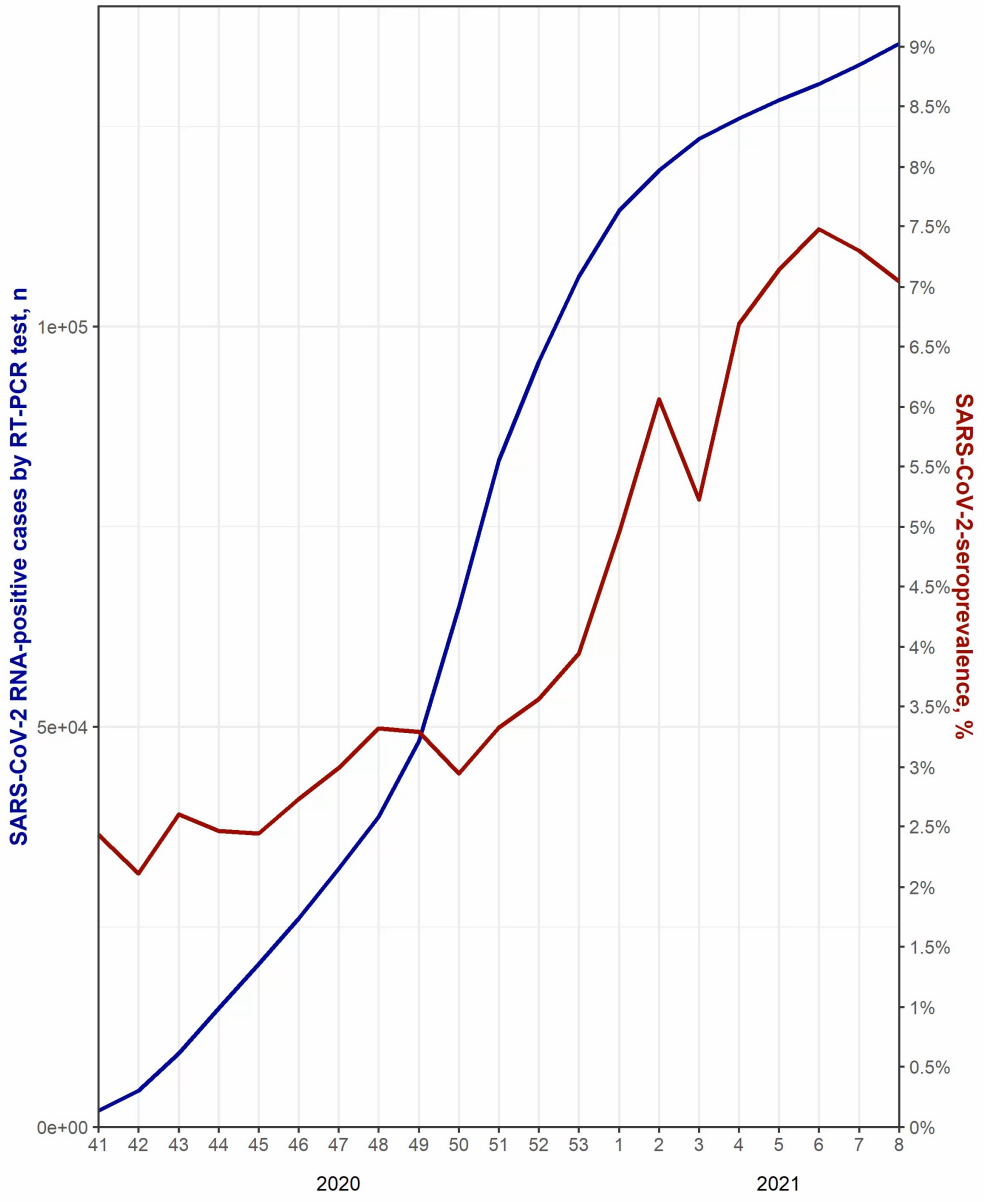
The percentage of undetected infections is decreasing over time with the scale-up of testing



SEROSURVEILLANCE REACTION TIME

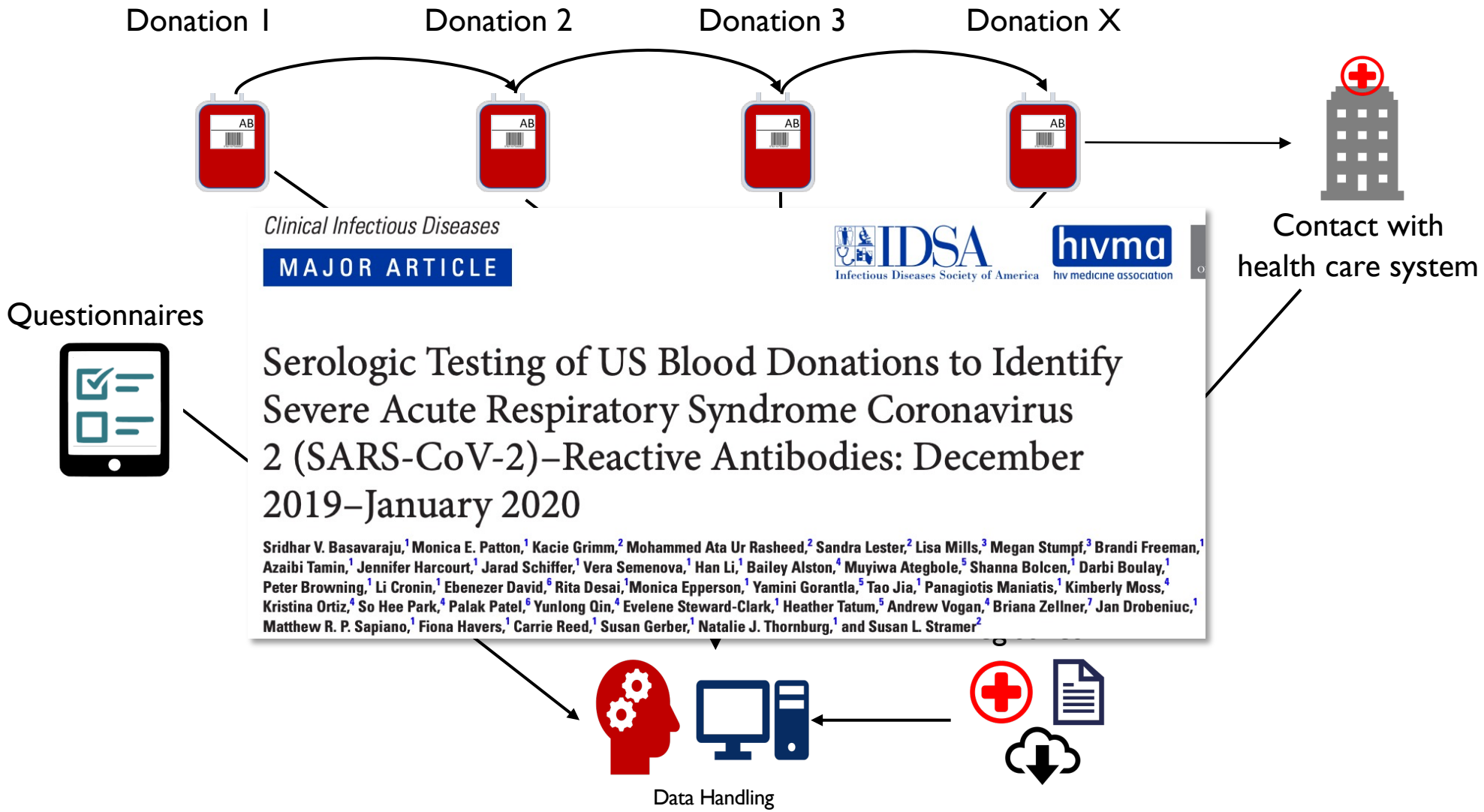
Lag period from infection incidence increase to seroprevalence increase

Weekly (week 41, 2020 to 8, 2021) numbers of SARS-CoV-2 PCR-pos samples in Denmark (approx. 5,800,000 citizens) and weekly seroprevalence estimates in Danish donors (based on approx. 125,000 tests). Manuscript under preparation.



YET UNPUBLISHED

- Anti-N IgG: the test works
- 5,000 donors from week 3: 15% seroprevalence
- 6,000 donors from week 5: 20% seroprevalence


Donation 1
Donation 2
Donation 3
Donation X
AB
AB
AB
AB
Contact with health care system
Questionnaires
Clinical Infectious Diseases
MAJOR ARTICLE
IDSA
Infectious Diseases Society of America
hivma
hiv medicine association
Serologic Testing of US Blood Donations to Identify Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)–Reactive Antibodies: December 2019–January 2020
Sridhar V. Basavaraju,[1] Monica E. Patton,[1] Kacie Grimm,[2] Mohammed Ata Ur Rasheed,[2] Sandra Lester,[2] Lisa Mills,[3] Megan Stumpf,[3] Brandi Freeman,[1] Azaibi Tamin,[1] Jennifer Harcourt,[1] Jarad Schiffer,[1] Vera Semenova,[1] Han Li,[1] Bailey Alston,[4] Muyiwa Ategbole,[5] Shanna Bolcen,[1] Darbi Boulay,[1] Peter Browning,[1] Li Cronin,[1] Ebenezer David,[6] Rita Desai,[1] Monica Epperson,[1] Yamini Gorantla,[5] Tao Jia,[1] Panagiotis Maniatis,[1] Kimberly Moss,[4] Kristina Ortiz,[4] So Hee Park,[4] Palak Patel,[6] Yunlong Qin,[4] Evelene Steward-Clark,[1] Heather Tatum,[5] Andrew Vogan,[4] Briana Zellner,[7] Jan Drobeniuc,[1] Matthew R. P. Sapiano,[1] Fiona Havers,[1] Carrie Reed,[1] Susan Gerber,[1] Natalie J. Thornburg,[1] and Susan L. Stramer[2]
Data Handling

BLOOD DONOR BIOBANKS AND SURVEILLANCE

Blood donors and transfusion recipients have helped produce knowledge about infections for 100 years

Blood donation facilities operate year-round, all over the world – also during a pandemic – and has the infrastructure to test and host biobanks

Blood donors are healthy and vulnerable citizens are underrepresented; the population is stable (≅100% participation rate) with no changes in selection over time

During the current pandemic, blood donor testing for SARS-CoV-2 antibodies was implemented quickly in a range of countries

Blood donor biobanks could be part of future preparedness plans

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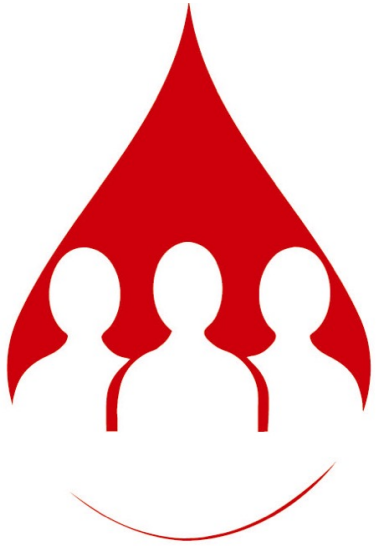
Thanks to our blood donors!



EXAMPLES OF KNOWLEDGE GAINED FROM SARS-COV-2 SEROPREVALENCE STUDIES

Seroprevalence in blood donors in The Netherlands, early last Spring

Archive samples from before the pandemic were used to ascertain seroconversion

– Unique feature of blood donor biobanks: sequential blood samples

Clinical Infectious Diseases

MAJOR ARTICLE

Estimation of SARS-CoV-2 Infection Fatality Rate by Real-time Antibody Screening of Blood Donors

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nature COMMUNICATIONS

ARTICLE

https://doi.org/10.1038/s41467-020-19481-7 OPEN

Low SARS-CoV-2 seroprevalence in blood donors in the early COVID-19 epidemic in the Netherlands

Ed Slot[1,2,12✉], Boris M. Hogema[1,3,12], Chantal B. E. M. Reusken[4,5], Johan H. Reimerink[4], Michel Molier[1], Jan H. M. Karregat[6], Johan IJlst[7], Věra M. J. Novotný[8], René A. W. van Lier[9,10] & Hans L. Zaaijer[1,3,11✉]