

# Ontario Critical Care Clinical Practice Rounds (OC<sub>3</sub>PR): COVID-19

May 11 2023

**From Polio to COVID19:  
Lessons from the Past for the Future**

Chaired by Dr. Dave Neilipovitz  
Presented by Dr. Hannah Wunsch



## Meeting Etiquette



• Attendees can submit questions to Q&A in the Zoom icon in the menu



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# From Polio to COVID-19: Lessons from the past for the future

**Hannah Wunsch, MD MSc**

**Staff Physician, Department of Critical Care Medicine,  
Sunnybrook Health Sciences Centre  
Professor of Anesthesiology and Critical Care, University of Toronto  
Canada Research Chair, Critical Care Organization and Outcomes**

# Disclosures

Book coming out (*The Autumn Ghost*) in May 2023,  
Greystone Books

## Research Funding

Department of Defense (US)

NIH (US)

CIHR (Canada)

AFP (Canada)

# AN ORIGIN STORY



# THIS ORIGIN STORY...



"As an intern in 1952, we admitted patients with AMI wherever a bed was available on the medical service, but always as far from the nurses' station as possible, so that they would not be disturbed by the commotion, especially the frequent telephone ringing. It was not uncommon for me, when arriving on the medical floor at 6 am to draw blood to be sent for testing, to discover that one of my AMI patients had died quietly during the night...older physicians accepted this as 'just the way it was.'"

-- Dr. Eugene Braunwald  
*European Heart J 2012*

# 70 YEARS AGO

- No invasive mechanical ventilation
- Oxygen through masks or “tents”
- No blood gases
- A few antibiotics
- No ICUs
- **Lots of poliomyelitis**





# POLIO

Fever

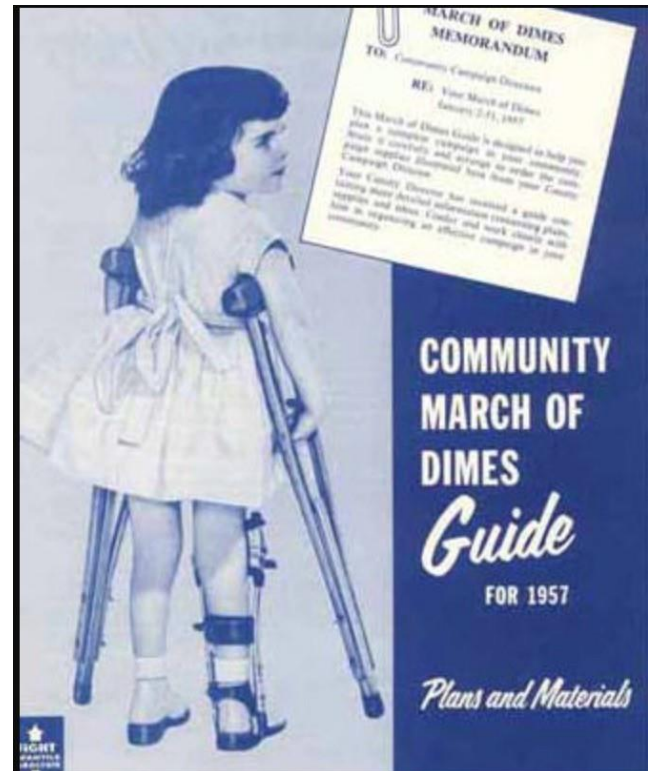
Nausea

Lethargy

Headache

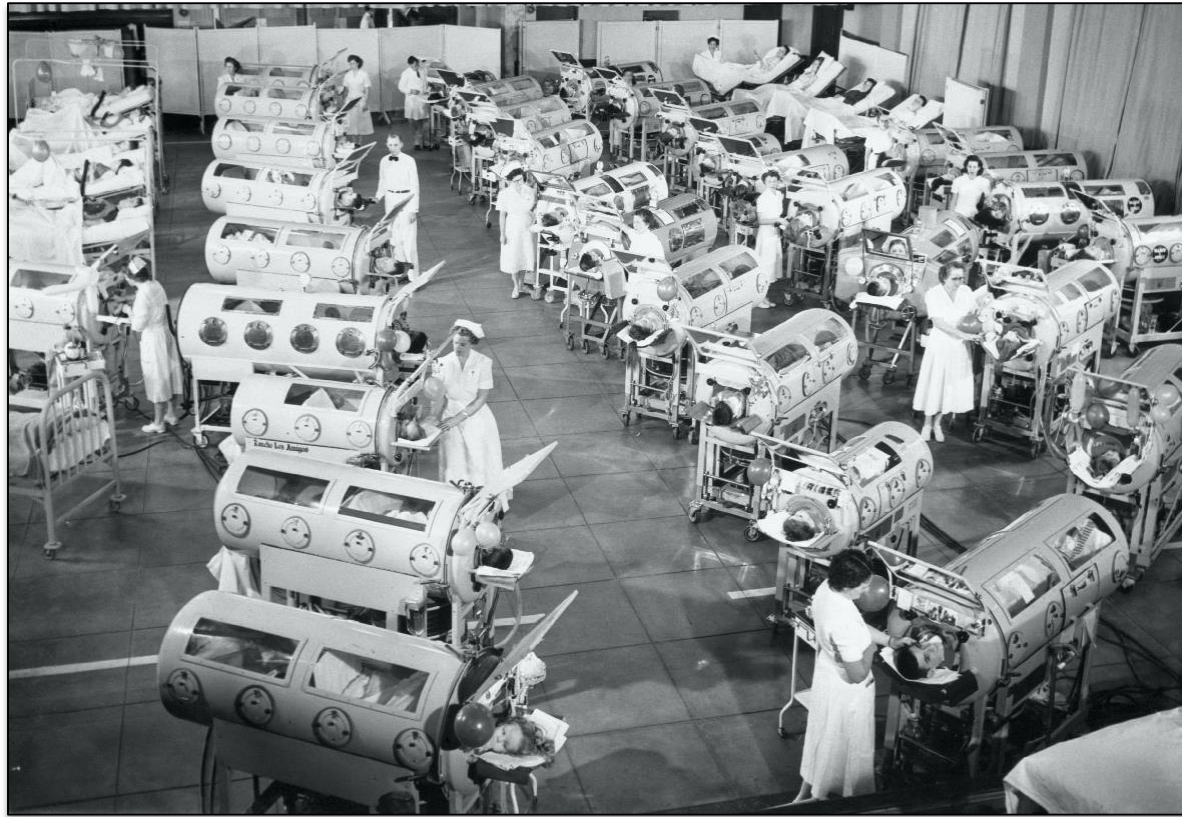
Sore throat

Neck stiffness

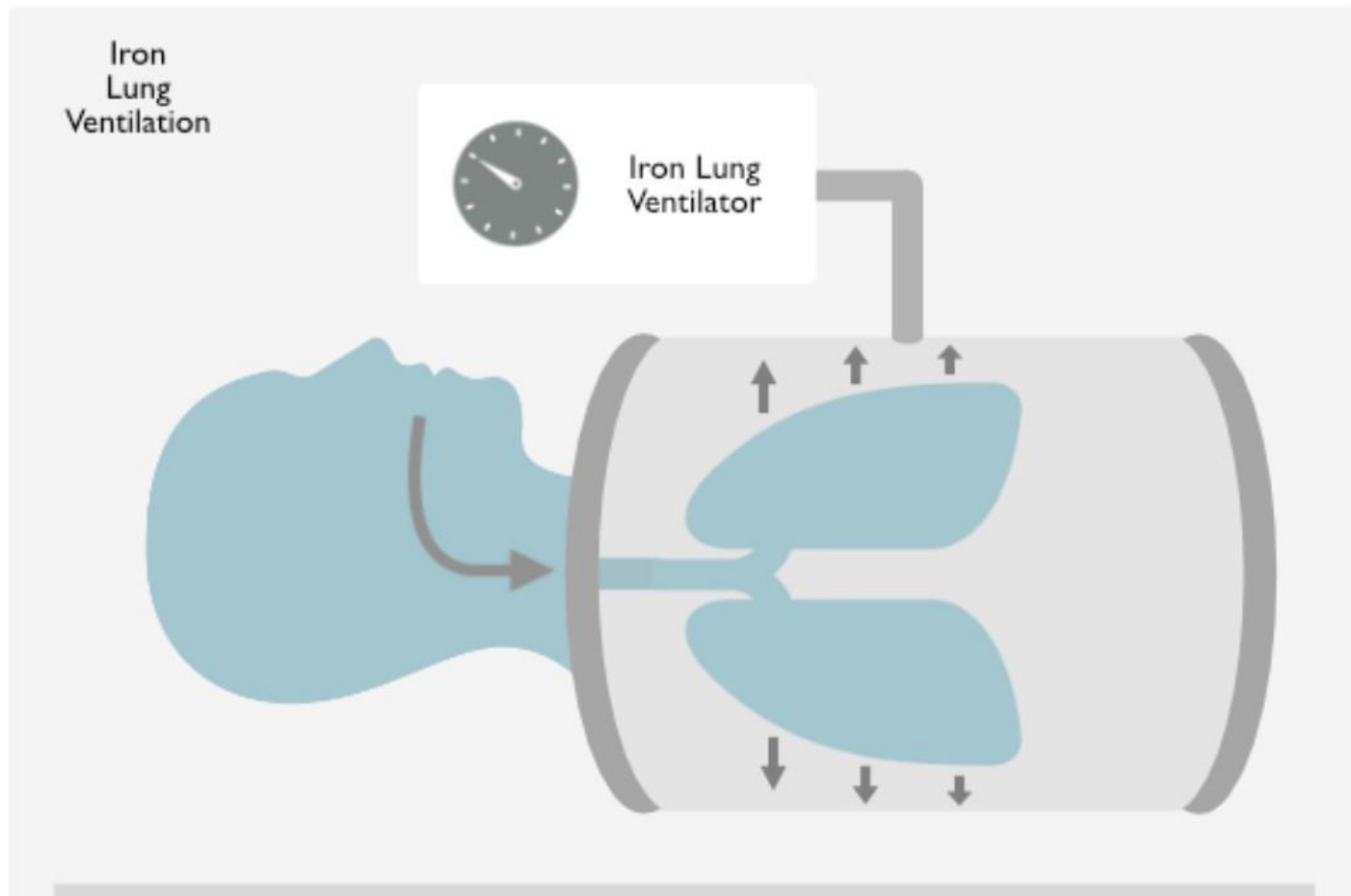




# POLIO = IRON LUNG



## Negative Pressure Ventilation



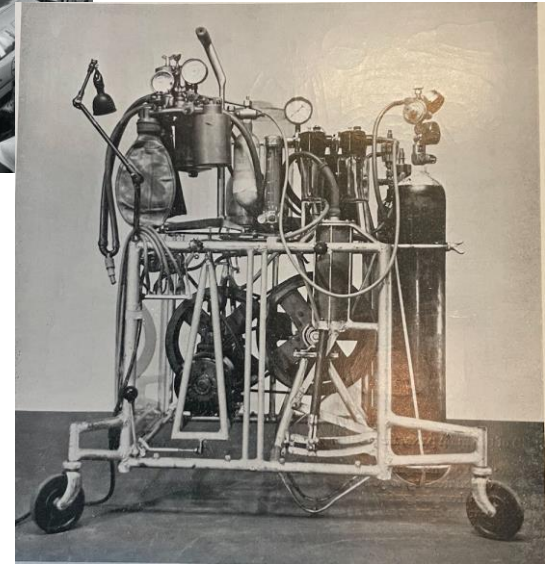
# By 1950s



Dandy with members of his "Brain Team."



Acute dialysis during the Korean War (1952)



<http://roadstothegreatwar-ww1.blogspot.com/2019/02/wound-or-physiologic-shock-and-great-war.html>  
<https://wedns.org/2014/04/recognizing-dandys-contributions-on-his-birthday/>  
<https://www.freseniusmedicalcare.com/en/media/insights/company-features/the-history-of-dialysis>



**NORWAY**

**SWEDEN**

**NORTH  
SEA**

**DENMARK**  
**COPENHAGEN**

**BALTIC  
SEA**

**UNITED  
KINGDOM**

**NETHERLANDS**

**POLAND**

**GERMANY**

**BELGIUM**

**CZECH  
REPUBLIC**

**FRANCE**



# THE BLEGDAM HOSPITAL

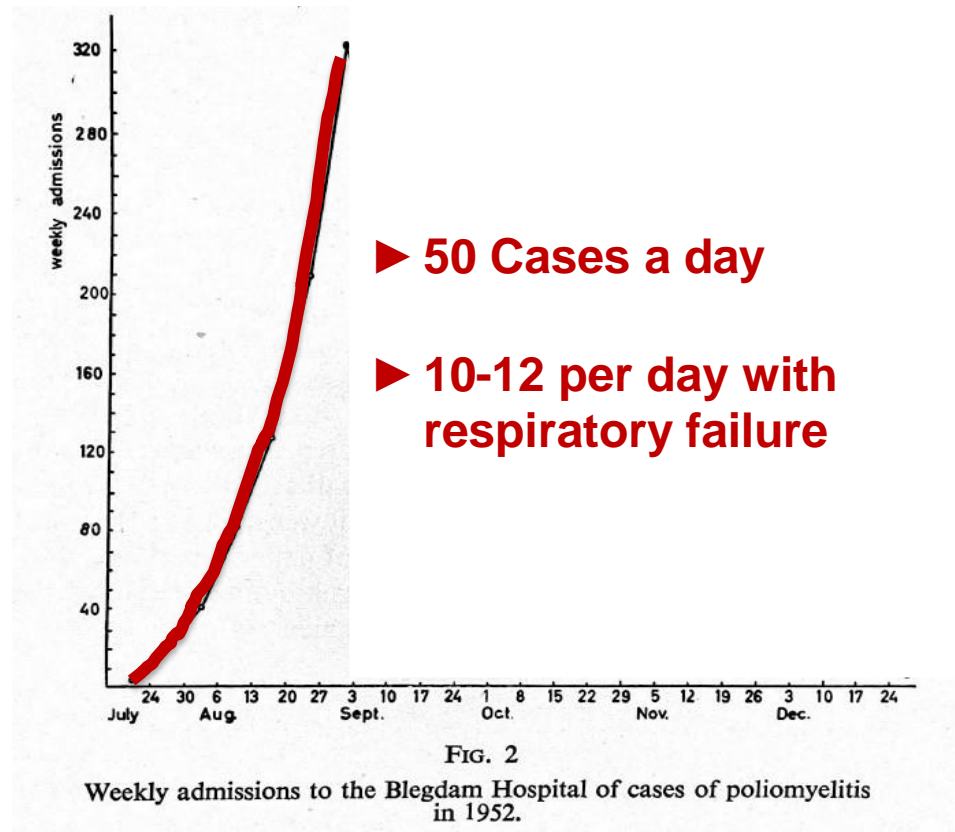


# Henry Cai Alexander (HCA) Lassen



Medical museum, Copenhagen

# SUMMER 1952 - COPENHAGEN





1952

8<sup>th</sup> MONTH

# AUGUST

8<sup>th</sup> MONTH

1952

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
	WAXED PAPERS	Food PROTECTION PAPERS	WRAPPING PAPERS	Genuine VEGETABLE PARCHMENT	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 31	<b>25</b>	26	27	28	29	30

1952 JULY 1952

	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17
18	19	20	21	22	23
24	25	26	27	28	29
30	31				

**KVP** KALAMAZOO VEGETABLE PARCHMENT CO.  
PARCHMENT - MICHIGAN  
PERMANENT - PENNSYLVANIA

1952 SEPTEMBER 1952

	1	2	3	4	5	6
7	8	9	10	11	12	13
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28	29	30				

OTHER COMPANIES: 

500 E. GORHAM STREET, KALAMAZOO, MICHIGAN  
OFFICIAL PAPER PRODUCTS COMPANY, HARTFORD, CONNECTICUT

500 GORHAM ST. PERMA, PERMANENT, PENNSYLVANIA  
OFFICIAL PAPER PRODUCTS CO., GIBBSVILLE, OHIO



# BJØRN IBSEN AND CARBON DIOXIDE



Courtesy of Ibsen family

# The Brinkman Carbovisor

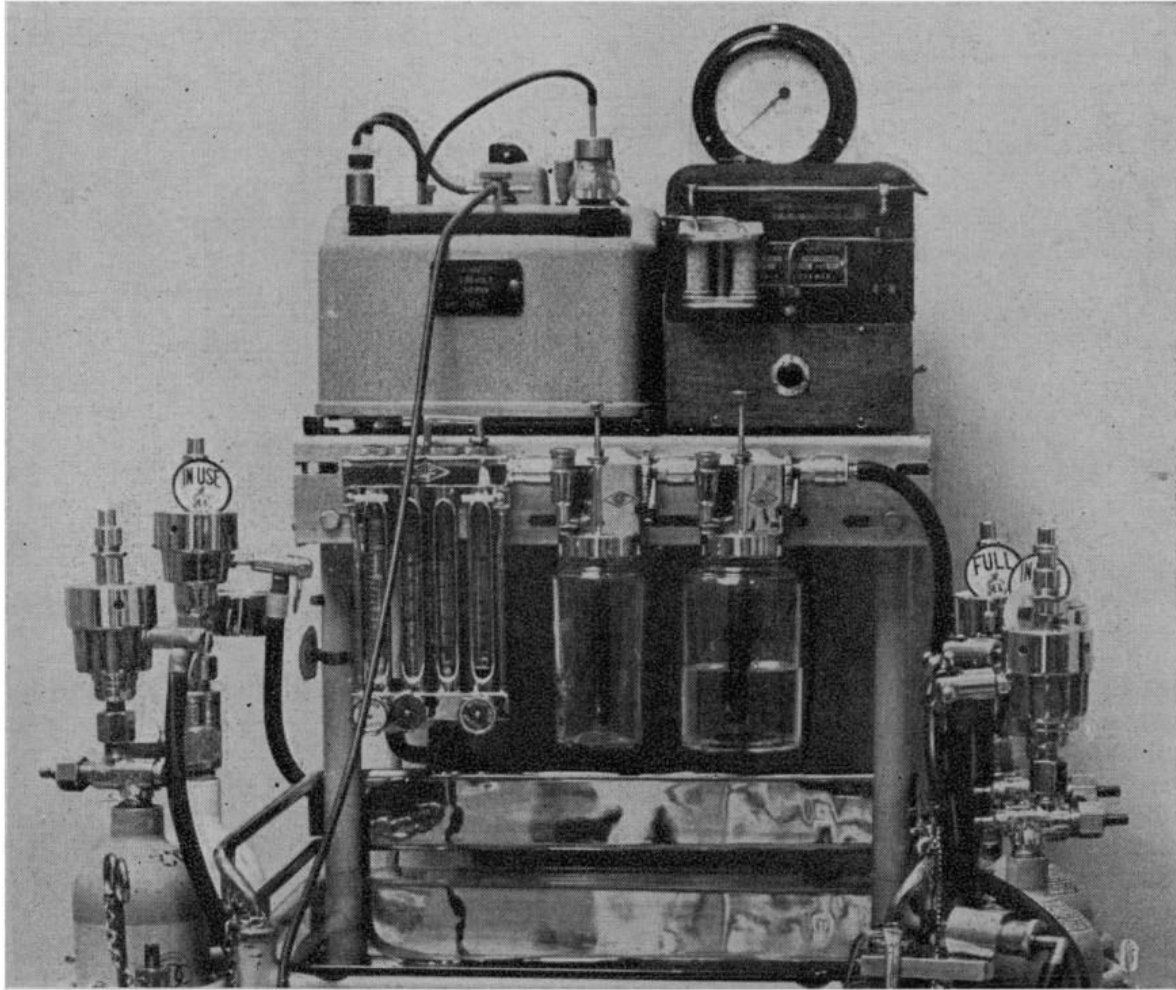


FIG. 2.—Carbovisor and oxygen analyser.

# WATERS TO-AND-FRO CIRCUIT

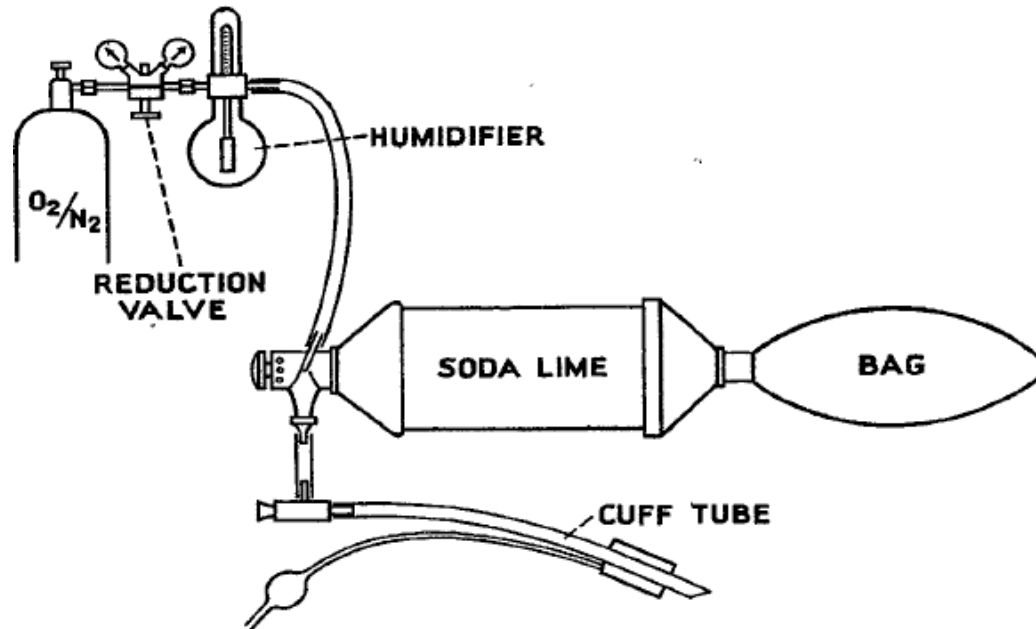



Fig. 3—Apparatus for administration of bag ventilation.

Lassen, *The Lancet* 1953



1952 8<sup>th</sup> MONTH **AUGUST** 8<sup>th</sup> MONTH 1952

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
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1952		JULY							1952	
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27	28	29	30	31						

**KVP** KALAMAZOO VEGETABLE PARCHMENT CO.  
PARCHMENT - MICHIGAN  
19500 - PENNSYLVANIA

1952		SEPTEMBER							1952	
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.	SUN.	MON.		
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21	22	23	24	25	26	27	28	29		
28	29	30								

OTHER COMPANIES:

THE KVP COMPANY LIMITED, WILFORD, ENGLAND  
APPLICATED PAPER PRODUCTS COMPANY, WASHINGTON, D.C.

FOR CONTACT IN U.S.A., MICHIGAN, TEXAS  
CONTACT PAPER PRODUCTS CO., WOODBRIDGE, MICHIGAN

# VIVI EBERT



Photos courtesy of Sven Erik Riedel (cousin)



1952 8<sup>th</sup> MONTH **AUGUST** 8<sup>th</sup> MONTH 1952

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
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13	14	15	16	17	18	19	20	21		
20	21	22	23	24	25	26	27	28		
27	28	29	30	31						

**KALAMAZOO**  
**KVP** VEGETABLE  
PARCHMENT CO.  
PARCHMENT - MICHIGAN  
PAPER - PENNSYLVANIA

1952		SEPTEMBER							1952	
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.	SUN.	MON.		
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14	15	16	17	18	19	20	21	22		
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28	29	30								

OTHER COMPANIES:

THE KVP COMPANY LIMITED, WILFORD, ENGLAND  
APPLICATED PAPER PRODUCTS COMPANY, HAMILTON, ONTARIO

FOR CONTACT IN U.S.A., MICHIGAN, U.S.A.  
CONTACT PAPER PRODUCTS CO., HERRICK, MICHIGAN

**12.52pm:** oxygen saturation 84%.

**12.54pm:** Respiration [Illegible], 100% oxygen.

**12.55pm:** Patient very restless. CO2 6 ½%.

**12.57pm:** We need to stop the oxygen in order to suck out the  
immediately and severely cyanotic and her condition  
100% oxygen again.

Blood pressure 150, pulse 94, respirations 40; always re  
her arms. 6% CO2. Patient unconscious.

**01.02pm:** CO2 7 ½%. Started active support of breathing

**01.06pm:** CO2 7%.

**01.17pm:** patient still very restless. 130 blood pressure, pulse irregular.

We have rising carbon dioxide and are now in a situation  
perform the ventilation because of her spasms and agi  
administer Pentothal 100 mg.

**01:32pm:** [In Ibsen's Handwriting] patient immediately calm and m

Pulse 146, blood pressure 80.

The patient is immediately warm and dry/

**Now in a situation  
where we can not  
perform ventilation  
because of her spasms  
and agitation**

**Therefore we  
administer  
pentothal 100 mg**

**The patient is  
immediately warm  
and dry**

Extract of medical record, ICM 2011

**ONLY ONE PROBLEM**

**No ventilators**

# STUDENT VENTILATORS



Medical museum, Copenhagen

**24 HRS A DAY, >1200 STUDENTS**



Medical museum, Copenhagen



# DR. ANNE HOLTEN JENSEN

(née Ingerslev)

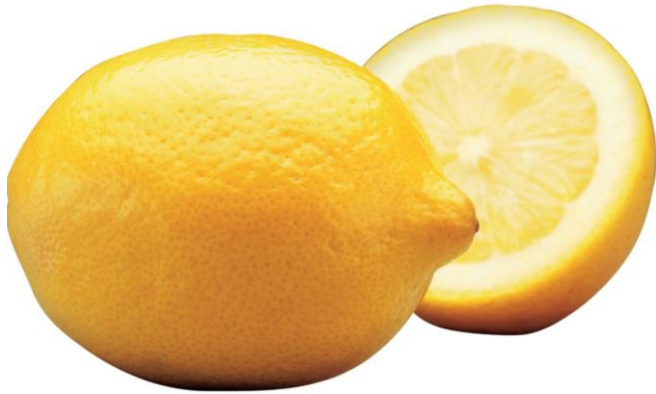


# “MECHANICAL STUDENTS”





# WOULD IT BE...?



# DR. POUL ASTRUP



Courtesy of Niels Astrup

# pH Monitoring

- Radiometer A/S for Carlsberg Brewery)



By January 1, 1953, we had done 705 determinations of  $pH$  in arterial or venous blood, from patients with threatened or manifest respiratory paralysis (Table I).

**“I NEED AN ASTRUP!”**

TABLE XXIX

MORTALITY RATES.—NEW METHODS OF TREATMENT INTRODUCED AUGUST 26, 1952. DATE OF REFERENCE: JANUARY 1, 1956

Group	Period of admission	No. of cases	Died	Per cent
I.	July 7–August 25	30	26	87
II.	August 26–September 7	50	25	50
III.	September 7–September 23	50	23	46
IV.	September 23–October 5	50	22	44
V.	October 6–October 20	50	15	30
VI.	October 21–November 6	50	18	36
VII.	November 7–December 19	50	13	26
VIII.	December 20–March 2	18	2	11
Total II.—VIII. ....		318	118	37

87%

36%

11%

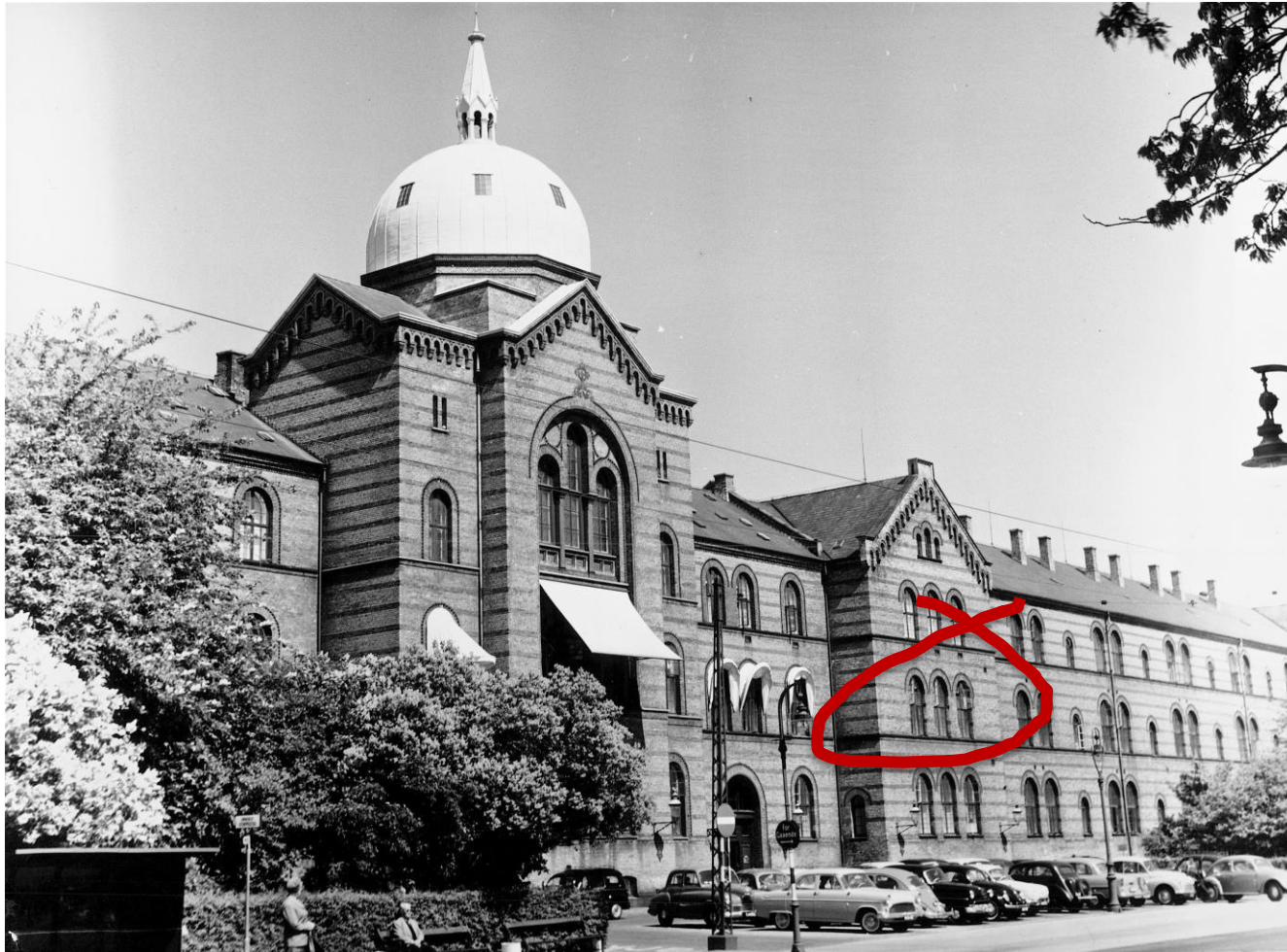
# NOT ALL SURVIVED

"I said little during the meal, concentrating on eating. I would occasionally return conversation, but rarely took the lead. As the dessert was served, one of the other guests unexpectedly cracked a bawdy joke. After a momentary embarrassed pause, all in the room roared with laughter, none more so than myself. It seemed that a safety valve had opened, and suddenly I felt able to cast off my reserve. But as I laughed the tears started to flow, and the laughs slowly changed into cries. Heart-wrenching, soulful wails. At first unnoticed, gradually, one by one the diners stopped laughing, until the whole table went silent and stared at me, their mouths open. I buried my head in my hands, and at last the cries and mourning and tears for the children came."

-Flemming Balstrup



# THE MUNICIPAL HOSPITAL



# Ibsen's ICU

- **Dedicated area**
- **24/7 staffing**
- Frequency of vitals/monitoring
- **Blood gas analysis**
- **Invasive mechanical ventilation**
- Other organ support
- **Specialized nursing**
- **Care for a range of patients**

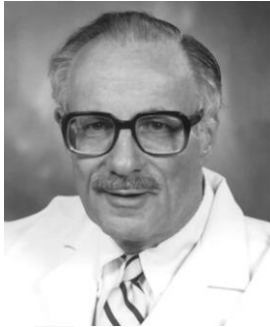


# 1958

Barrie Fairley



Max Harry Weil



Peter Safar

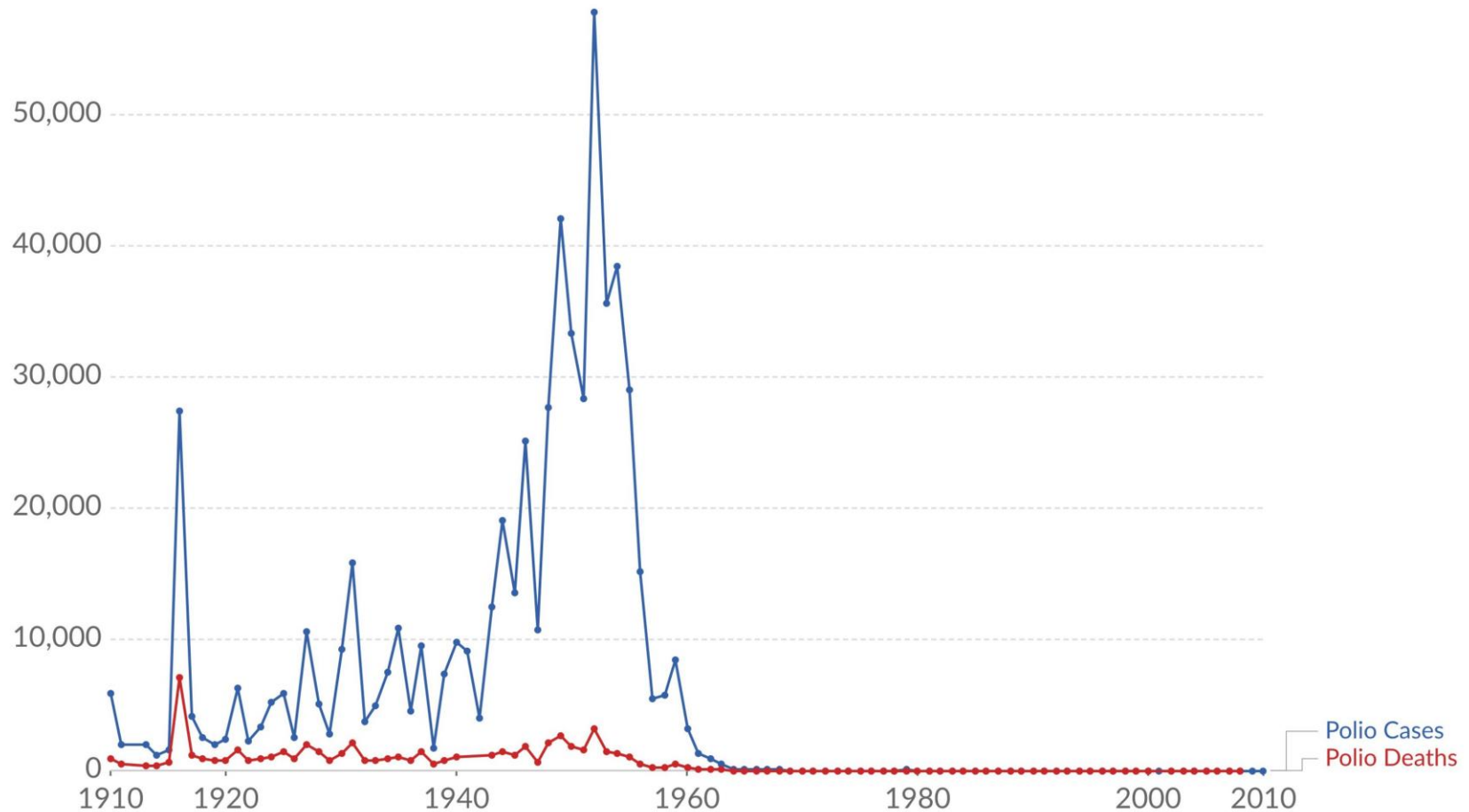


# What did we learn from polio?

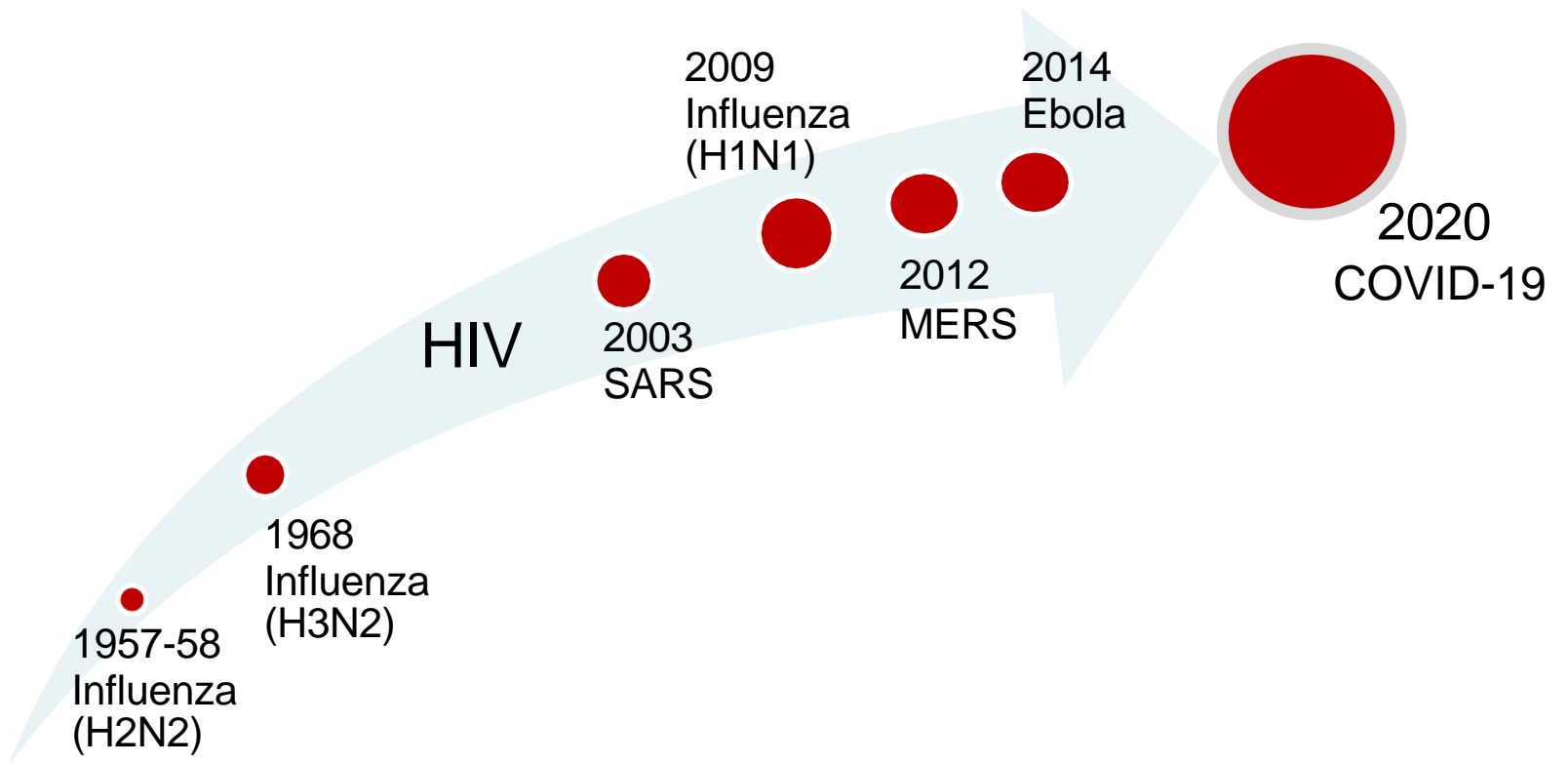
- **Positive pressure ventilation**
- **Blood gases**
- **Respiratory physiology**
- **ICUs**
- Rehabilitation
- Disability rights
- Vaccine development
- Long-term sequelae of viral illness

# Reported paralytic polio cases and deaths in the United States since 1910

The reported figures include both wild- and vaccine-derived type polio infections that occurred indigenously and as imported cases.



Source: Our World In Data based on US Public Health Service (1910-1951) and US Center for Disease Control (1960-2010)  
OurWorldInData.org/polio/ • CC BY



# SARS



**Wake Up!**



# In Canada...

Fowler *et al. Critical Care* (2015) 19:133  
DOI 10.1186/s13054-015-0852-6



RESEARCH

Open Access

## Critical care capacity in Canada: results of a national cross-sectional study

Robert A Fowler<sup>1,2\*</sup>, Philip Abdelmalik<sup>3</sup>, Gordon Wood<sup>4</sup>, Denise Foster<sup>5</sup>, Noel Gibney<sup>6</sup>, Natalie Bandrauk<sup>7</sup>, Alexis F Turgeon<sup>8</sup>, François Lamontagne<sup>9</sup>, Anand Kumar<sup>10</sup>, Ryan Zarychanski<sup>11</sup>, Rob Green<sup>12,13</sup>, Sean M Bagshaw<sup>14</sup>, Henry T Stelfox<sup>15</sup>, Ryan Foster<sup>16</sup>, Peter Dodek<sup>17</sup>, Susan Shaw<sup>18</sup>, John Granton<sup>19</sup>, Bernard Lawless<sup>20</sup>, Andrea Hill<sup>1,2</sup>, Louise Rose<sup>21</sup>, Neill K Adhikari<sup>1,2</sup>, Damon C Scales<sup>1,2</sup>, Deborah J Cook<sup>22</sup>, John C Marshall<sup>23</sup>, Claudio Martin<sup>24</sup>, Philippe Jouvét<sup>25</sup> and on behalf of the Canadian Critical Care Trials Group and The Canadian ICU Capacity Group

# EBOLA



REVIEW

Open Access



# Ebola virus disease and critical illness

Aleksandra Leligdowicz<sup>1</sup>, William A. Fischer II<sup>2</sup>, Timothy M. Uyeki<sup>3</sup>, Thomas E. Fletcher<sup>4,5</sup>, Neill K. J. Adhikari<sup>1,6</sup>, Gina Portella<sup>7</sup>, Francois Lamontagne<sup>8</sup>, Christophe Clement<sup>9</sup>, Shevin T. Jacob<sup>10</sup>, Lewis Rubinson<sup>11</sup>, Abel Vanderschuren<sup>12</sup>, Jan Hajek<sup>13</sup>, Srinivas Murthy<sup>14</sup>, Mauricio Ferri, Ian Crozier<sup>15</sup>, Elhadj Ibrahima<sup>16</sup>, Marie-Claire Lamah<sup>16</sup>, John S. Schieffelin<sup>17</sup>, David Brett-Major<sup>18</sup>, Daniel G. Bausch<sup>19</sup>, Nikki Shindo<sup>19</sup>, Adrienne K. Chan<sup>20</sup>, Tim O'Dempsey<sup>21</sup>, Sharmistha Mishra<sup>22</sup>, Michael Jacobs<sup>23</sup>, Stuart Dickson<sup>24</sup>, G. Marshall Lyon III<sup>25</sup> and Robert A. Fowler<sup>1,6\*</sup>

**Table 1** Chronological demographic description of 27 Ebola virus disease patients treated outside West Africa (August 2014–May 2015)

	Age (years)	Occupation	Country where Ebola virus infection occurred	Case presentation	Country of Hospitalisation	Hospital LOS (days)	Outcome
1 <sup>a</sup>	33	Health worker	Liberia	Medically evacuated	USA	19	Survived
2 <sup>a</sup>	59	Health worker	Liberia	Medically evacuated	USA	14	Survived
3	75	Non health worker	Liberia	Medically evacuated	Spain	5	Died
4	29	Health worker	Sierra Leone	Medically evacuated	UK	10	Survived
5 <sup>a</sup>	36	Health worker	Sierra Leone	Medically evacuated	Germany	30	Survived
6 <sup>a</sup>	51	Health worker	Liberia	Medically evacuated	USA	20	Survived
7 <sup>a</sup>	43	Health worker	Sierra Leone	Medically evacuated	USA	41	Survived
8	N/A	Health worker	Liberia	Medically evacuated	France	16	Survived
9	70	Nonhealth worker	Sierra Leone	Medically evacuated	Spain	3	Died
10 <sup>a</sup>	45	Unknown	Liberia	Imported infection	USA	8	Died
11 <sup>a</sup>	38	Health worker	Sierra Leone	Medically evacuated	Germany	47	Survived
12 <sup>a</sup>	44	Health worker	Spain	Secondary infection	Spain	30	Survived
13 <sup>a</sup>	33	Nonhealth worker	Liberia	Medically evacuated	USA	16	Survived
14	30	Health worker	Sierra Leone	Medically evacuated	Norway	13	Survived
15	56	Health worker	Liberia	Medically evacuated	Germany	6	Died
16 <sup>a</sup>	26	Health worker	USA	Secondary infection	USA	13	Survived
17 <sup>a</sup>	29	Health worker	USA	Secondary infection	USA	14	Survived
18	33	Health worker	Guinea	Imported infection	USA	19	Survived
19	N/A	Nonhealth worker	Sierra Leone	Medically evacuated	France	21	Survived
20 <sup>a</sup>	44	Health worker	Sierra Leone	Medically evacuated	USA	2	Died
21 <sup>a</sup>	43	Health worker	Sierra Leone	Medically evacuated	Switzerland	15	Survived
22	50	Health worker	Sierra Leone	Medically evacuated	Italy	38	Survived
23	N/A	Nonhealth worker	Liberia	Medically evacuated	Netherlands	13	Survived
24	39	Health worker	Sierra Leone	Imported infection	UK	25	Survived
25	25	Health worker	Sierra Leone	Medically evacuated	UK	15	Survived
26	N/A	Health worker	Sierra Leone	Medically evacuated	USA	27	Survived
27	N/A	Health worker	Sierra Leone	Imported infection	Italy	31	Survived

<sup>a</sup>Medical management (including utilization of invasive therapies) is described in peer-reviewed format (Table 3) and in reference [40]  
LOS length of stay (days), N/A not available

**18%**  
**vs.**  
**40-90%**

**DO WHAT WE DO AND DO IT WELL**



# What did we learn from polio?

- Positive pressure ventilation
- Blood gases
- Respiratory physiology
- ICUs
- Rehabilitation
- Disability rights
- Vaccine development
- **Long-term sequelae of viral illness**

# Robert Krauss



## The Bluejackets 1948

STYLE The New York Times DVI

VOWS

### They Needed a Place to Marry. Suddenly Their Ship Came In.

Max Krauss and Emily Young wed aboard the U.S.S. Baylander, which happened to be docked outside his parents' Harlem home at just the right time.

[Give this article](#) [Share](#) [Bookmark](#)



Max Krauss and Emily Young married Aug. 23 aboard the decommissioned U.S.S. Baylander, which was docked at West Harlem Piers on the Hudson River. Ann Attky/The New York Times

# Post-polio Syndrome

1962

First report



- Weakness
- Fatigue
- Pain
- Functional loss



20-80%

# Characteristics and Management of Postpolio Syndrome

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Burk Jubelt, MD

---

James C. Agre, MD

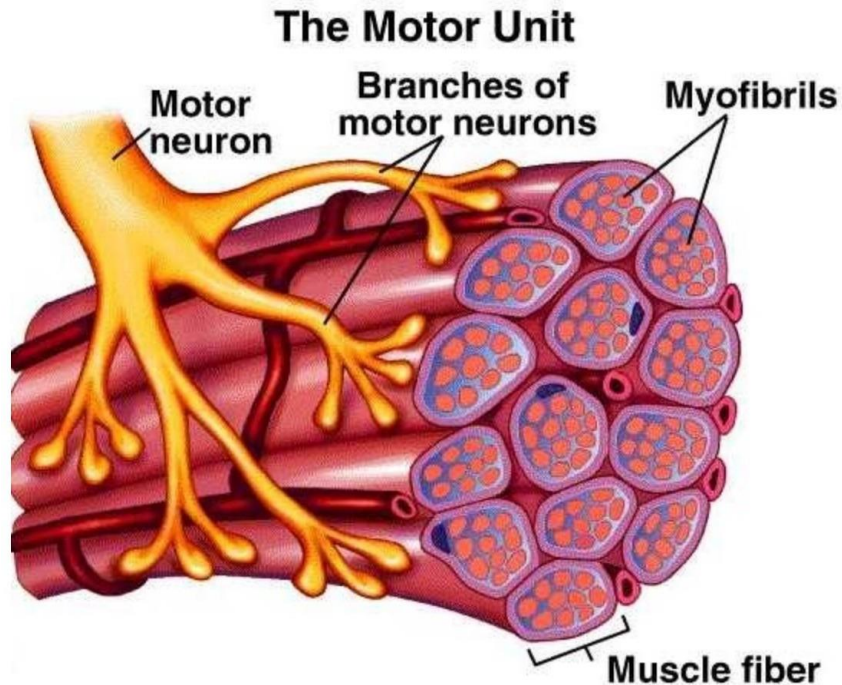
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**P**OSTPOLIO SYNDROME (PPS) REFERS to new, late manifestations occurring many years after acute poliomyelitis infection. Over the last 25 years,

a prior episode of poliomyelitis with residual motor neuron loss (can be confirmed by typical history, neurologic examination, or electromyography); (2) a period (usually  $\geq 15$  years) of neurologic and functional stability after recovery from the acute illness; (3) the gradual or rarely abrupt onset of new weakness

mal muscle fatigue (decreased endurance) has also been seen in patients with PPS and may be the forerunner of new weakness.<sup>1,13</sup> This abnormal muscle fatigue manifests as increased weakness after heavy overuse with delayed recovery after several days of rest.<sup>14</sup> Muscle pain (myalgias) also occurs and ap-

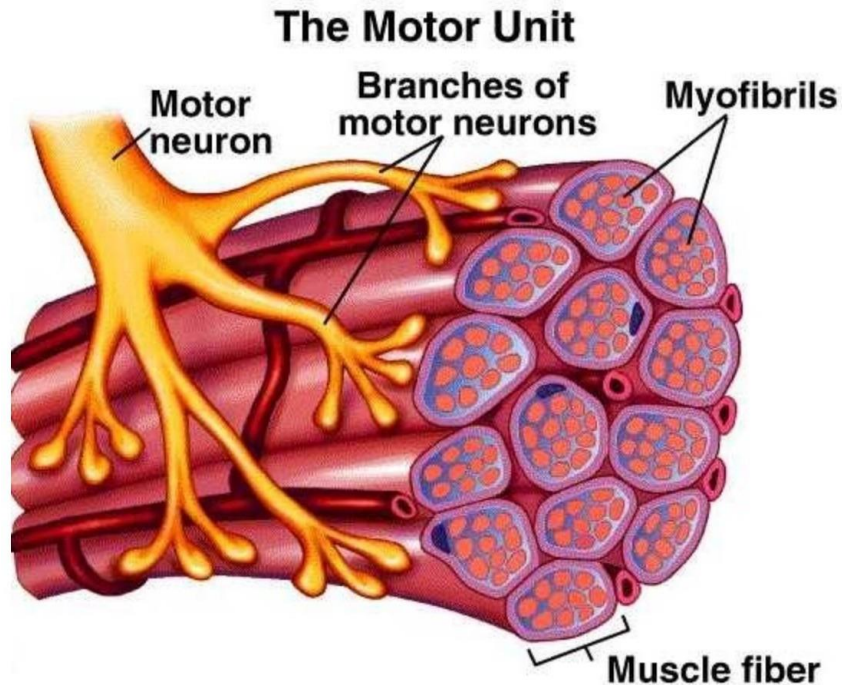
# THEORIES



- Reactivation of polio
- Autoimmune reaction
- Metabolic fatigue of remaining motor neuron units



# THEORIES



- Reactivation of polio
- Autoimmune reaction
- **Metabolic fatigue of remaining motor neuron units**



# Long-term consequences of viruses

## Serial Propagation *in vitro* of Agents Producing Inclusion Bodies Derived

RESEARCH

REPORT

From the

MULTIPLE SCLEROSIS

### Longitudinal analysis reveals high prevalence of Epstein-Barr virus associated with multiple sclerosis

Kjetil Bjornevik<sup>1†</sup>, Marianna Cortese<sup>1†</sup>, Brian C. Healy<sup>2,3,4</sup>, Jens Kuhle<sup>5</sup>, Michael J. Mina<sup>6,7,8</sup>, Yumei Leng<sup>6</sup>, Stephen J. Elledge<sup>6</sup>, David W. Niebuhr<sup>9</sup>, Ann I. Scher<sup>9</sup>, Kassandra L. Munger<sup>1†</sup>, Alberto Ascherio<sup>1,10,11\*†</sup>

Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system of unknown etiology. We tested the hypothesis that MS is caused by Epstein-Barr virus (EBV) in a cohort comprising more than 10 million young adults on active duty in the US military, 955 of whom were diagnosed with MS during their period of service. Risk of MS increased 32-fold after infection with EBV but was not increased after infection with other viruses, including the similarly transmitted cytomegalovirus. Serum levels of neurofilament light chain, a biomarker of neuroaxonal degeneration, increased only after EBV seroconversion. These findings cannot be explained by any known risk factor for MS and suggest EBV as the leading cause of MS.

Science 2022

on and the

t.


Ex Bio & Med 1953

# COVID-19

Long COVID

## Post-COVID Syndrome?

Franglais







 Statistics Canada Statistique Canada

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**The Daily**

 In the news	 Indicators	 Releases by subject
 Special interest	 Release schedule	 Information

**Between April and August 2022, 98% of Canadians had antibodies against COVID-19 and 54% had antibodies from a previous infection**

Text Tables Related information  PDF (198 KB)

Released: 2023-03-27

# IMPORTANCE OF DATA

The image shows the top section of the ICES website. At the top right, there is a dark blue navigation bar with links for "Data Dictionary", "Careers", "Contact ICES", "Website Privacy", "FAQ", and "ICES Login". Below this, on the left, is the IC/ES logo and a "30<sup>TH</sup> ANNIVERSARY" graphic. To the right of the logo are utility icons for "Text Resize", "Change Contrast", and "Print", followed by social media icons for Facebook, Twitter, YouTube, LinkedIn, and Instagram. A search bar with the placeholder text "Search ICES.on.ca" and a "Search" button is located below the social media icons. At the bottom, there is a horizontal navigation menu with six colored buttons: "ABOUT ICES" (dark blue), "RESEARCH" (light blue), "PUBLICATIONS" (red), "DATA & PRIVACY" (teal), "NEWSROOM" (yellow), and "DATA & ANALYTIC SERVICES" (purple). Each button has a small downward-pointing triangle indicating a dropdown menu.



# WAR

The world this week

## News in focus



ANADOLU AGENCY VIA GETTY

A bombed hospital in Volnovakha in Ukraine's Donetsk region.

## SURGE OF HIV, TUBERCULOSIS AND COVID FEARED AMID WAR IN UKRAINE

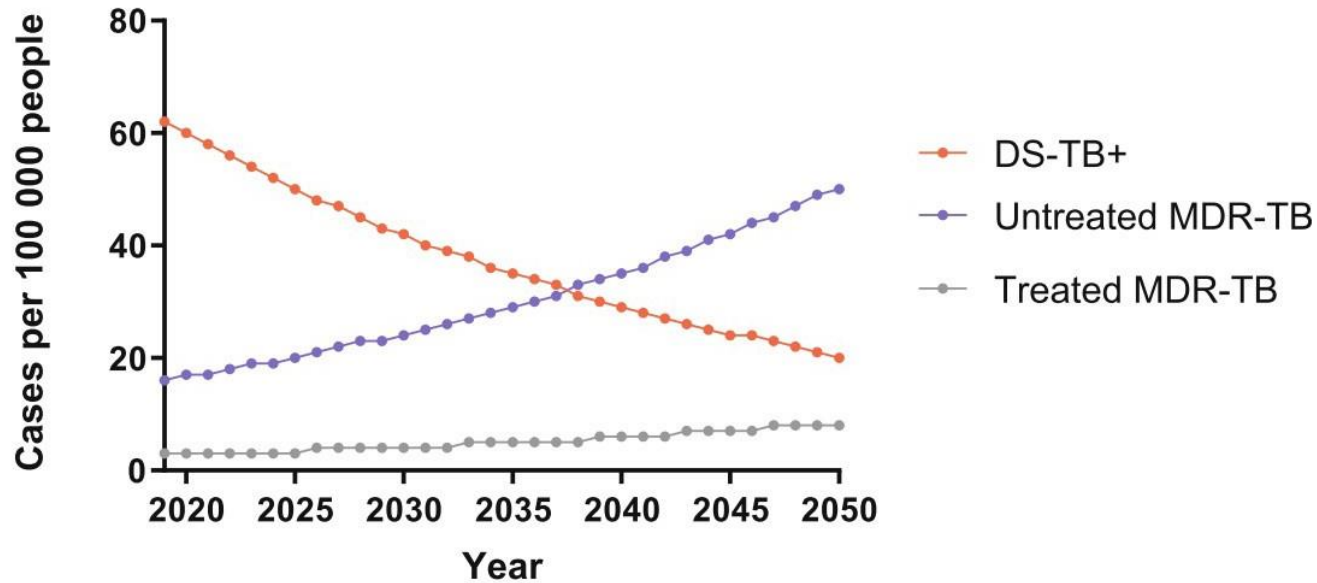
Infectious diseases are likely to spread as Russia's invasion displaces people and disrupts health services.

By Leslie Roberts

to rubble, access to diagnostic services and When Russia invaded on 24 February,



# Multidrug Resistant Tuberculosis



**Fig. 2** Predicted TB prevalence from 2019 to 2050 under current TB control conditions. DS-TB<sup>+</sup>, bacteriologically confirmed drug-susceptible TB; MDR-TB, multidrug-resistant tuberculosis

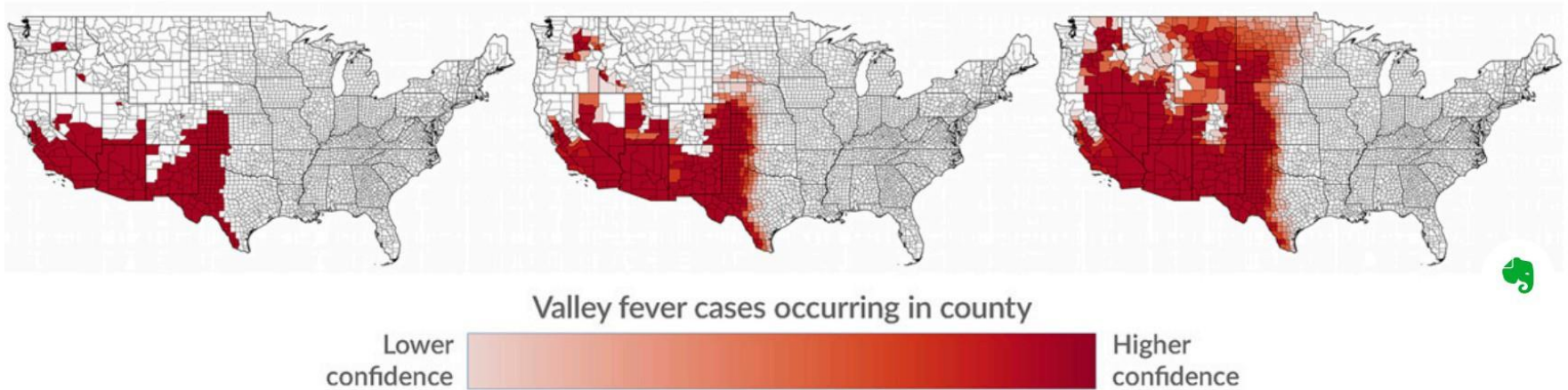
# Climate Change

Expansion of Valley fever in the western US in response to high climate warming

2007

2035

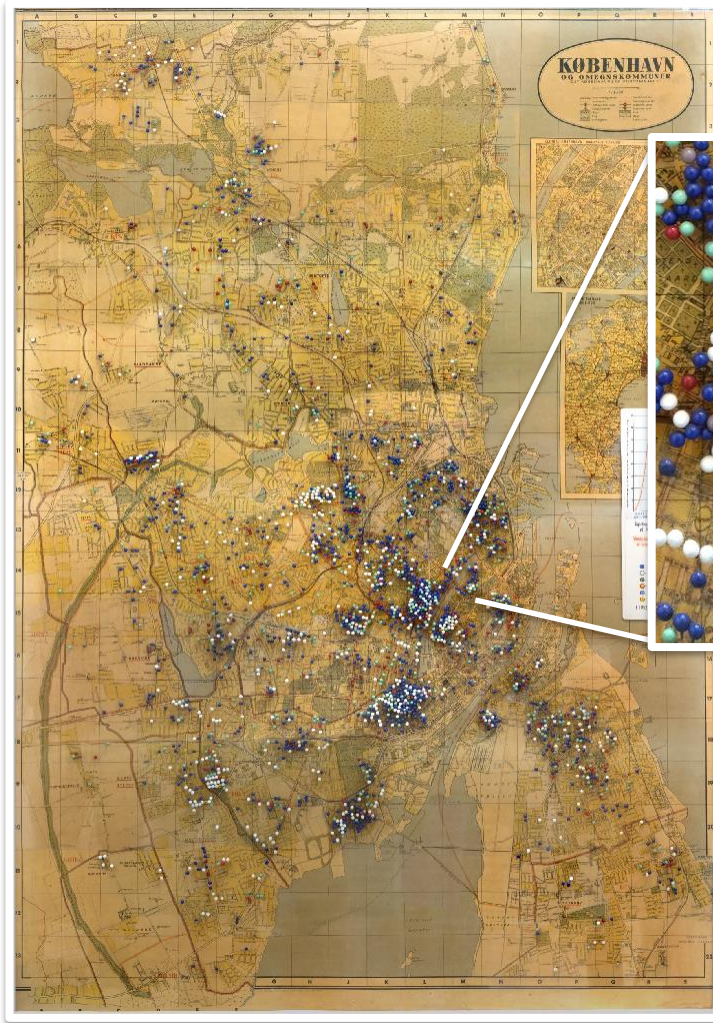
2095



Adapted from Gorris et al. (2019), *GeoHealth*

Graphic by Morgan Gorris (@DrMorganG)

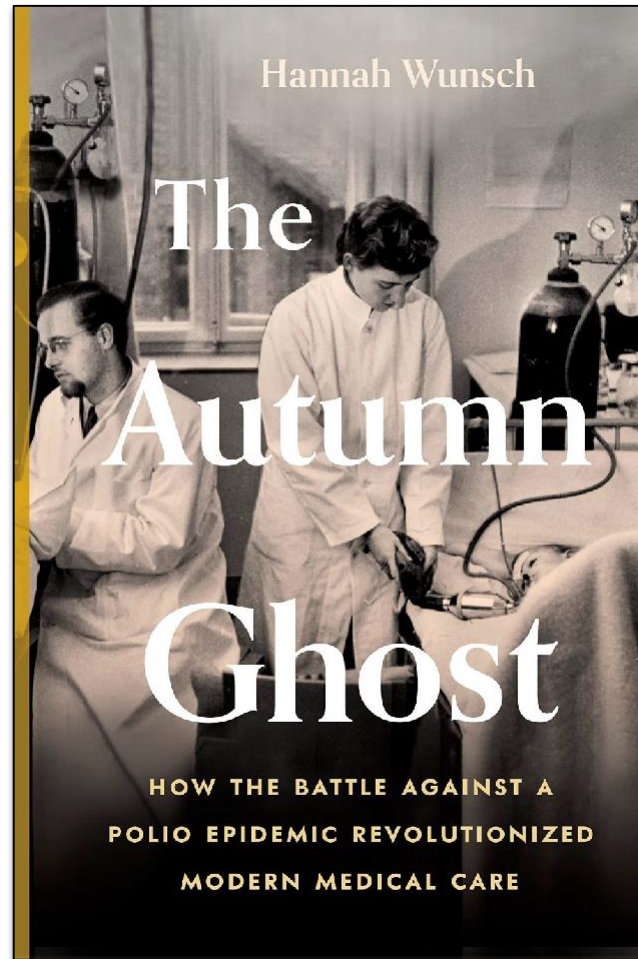
Under a scenario in which the world continues high levels of CO<sub>2</sub> emissions, Valley fever cases will likely move out of the US Southwest and up to the Canadian border by 2095. Image credit: Morgan Gorris.



Map, Courtesy of Medical Museum, Copenhagen, Photo by Dwight Friesen



**MAY 9, 2023**



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