### INFECTIOUS DISEASES IN THE ARCTIC – AN OVERVIEW

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### THE ARCTIC / CIRCUMPOLAR AREA

- Geography
  - Polar circle
  - 10° July isotherm
  - Treeline
- Small populations
- Scattered settlements
- Difficult transportation
- Politically Arctic areas parts of other countries (USA, Canada, Denmark, Russia, Scandinavian countries)





### ARCTIC PEOPLES

- Alaska, Northern Canada, Greenland
  - Eskimos (Inuits, Yupik)
  - Indians (First Nations)
- Northern Russia
  - Siberian peoples
- Northern Scandinavia
  - Sami (Caucasians)

 In all countries Caucasians from 'southernly' areas (e.g. USA, Canada, Denmark)



#### GREENLAND

- World's largest island
- Self rule from Denmark
- Population 56,000
  - 89% born in Greenland (Inuits)
  - 11% born in Denmark (Caucasians)
- Only narrow coastal strip inhabited
  - Capital Nuuk 30% of pop.
  - 16 towns 55%
  - > 50 settlements 15%
- One central hospital, 16 small hospitals with 1-4 MDs



#### LIVING CONDITIONS IN ESKIMO AREAS

- Traditional life style based on hunting, mainly sea mammals
- Small settlements
- Crowded housing conditions
- Low income
- Shorter life expectancy as e.g. in Denmark (~10 years)
- Infectious diseases frequent
  - Tuberculosis, invasive bacterial diseases, respiratory tract infections, otitis media, sexually transmitted diseases, hepatitis B infection, zoonoses
- Rapidly changing living conditions towards western life style



#### INFECTIOUS DISEASES IN THE ARCTIC

 'No infections – the climate is clean and cold...'

Infectious diseases in the Arctic are:

• Very frequent



- Characteristic patters
- Been closely connected with the development of society (e.g. tuberculosis)
- Intervention (vaccination, treatment) had dramatic effects

#### EPIDEMIC POTENTIAL

- Isolation
  - Transportation difficult
  - Travels/contact dependent upon time of year (at least in earlier times)
- Receptive populations
  - Not previously infected
- Favourable conditions for transmission
  - Narrow and tight houses
  - Crowding





#### ALFRED BERTHELSEN (1877 - 1950)

Physisian – took part in the Literary Ekspedition, district physician in Uummannak, and from 1927 Chief Medical Officer for Northern Greenland.

'Grønlandsk medicinsk statistik og nosografi'. Meddelelser om Grønland 117, 1943



#### INDHOLD

			Bide
	Ind	ledning	5
	1.	Akutte Luftvejskatarrher (Febris catarrhalis acuta)	6
	2.	Influenza (Influenza)	<b>24</b>
	3.	Kighoste (Tussis convulsiva)	35
	4.	Krupøs Lungebetændelse (Pneumonia crouposa)	49
	5.	Papegøjepneumoni (Psittacosis)	52
	6.	Difteri (Diphtheria)	53
	7.	Svælgbetændelse (Angina)	61
	8.	Skarlagensfeber (Scarlatina)	68
	9.	Rosen (Erysipelas)	85
	10.	Gigtfeber (Febris rheumatica)	103
•	11.	Børnesaar (Impetigo)	107
•	12.	Rødlinger (Rubeolae)	108
	13.	Den fjerde Sygdom (Rubeola scarlatinosa)	111
	14.	Mæslinger (Morbilli)	112
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•	16.	Koldfeber (Malaria)	117
	17.	Tyfus (Febris typhoidea)	117
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	23.	Faaresyge (Parotitis epidemica)	145
	24.	Børnelammelse (Poliomyelitis anterior acuta)	151
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		demica)	169
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## CAUSES OF DEATH GREENLAND 1924-2001



#### TUBERCULOSIS IN THE ARCTIC



#### INCIDENCE OF TUBERCULOSIS GREENLAND 1956 - 2004



#### INFECTIOUS DISEASES TODAY



Invasive pneumococcal disease

#### GONORRHEA



#### PRESENT SITUATION

Gonoré-incidensen pr. 1.000 blandt 15 - 59-årige Incidens of gonorrhea per 1.000 among 15 - 59 year olds









#### INCIDENCE/100,000 2012

	Greenland	Denmark	Alaska	Female sex workers India
Gonorrhea	2,555	12	100	5,170
Chlamydia	6,403	473	749	5,680

### HIV

- 171 cases 1985-2011
  - 71% infected in Greenland
  - 10% Denmark
  - 12% elsewhere
- Routes of infection
  - 74% heterosexually
  - 18% homosexually
  - 2% IV-abuse
  - 6% unknown
- Median age 46 years (IQR 34-56)
- Many alcoholised, low SES, low compliance





#### HEPATITIS IN GREENLAND

Hepatitis A (foodborne infection) – 'Epidemic jaundice'
– 1975: 11% of population clinical hepatitis



 Hepatitis B (bloodborne infection) – Endemic in Greenland (Skinhøj et al.)

## INVASIVE PNEUMOCCAL DISEASE IN THE ARCTIC, CHILDREN <2 YEARS



#### EFFECT OF *S. PNEUMONIAE* VACCINE IN ALASKA



#### EFFECT OF PCV13 VACCINE 2010 GREENLAND



### CHRONIC OTITIS MEDIA

#### • Frequent in Greenland

- Prevalence among the highest in the world
- Historic, skeletal studies (Homøe)
  - Before Danish colonization (<1721): 5%
  - 100-200 years ago: 18%
- Maniitsoq 1984 & Sisimiut 1993-94, children 3-8 years: 20%
- COM established before 3 years of age
- Role of genes? Role of environment? Role of microbes?
- More relevant is prevention possible?
  - What is exact age of debut, and what are risk factors?





#### PREVALENCE AND AGE AT DEBUT



#### RISK FACTORS FOR RESPIRATORY TRACT INFECTIONS

	URI	LRI	OTITIS MEDIA
Age	X	X	
Persons in sleeping room	x	x	
Childcare	x	x	X
Passive smoking		x	
Gender (boys)		X	
Mothers ear discarge			X
Respiratory tract infections			X

### TRICHINELLOSIS



- Nematode (round worm) living in muscle tissue of infected animals
- Infection by eating infected meat
- Gastrointestinal symptoms, fever, muscle pains
- Most *trichinella* species killed by freezing or cooking meat
- Arctic species *T. nativa* freeze resistant
- Earlier official Greenland recommendations to cook OR freeze game meat!





#### TRICHINELLA IN ANIMALS OF GREENLAND

Host	Prevalence (%)	Reference
Sledge dog	61.9	Madsen, 1961
Polar bears	24.2	Madsen, 1961
	32.0	Born et al., 1990
	22.8	Henriksen et al., 1993
Polar fox	1.4	Madsen, 1961
	6.0	Kapel et al., 1996
Walrus	1.0	Madsen, 1961
	1.6	Born et al., 1982
Ringed seal	0.2	Møller 2006
Hooded seal	2.3	w

### BOTULISM

- Home-prepared uncooked aquatic game foods from fish, whales, seals, walruses and beavers (Alaska)
- Fermented seal / seal flippers
- Recent transition from preparation in traditional earthen pits to preparation in synthetic (plastic) containers
- Increase in human cases during the 1970s and 1980s in Alaska
- Outbreak in Thule, Greenland, September 2013



#### **Outbreak of Botulism Type E Associated with Eating** a Beached Whale --- Western Alaska, July 2002

Betulism is a neuroparalytic illness caused by texins produced by the bacterium Cleatridium botalinum, an obligate anaerobe found commonly in the environment, intercration with texin type E is associated exclusively with earing animal foods of marine (sait or fresh water) origin. Persons who cat raw or fermented marine fish and mammals are at high risk for botalism from type E taxin. On July 17, 2002, the Alaska Devision of Public Health investigated a cluster of suspected botalism cases among residents of a fishing village in Alaska. This report summarizes the findings of the outbreak investigation, which linked disease to eating raw multuk (skin and a pink blubber layer) from a beached whole (Figure). To avoid delays in treatment, health-care providers evaluating patients suspected of having botulism should base treatment decisions on clinical findings. Public health authentices should be notified immediately about any suspected botulism case.

During July 13-15, residents of a western Alaska village on the Bering Sea shore shared a meal consisting of multick harvested from a beached adult beloga whale found near their village. The villagers estimated that the whale had been dead for at least several weeks. They cut the whale fluke (tail) into pieces and stored them in zipper-soaled plastic bags in a refrigerator until they were eaten 1 or 2 days later. On July 17, after a physician from western Ainska reported three suspected cases of botulism among patients who had eaten the maktuk, the Alaska Section of Epidemiology began an investigation.

A case of foodborne botulism was defined as illness in a person who had eaten the muktuk and subsequently had symmetric descending flaccid paralysis of motor and autonomic nerves. Persons who ate multick were interviewed and exemined, and their hospital records were rostewed. Serum, stool, and gastric contents from patients and



KAlaallit Nunaata Radioa

Dødeligt forgiftet ved sin fars begravelse





Myndighederne advarer om livsfarlig madforgiftning



AF: JONAS LØVSCHALL-WEDEL En tragedie har ramt Grønlands nordligste byge

A: A

Send Link 0 500

### CLIMATE CHANGES AND INFECTIOUS DISEASES

#### • Vibrio parahaemolyticus

- 2004 Alaska cruise ship outbreak
- Local oisters
- Most northernly occurrence of bacterium







McLaughlin et al. NEJM 2005

- Q fever
  - Bacterium in ruminants
  - Human cases in the Arctic not seen
  - Q fever endocarditis East Greenlander 2007
  - Climate changes?

#### Gedeinfluenza er kommet til Grønland

Læger har fundet det første tilfælde af sygdommen Qfeber, også kaldet gedeinfluenza. Sygdommen findes i kvægbesætninger, og det er en gåde hvordan sygdommen er kommet til Grønland.

#### • Emerging infections?

- Giardia
- Cryptosporidium
- Toxoplasma
- Ascaris
- Anisachis
- Diphyllobotrium



Koch et al. EID 2009

### OTHER DANGERS AND ANNOYANCES IN GREENLAND...





### IN CONCLUSION

- Epidemic potential among Arctic populations
- Tb main disease in 20th century
- Tb less frequent today, but too prevalent, epidemics occurring
- Main STIs gonorrhea and chlamydia, increasing incidence
- HIV still confined to particular groups
- HBV infection frequent
- Invasive pneumococcal disease and chronic otitis media frequent
- Trichinellosis still a risk in Greenland botulism outbreaks
- Climate changes may change infectious disease pattern

#### FURTHER INFORMATION

### Infectious Diseases

A GEOGRAPHIC GUIDE

Edited by Eskild Petersen, Lin H. Chen & Patricia Schlagenhauf





# THANK YOU FOR YOUR ATTENTION



"And now Edgar's gone. ... Something's going on around here."