

Outbreak of legionellosis in Østfold, Norway, 2005

Nordisk helseberedskapskonferanse
Finland 16. september 2005

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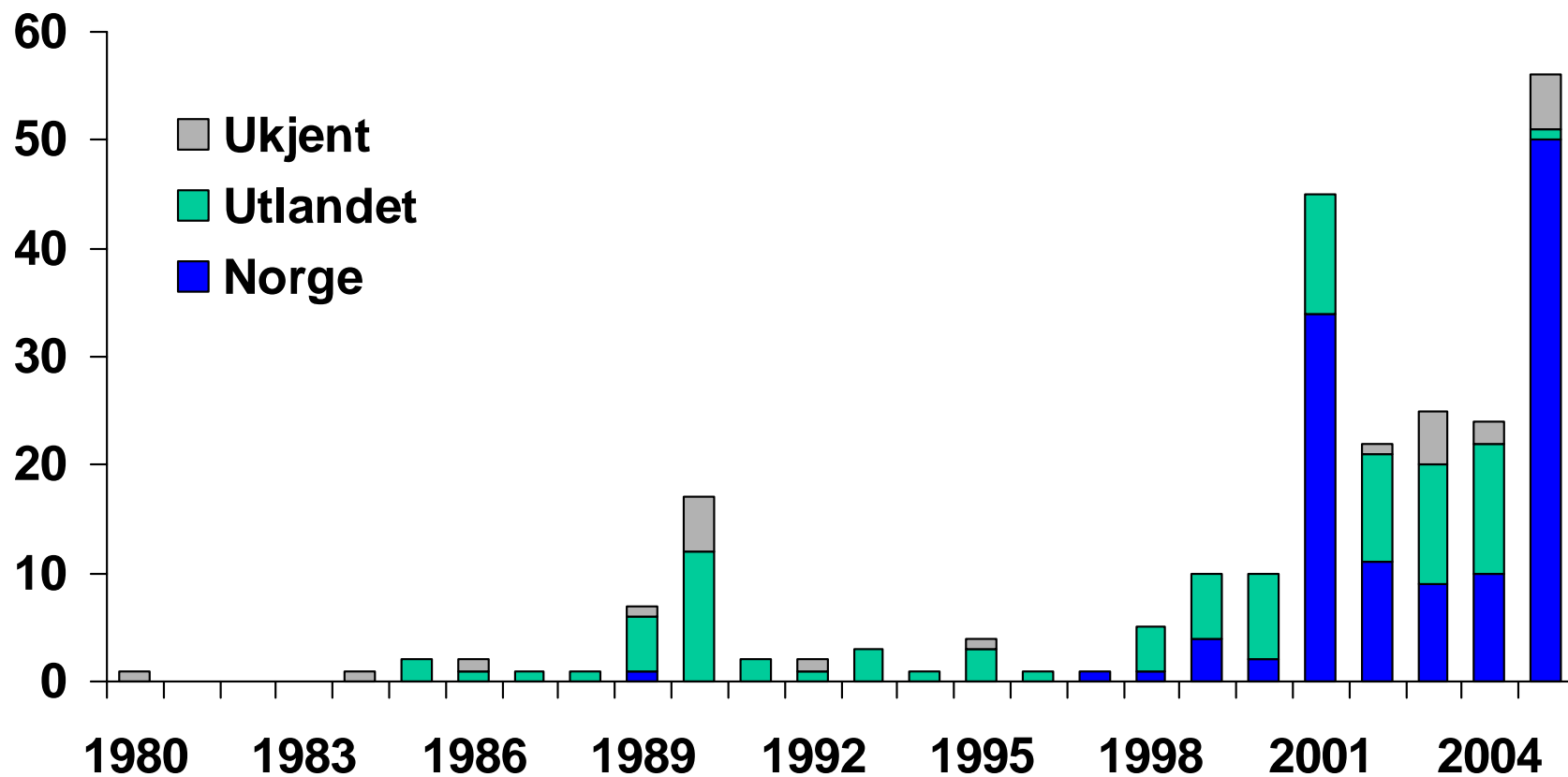
Legionellosis

- Legionella - common bacteria in fresh water
- First recognized in 1979 after an outbreak during a conference for American **Legion** (military veterans) in Philadelphia in 1976
- Caused by inhalation of aerosols containing legionella bacteria
- Clinical picture: pneumonia
- Incubation periode 2 to 10 days from exposure to symptoms
- Does not spread between humans
- Treatment: antibiotics and often intensive care
- Often not diagnosed
- Affects particularely elderly, persons with chronic disease, smokers
- Lethality 2 – 15%
- < 5% of infected persons become sick
- Some can have asymptomatic infection



Legionellosis notified in Norway 1980-2005

(10.June 2005)



Sources of outbreaks

- Water installations emitting aerosols:
- Cooling towers
- Whirlpools
- Showers and taps
- Humidifiers
- Fountains
- Ventilation equipment in hospitals



Outbreak in Østfold

- The cities Fredrikstad and Sarpsborg
- Largest outbreak in Norway
- 55 patients
- 10 deaths



Alarm Saturday May 21 and Sunday May 22

- 11:40: Early warning from Hospital Østfold Fredrikstad to doctor on duty at NIPH ("Smittevernvakta")
- 13:40: responsible Medical Officers in Fredrikstad and Sarpsborg were informed. Directorate of Health was notified.
- 16:50: Press release from the local authorities
- 17:00: All owners of cooling towers had been informed
- 19:10: Outbreak meeting at NIPH
- 20:00: Advice on investigation and questionnaires were sent to the local medical officers

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- 11:00: NIPHs outbreak team on site in Fredrikstad; nurses start structured interviews
 - 13:00: First press conference
 - .. Investigation continues



Responsibilities

- Municipalities were responsible and in charge
- Field-epidemiological team from NIPH came to support at request of local authorities and assisted and gave advice, but "the show was run by local authorities"



Agedistribution

Aldersgruppe	K	M	Totalt
30-39		1	1
40-49	2	4	6
50-59	1	5	6
60-69	6	8	14
70-79	5	8	13
80-89	6	5	11
90-99	2		2
Totalt	22	31	53

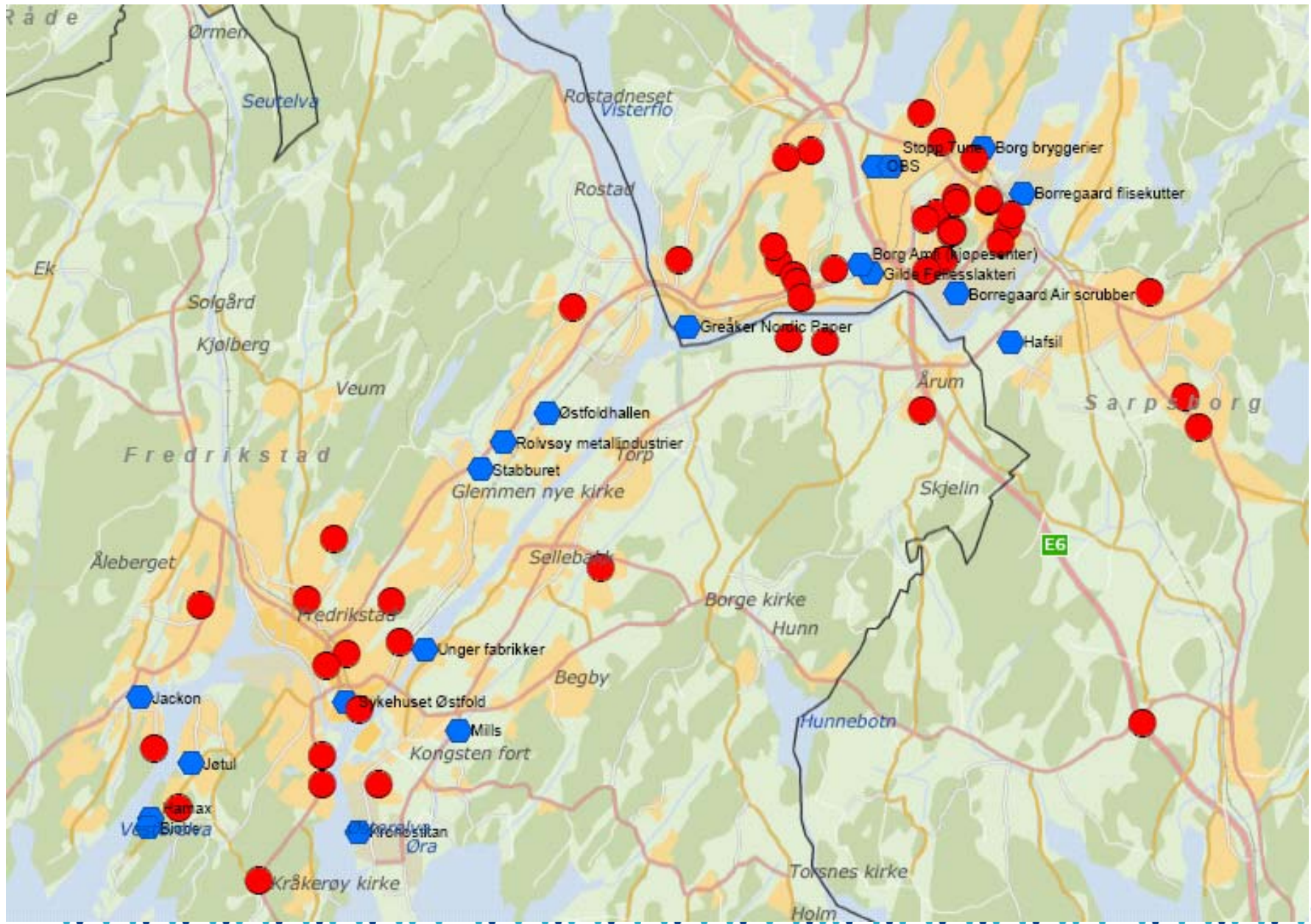


Patients per 10 000 inhabitants

Aldersgruppe	Fredrikstad	Sarpsborg	Totalt
30-39	0.0	1.4	0.6
40-49	1.0	4.3	2.3
50-59	4.2	3.0	3.7
60-69	10.6	12.7	11.5
70-79	9.9	23.0	15.2
80-89	6.7	43.2	21.6
90-99	0.0	68.5	26.0
Totalt	2.7	6.2	4.2



Location of pasients and cooling towers



Working hypothesis

- Source was active from 7th of May and a few days
- Source is a cooling tower
 - No common indoor place where all patients had stayed
 - Only cooling towers have potential for wide spread
 - Patients live far from each other; some of them not have moved around
 - Historically the most common source for large outbreaks
 - Wind has spread bacteria up/down the river Glomma



Outbreak investigation: Three main pillars

- **Environmental investigation and risk assessment of installations**
 - On site inspections and check of routines of all cooling towers
 - Follow up of other possible sources
 - Take samples from all cooling towers and other possible sources
 - Obs: Legionellabacteria are often found
 - **Epidemiological investigation**
 - Patients: place of residence and movements
 - In relation to possible sources
 - Statistical tests
 - Obs: information of movements very uncertain
 - **Mikrobiological investigation**
 - Compare environmental- and patient strains (bacteria isolates)
 - DNA-analyses
 - Obs: same DNA-profile can often be found in several cooling towers
- **Therefor: we must see all three in connection**



Check of possible sources

- Internkontroll, maintenance routines, documentation
- Water temperature
- Manual cleaning
- Desinfektion
- Routines for check of germ content of water
- Continuous running or stops?
- Incidents April – May?
- Samples were taken from all to check for legionella and total number of germs



Assessment of cooling towers

- 15 were not suspected:
 - Closed during the relevant periode
 - Located far from the patients
 - Good maintainance, both manual cleaning and desinfektion
 - Some which had lacking routines were closed
- 8 were considered suspect:
 - 5 had unsatisfactory routines and were closed
 - 3 were not closed because routines were satisfactory



Epidemiological investigation

Mapping of patients

- Location of residence
- Movements in the relevant periods
- Location of cooling towers
- Daily spread of aerosols from the towers
 - Radius of varying length
 - Zones, based on meteorological modelling of aerosol spread



Epidemiological investigations

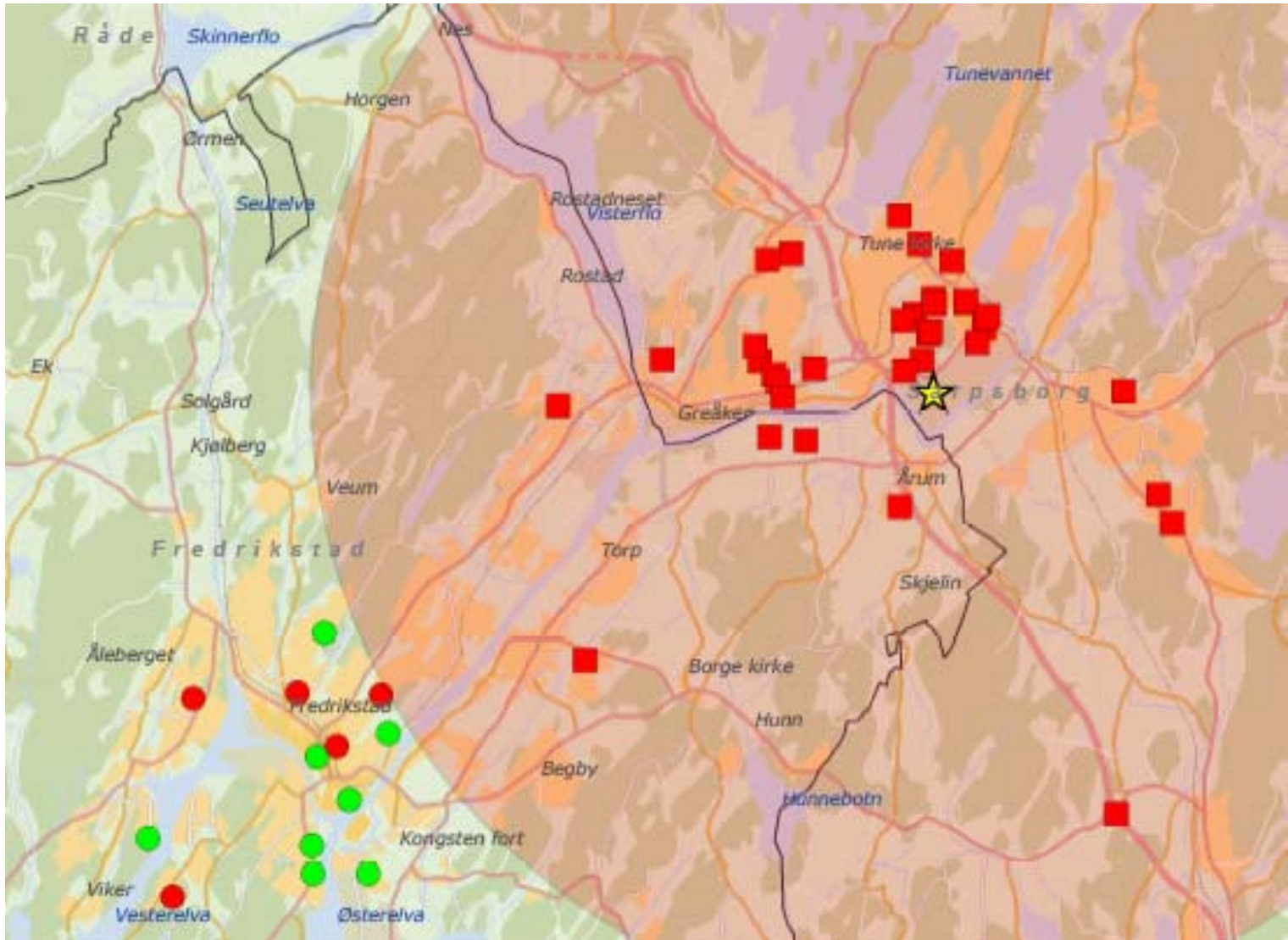
Risk by living close to an installation

Enterprise	Radius around the installation				
	1000 m	1500 m	3000 m	5000 m	10000 m
Hafsil (Hafslund Globe)	0.0	0.0	3.7	3.3	1.6
Hansa Borg Bryggerier	2.6	3.5	2.5	2.9	2.2
Nordic Paper AS	0.0	0.6	1.7	2.6	2.7
Rolvsøy Metallindustri	0.0	0.0	0.3	0.5	2.9
Østfoldhallen	0.0	0.0	0.3	0.8	3.2
Borregaard Industrier Ltd	7.2	5.8	4.7	3.4	1.6
Gilde Fellesslakteriet BA	2.0	5.5	5.5	3.3	1.6
Stabburet	0.0	0.0	0.6	0.4	3.4



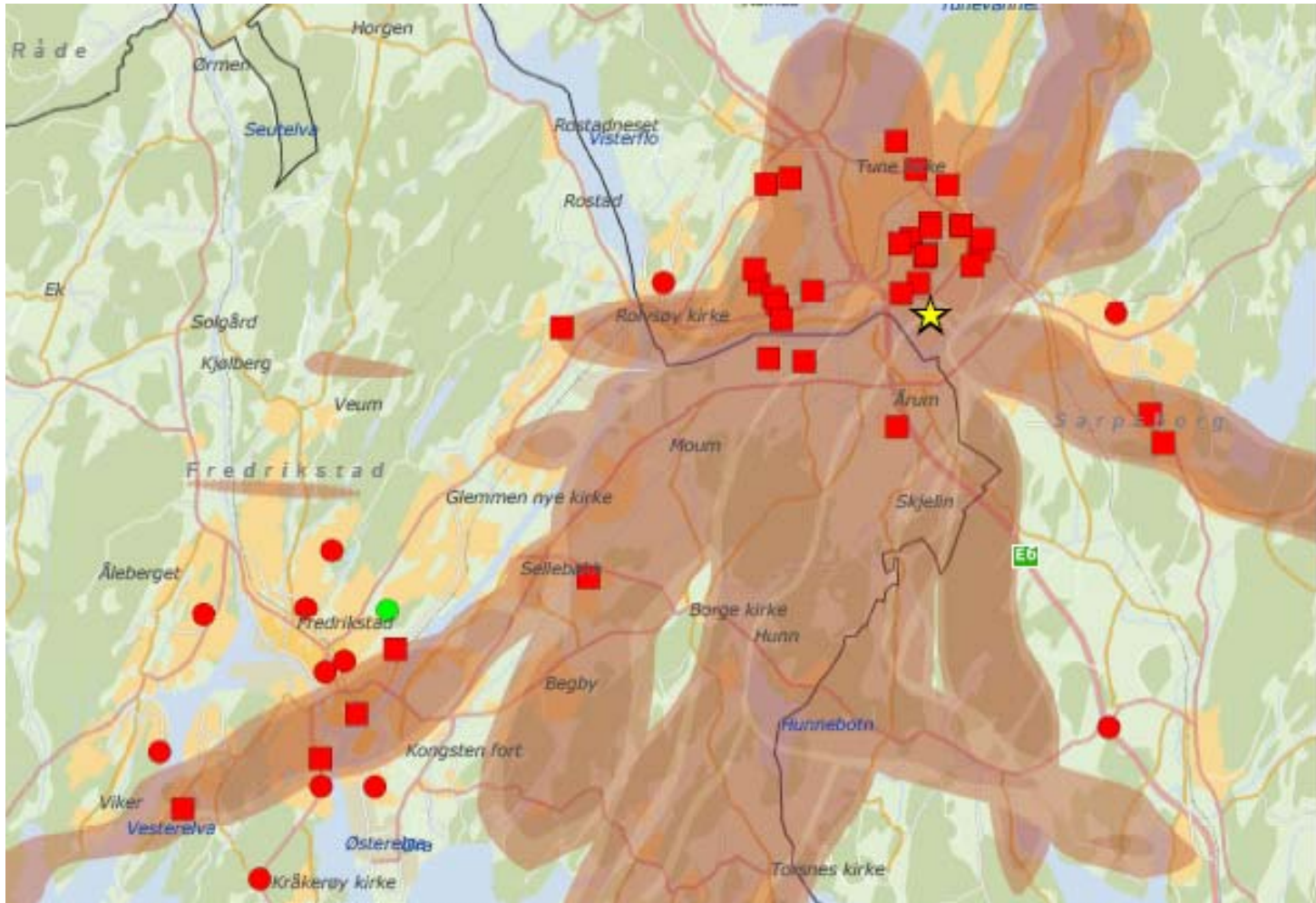
Epidemiological investigation

Patients within 10 km radius



Epidemiological investigation

Aerosol spread 7 – 10 mai



Microbiological investigation

Samples

Patients

- Bacteria isolates from 8 patients were available
- All patients had the same bacterisstrain=
”outbreak strain”

Environmental samples

- Østfoldhallen: 16 isolates were identical, but unlike the outbreak strain
- Rolvsøy metall: Unlike the outbreak strain
- Borregaard scrubber:
identical with outbreak strain
- River Glomma 300 m downstream of Borregaard: identical with outbreak strain



Microbiological investigation

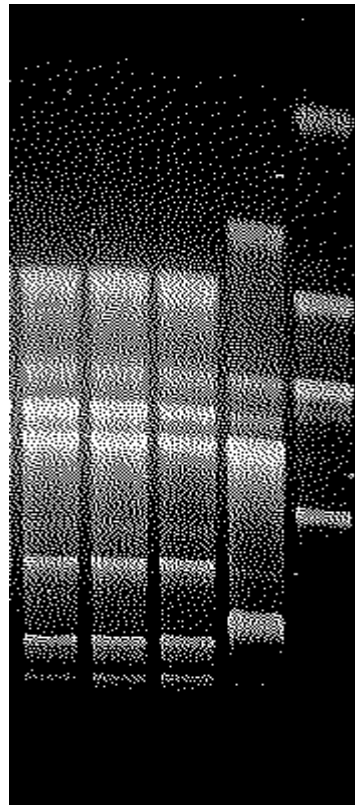
DNA-analyses Patient vs. environmental

1 2 3 4 5 6



Metode 1

7 4 3 6 K



Metode 2

1. Kontroll L63
2. Kontroll Phil1
3. Pasient 1
4. Miljøprøve 1 (Borregaard)
5. Pasient 3
6. Miljøprøve 2 (kjøletårn Østfoldhallen)
7. Miljøprøve 3 (vann fra Glomma)

Caugant, NIPH 2005



Conclusion

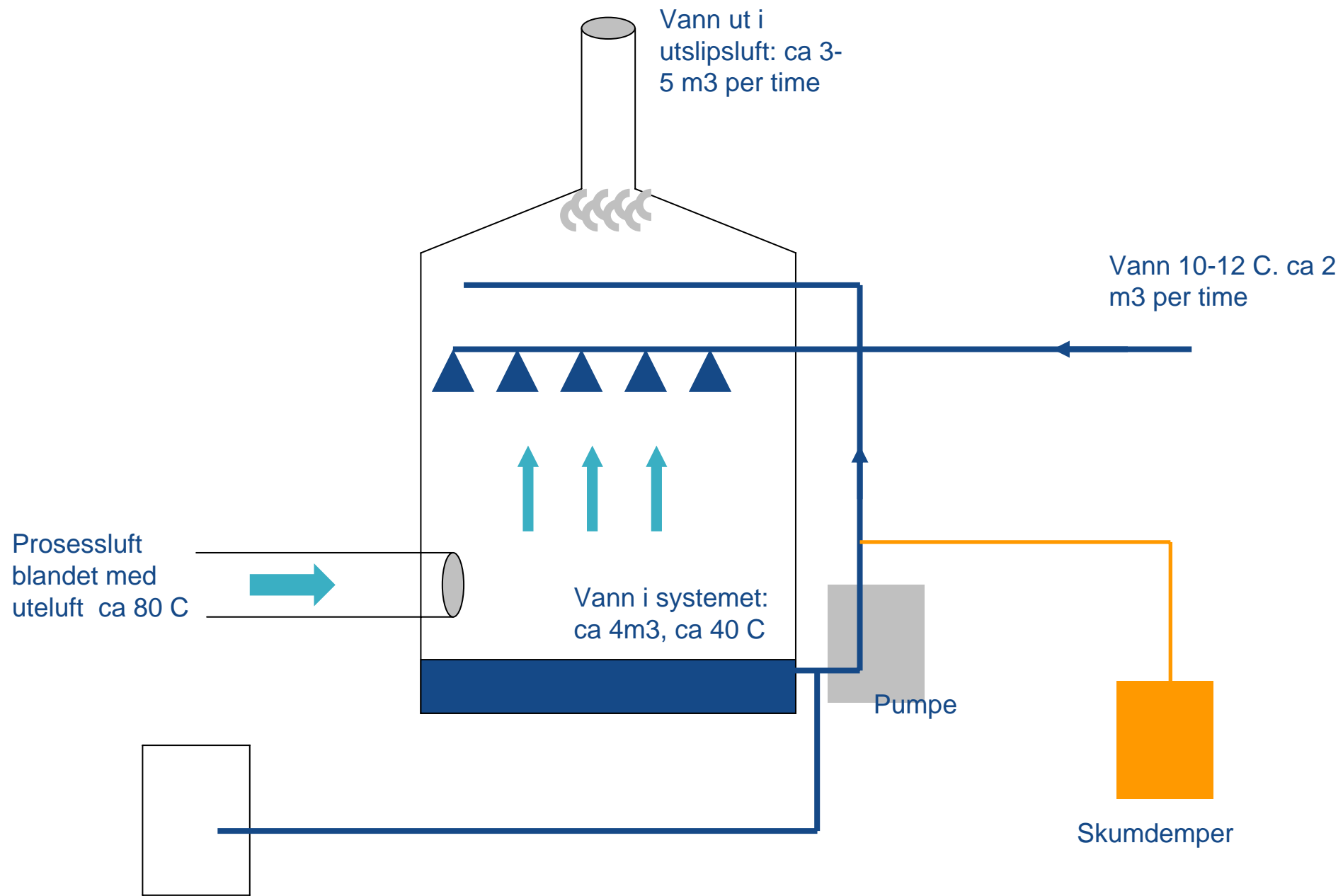
- Infection was most probably caused by the scrubber at Borregaard, because;
 - Right temperature of water, no disinfection and emission of aerosols over long distances
 - Fits well with the locations of patients residences and analyses of patients movements
 - Fits well with the DNA-analyses
- Surprise:
 - Never before reported outbreak caused by air scrubber
 - Routines at the installation were good



Measures taken

- The factory and Sarpsborgs health authority:
 - Installation was immediately closed
 - Cleaning and disinfection
 - New routines for cleaning and disinfection
- Police was notified
- National health authorities were notified
 - New regulations issued
- Information to other countries





EWGLI risk assessment guidelines

- **A risk of exposure to Legionella bacteria exists in:**
 - a) Water systems incorporating a cooling tower;
 - b) Water systems incorporating an evaporative condenser;
 - c) Hot and cold water systems;
 - d) Natural thermal springs and their distribution systems;
 - e) Spa pools;
 - f) Humidifiers;
 - g) **Other plant and systems** containing water that is **likely to exceed 20°C** and which may **release a spray or aerosol** (i.e. a cloud of droplets and/or droplet nuclei) during operation, demonstration or when being maintained, for example **industrial water systems** and horticultural sprinkler systems.
- Not all of the systems listed above will require elaborate assessment and control measures. A **simple risk assessment** may show that the risks are low and in such case no further action will be necessary.
- A water system **includes all plant/equipment and components** associated with that system, e.g. **all associated pipework, pumps, feed tanks, valves, showers, heat exchangers quench tanks, chillers** etc. It is important that the system is considered as a whole and not, for example, the cooling tower in isolation.
- Other systems, such as **humidifiers and air washers, spa baths and pools, car/bus washes, wet scrubbers, industrial water systems, fountains and water features**, also need to be considered.



Political handling

- The outbreak created much public and media interest.
- New regulations were issued, all owners of relevant installations were to notify local authority on short notice

