

Is seroepidemiology a tool to unravel the pyramid of surveillance for foodborne pathogens?
 Kåre Mølbak (for the MedVetNet WP32 team), Statens Serum Institut, Denmark

EADGENE European Animal Disease Genomics Network of Excellence for Animal Health and Food Safety

Animal Disease Genomics: Opportunities and Applications
 10th - 11th June 2008, Edinburgh, UK

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" The true size of the problem posed by food- and water-borne infections is difficult to ascertain: even the best national surveillance systems miss the majority of cases, namely those patients who do not seek health care for their symptoms of gastroenteritis."

The First European Communicable Disease Epidemiological Report, ECDC 2007, p.7

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Underascertainment

- Asymptomatic or mild infections not perceived as illness.
- Not everyone with clinical illness uses formal medical sector.
- Often no stool sample
 - symptomatic treatment
 - sample requested, but not supplied by patient
- Laboratory methods not standardized.
- Positive results may not be reported.

... varies between countries

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The surveillance pyramid

Surveillance of foodborne infections in humans is based on reporting of laboratory-confirmed infections.

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Aim:

- To develop a cost-effective method to determine the community incidence of infections with salmonella and campylobacter, based on measurements of serum antibody levels in population-representative serum collections.
- ELISAs developed at
 - Statens Serum Institut (salmonella, campylobacter)
 - SSDZ Laboratory Delft (campylobacter)

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Step 1: Establish the test

- Indirect ELISA
- Antigen: commercially available LPS
 - S. Enteritidis: O-type 1, 9, 12 group D1
 - S. Typhimurium: O-type 1, 4, 5, 12 group B
 - Extensive cross reactivity => mixed ELISA S. Ent + S. Tm.
- Quantitative IgG, IgM, and IgA
- Automated

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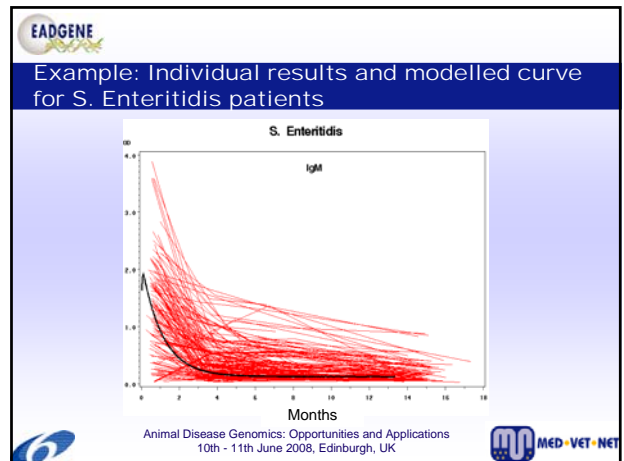
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Step 2: Establish antibody decay profiles

- 305 patients with stool culture-confirmed *S. Enteritidis* or *S. Typhimurium* infection
- Prospective follow-up
- Up to four serum samples at 1 week, 3, 6, 12 months after diagnosis

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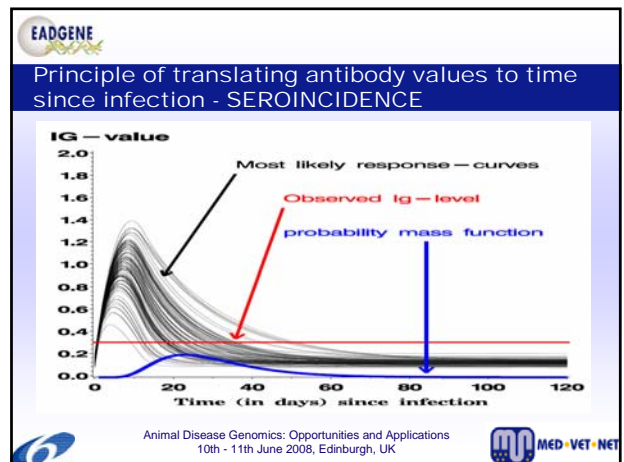


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Step 3: Mathematical backcalculation model

- High levels of IgA, IgM => recent infection
- Low single antibody measurement (IgG, IgA, IgM)
 - a person with a "weak" response infected recently?
 - a person with a "strong" response infected a long time ago?
 - a non-infected person with a relatively high background antibody level?

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Step 4: Applying the model on samples taken from the general population - *Salmonella*

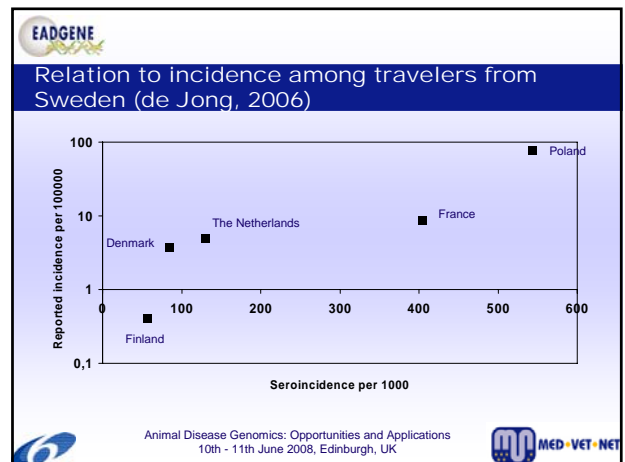
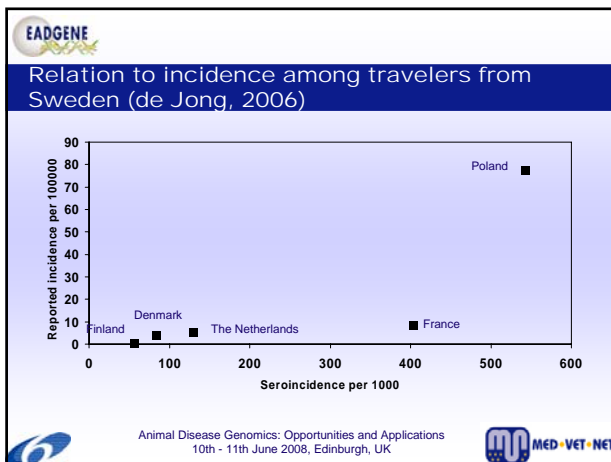
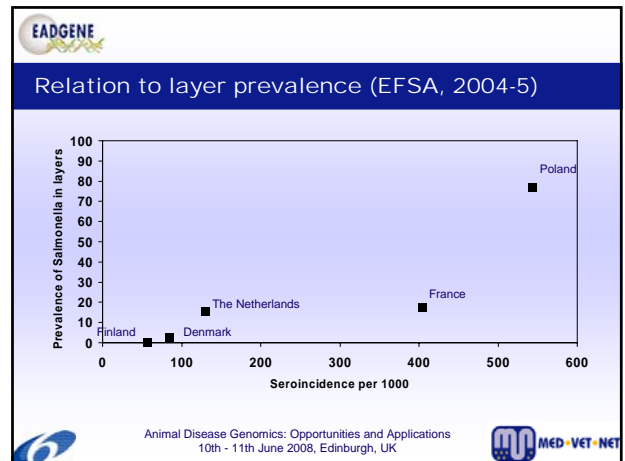
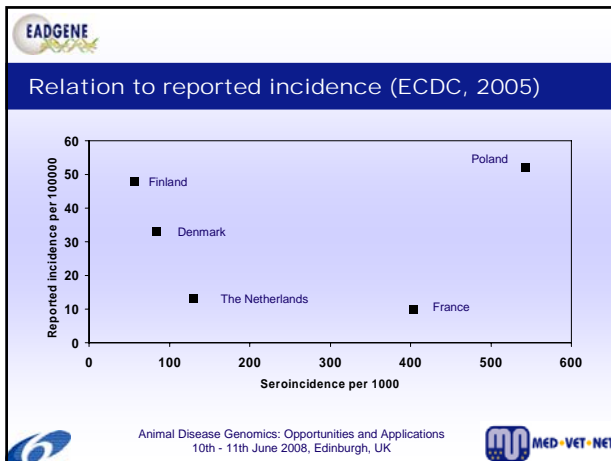
	Den- mark	France	Poland	Nether- lands	Ro- mania	Finland
No. of samples	1807	1013	500	1307	510	518
Year	2006/7	2003/4	2004	1999	2007	2000/1
Incidence*	84	404	543	130	385	56
95% Credibility Interval	47,131	291,541	371,731	75,201	241,570	13,131

*Seroincidence: Number of cases of *Salmonella* infections per 1000 population

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- Two groups of countries:
- Low incidence countries
 - Finland 56 per 1000 population
 - Denmark 84
 - The Netherlands 130
 - High incidence countries
 - Romania 385
 - France 404
 - Poland 543
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Conclusions

- The serology-derived incidence estimate of *Salmonella infections* is several hundredfold higher than the number of **cases** captured by routine surveillance.
- Can this really be true?
- **Sero-incidence** does not measure the burden of illness, but the force of infection on the human population.
- Sero-incidence is a new approach to evaluate and 'calibrate' surveillance data from different countries.

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Long term perspective


- To proliferate our method as a new approach to measure and monitor the incidence of infections ...
- ... of salmonellosis and campylobacteriosis (+ ?)
- ... independent of the sensitivity of lab-based surveillance
- ... independent of biases inherent to interview-based studies

... make data from different countries comparable !

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What's next ?



- More countries:
 - Sweden, Italy
 - UK ?
- Data on *Campylobacter*
- Relation between disease and seroincidence
- Age-patterns
- "Exotic" serotypes


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