



# **Disease prevention and control: the role of a National Public Health Institute**

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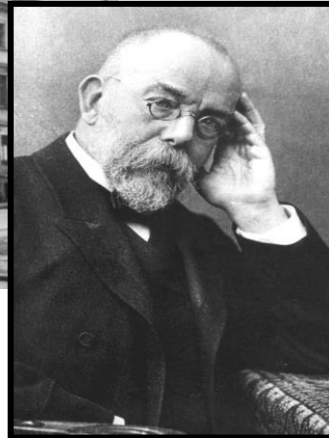
# The Robert Koch Institute in history



## Triangle, 1891 - 1900

**1891** founded as the Royal Prussian Institute for Infectious Diseases.

Robert Koch headed the Institute until 1904.



## Robert Koch 1843 - 1910

co-founder of modern bacteriology and hygiene

**1952** The Institute became part of the newly founded Federal Health Office (Bundesgesundheitsamt, BGA)

**1994** Robert Koch Institute for Infect. Dis. and NCD:  
The Federal Health Office is replaced by independent institutions. RKI continues its work as an independent federal health authority (associated with the Federal Ministry of Health)

**Robert Koch Institute 1900**





# The Robert Koch Institute, Seestraße





# 03 February 2015: Official Opening of the BSL-4 Laboratory by Chancellor Merkel





## ***Laws as basis for the tasks of the RKI***

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### **➤ Infection Protection Act (2000 / 2001)**

Notifiable diseases

Guidelines

Prevention

### **➤ Transfusion Law ( 1998 )**

Safety of Blood products

(infectious diseases, supply)

Epidemiological register of HIV, HBV and HCV

### **➤ Stem Cell Law ( 2002 )**

Approval of research projects

Register of Stem cells used

Aims of research projects

### **➤ Gene Diagnostics Law ( 2010 )**

Requirements, Regulation





## Who we are...

- **Staff** - more than 1.100 people, approx. 400 scientists  
about 80 PhD students + master / bachelor students
- **Budget** - about 70 Mio. Euro
- About **50** projects by external research funding
- Several members affiliated with Berlin universities  
(joint appointments)
- The RKI-website [www.rki.de](http://www.rki.de) is a frequently used information source for health professionals and the public

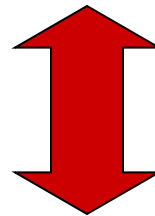


# Tasks

- **Scientific Advice and Consultation** for the federal level in the field of control and prevention of infectious and non-communicable diseases
- Central federal institution for **prevention and detection of biological attacks**
- Executive authority in the fields of **infection protection and stem cell law**
- Practice oriented **research** in the field of health related problems
- Information and **advice** for **policy makers & professional public**

# The Robert Koch Institute (RKI) in the framework of the federal structure of Germany

**Federal Ministry of Health**



**Robert Koch-Institute**  
*Federal Health Agency*

**Central federal institution responsible for disease control and prevention and response-orientated research for the Public Health Sector**

**In respect to the federal states:**

**without executive power  
recommendations only or  
intervention on demand!**



# Basic Functions



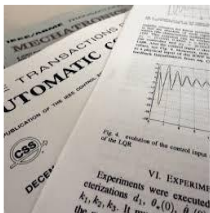
## Science

- Quality
- Independency



## Diagnostic/Service

- Timely methods
- Quality management



## Publications

- National
- International
- Target groups



## Cooperations

- Governmental Institutes
- Universities, NRC
- ÖGD



## Politics

- Data
- Advise



## Commissions

- Scientific offices
- External expertise



## Communication

- National
- International



## Infrastructure

- Staff, Buildings
- Bioinformatics, IT, Lab Equipment



# Organisational structure

## ■ 4 Departments

- Infectious Diseases
- Epidemiology and Health Monitoring NCD
- Infectious Disease Epidemiology
- Centre for Biological Threats and Special Pathogens

## ■ Research groups

- Project Groups (5)
- Junior Research Groups (2)

## ■ Further responsibilities

- Regulatory authority for the import and use of human embryonic stem cells
- National Reference Centres / Consultant Laboratories
- Scientific committees

# Current Research Foci: Infectious Diseases

## Identify, Protect from and Manage Infectious Diseases



Nosocomial Infections



Risk-based Analyses of  
Infectious Agents



Respiratory Diseases



Outbreak-Analyses and  
Intervention



Sexually-transmitted  
Infections (STI)



Riskfactors and -Groups



Food-associated and  
Zoonotic Agents



Identification and Analyses  
of new Infection Risks

# Current Research Foci: Non-Communicable Diseases

- **Health Monitoring: Identification and Assessment**



- Major non-communicable diseases and risks
  - Epidemiological and statistical analyses, risk assessment, Trend analyses, tool development
  - Reporting to the public
- **Prevent and control**
    - Research in prevention potential and –needs
    - Development of health aims as well as tools to reach these aims





# Scientific Committees

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- Central Ethic Committee for Stem Cell Research
- Advisory board: German Centre for Cancer Registry Data
- Commission for Genetic Diagnostics
- Committee for Epidemiology of Infections
- Committee for Health Reporting
- Committee for Hospital Hygiene and Infection Prevention
- National Advisory Committee on Blood
- Standing Committee for Vaccination
- Committee for Anti-Infectives, Resistance and Therapy
- Advisory board: Influenza

# National Reference Centres / Consultant Laboratories

## ➤ National Reference Centres

- Influenza
- Cryptococcosis, scedosporiosis and imported systemic mycoses
- Measles, mumps, rubella
- Poliomyelitis and other entero-viruses
- Salmonellosis and other enteric pathogens
- Staphylococci

## ➤ Consultant Laboratories

- Electron microscopic diagnostics in infectious diseases
- Listeria
- Infections of the gastrointestinal tract (Noro / Rota viruses)
- Poxvirus
- Tick-borne encephalitis



## International Collaborating Centre

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- **WHO EURO Regional Polio Reference Laboratory**
- **WHO EURO Regional Reference Laboratory for Measles and Rubella**
- **Organisation of the European Network for Diagnostics of "Imported" Viral Diseases (ENIVD)**



# Smallpox

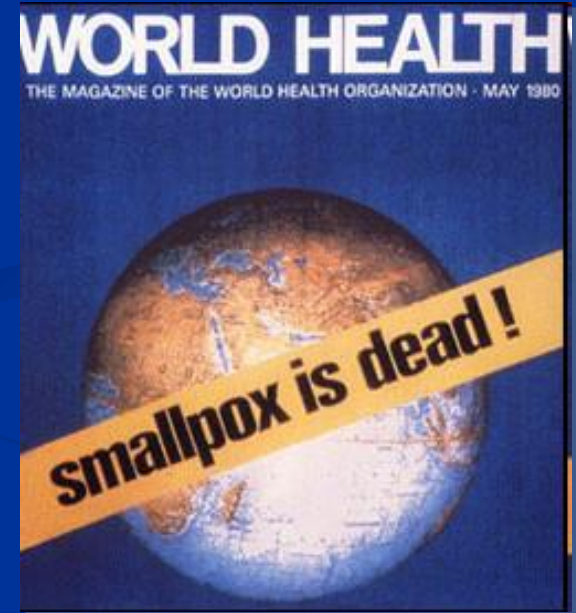
Variola major



Edward Jenner / Benjamin Jesty



Smallpox Eradication



9. Dezember 1979, 2 Jahre nach dem letzten natürlichen Variola-Fall in Somalia



# Klassische & exotische Kuhpocken

- Europa/Vorderasien
- Sehr breites Wirtsspektrum
- Komplettestes Orthopockenvirus-Genom



Katze



Mensch



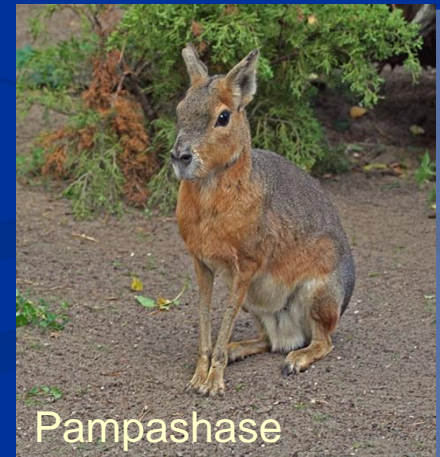
Zebramanguste



Elefant



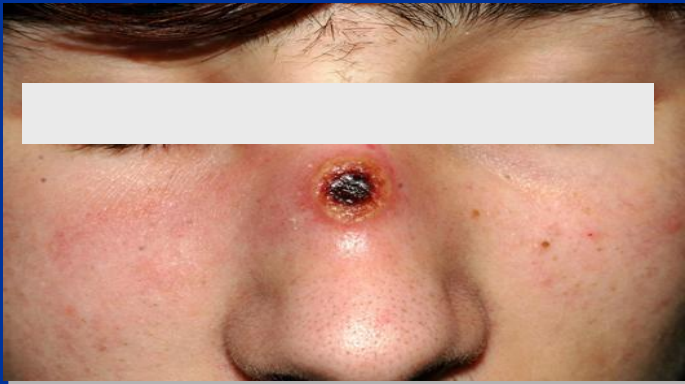
Krallenaaffe



Pampashase

# Übertragung durch Kuschelratten

- >1 Jahr Infektionen mit identischem Virusstamm
- 16 humane Fälle allein in NRW



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# **Large Outbreak through enterhemorrhagic *E.coli* 0104:H4 with bloody diarrhea and hemolytic uremic syndrome 2011**



# Epidemic profile (final report, Sept. 9, 2011)

Outbreak cases	N	Age (median)	% Female	Deaths
EHEC	2.987	46 years	58%	18 (0,6%)
HUS	855	42 years	68%	35 (4,1%)
	>20%	90% adults!	> ♀	
Total	3.842			53

## Comparison with previous years

EHEC: ~1,000 illnesses/ year

median age: 5 years

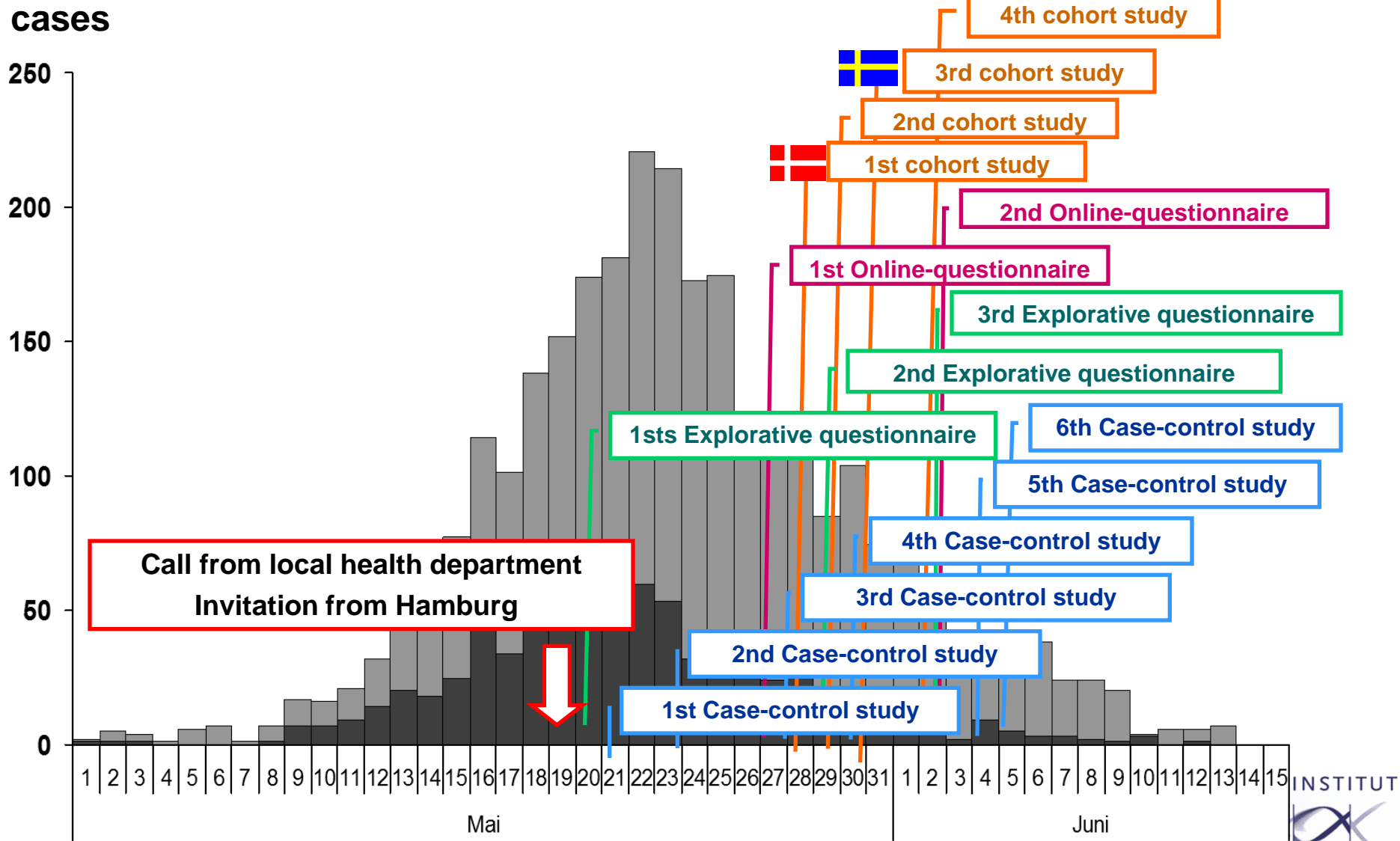
HUS: 65 illnesses/ year

median age: 2 years



# Timeline of epidemiological studies

Evidence for sprouts as the only risk factor



# Cohort study 4: Methodology

- **Guests: which meal(s) ordered/eaten?**
- **Chef: which ingredient in each menu item?**
- **Merging of the two databases**



# How sprouts were served...

**(1) On top of the main dish**



**(2) As part of the side salad**



# Common link between German and French outbreak

Fenugreek seeds ( *Trigonella foenum-graecum* )  
( including seed mixes and homegrown, risk of cross-contamination )



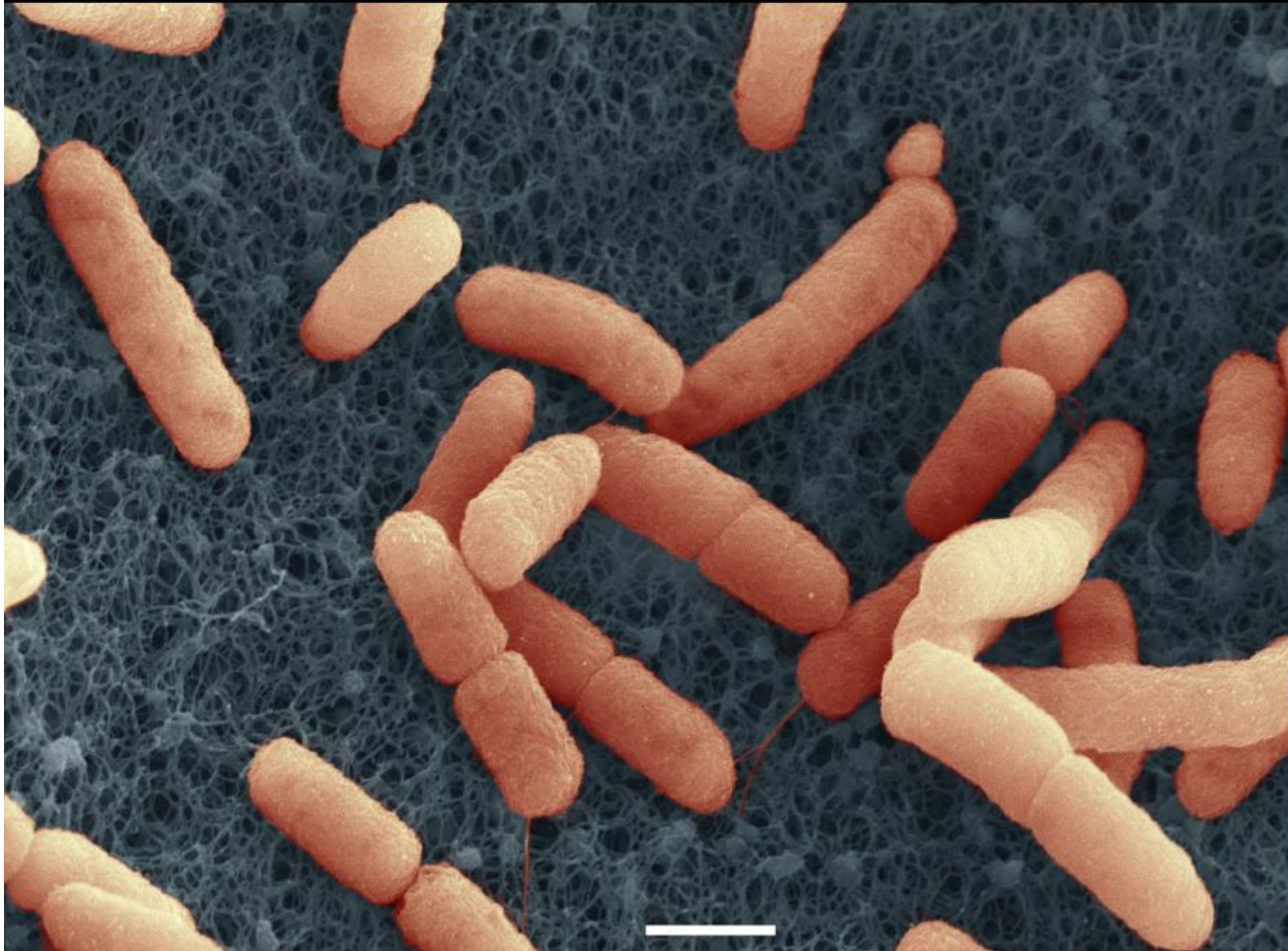
( Source Galster's Kräuter, Fürth )







# Microbiological characterisation of EHEC O104:H4



# Economic losses for fruit and vegetable sector

(source: Copa-Cogeca)

- In first two weeks : at least 812 Mio €
- Temporary export ban to Russia : 600 Mio €
- Market intervention by Europ. Commission : 227 Mio €

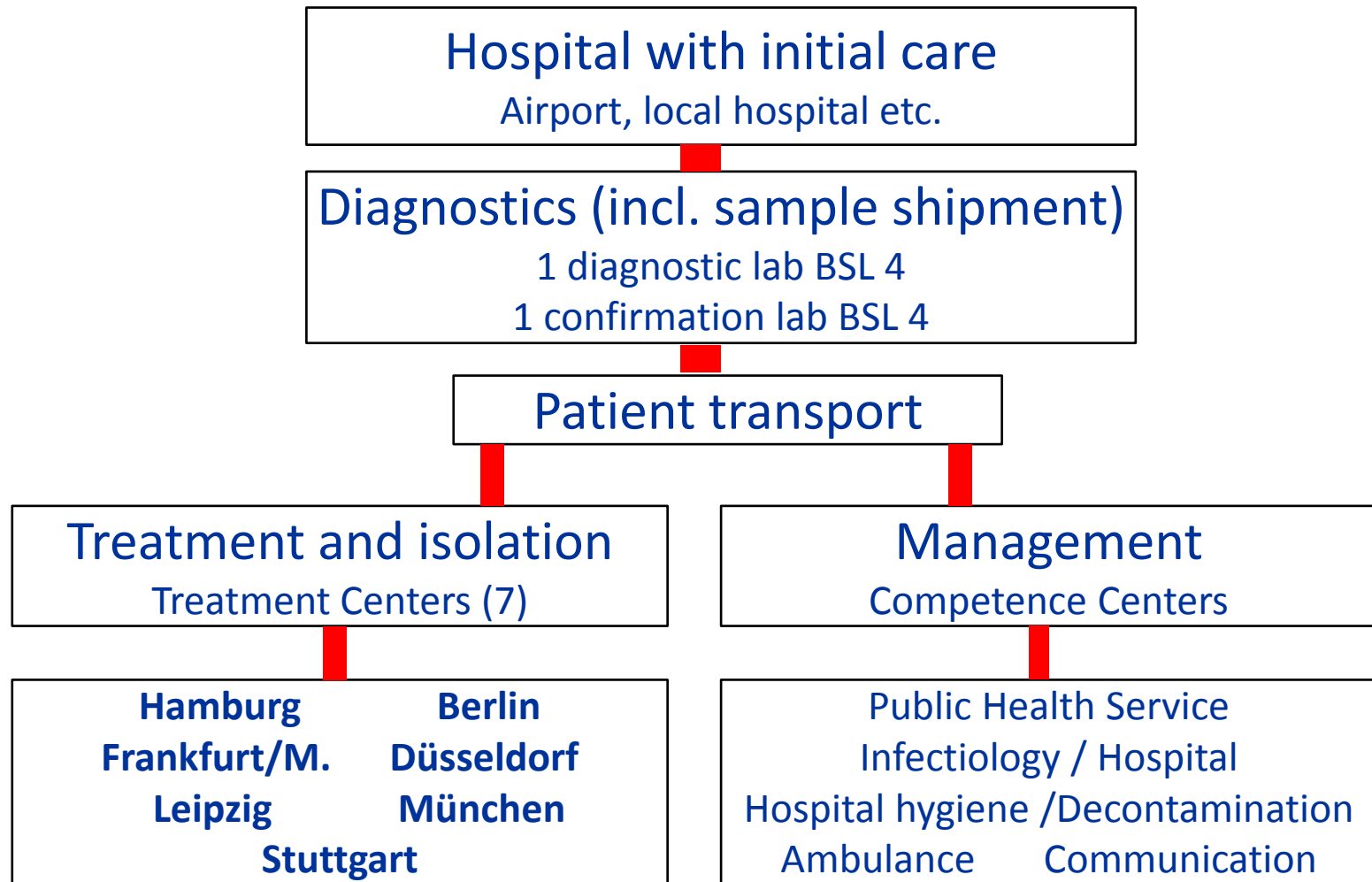
**Total: > 1600 Mio Euro**

# Framework Ebola Virus Disease

## RKI recommendations on intervention preparedness

- Suspected cases: define, detect, provide care
- Diagnostics (including sample transport)
- Handling of contact persons
- Patient transport
- Isolation and treatment of cases
- Therapeutic approaches
- Post exposition measures
- Disinfection, decontamination, handling of waste/waste water
- Communication

# Concept of competence and treatment centers



# Norovirus-outbreak in schools and kindergardens with food supply by external caterer, Sept.–Oct. 2012

- Largest foodborne Norovirus-outbreak in Germany ever, Sept. 2012
- Peak of cases between Sept. 25 - 28 in 5 federal states: Brandenburg, Berlin, Sachsen-Anhalt, Sachsen, Thüringen
- More than 11,000 cases reported, predominantly children, adolescents and personnel in nurseries and schools
- Most affected institutions were supplied with food by **O N E** single caterer



# Epidemiological analysis of Norovirus - outbreak

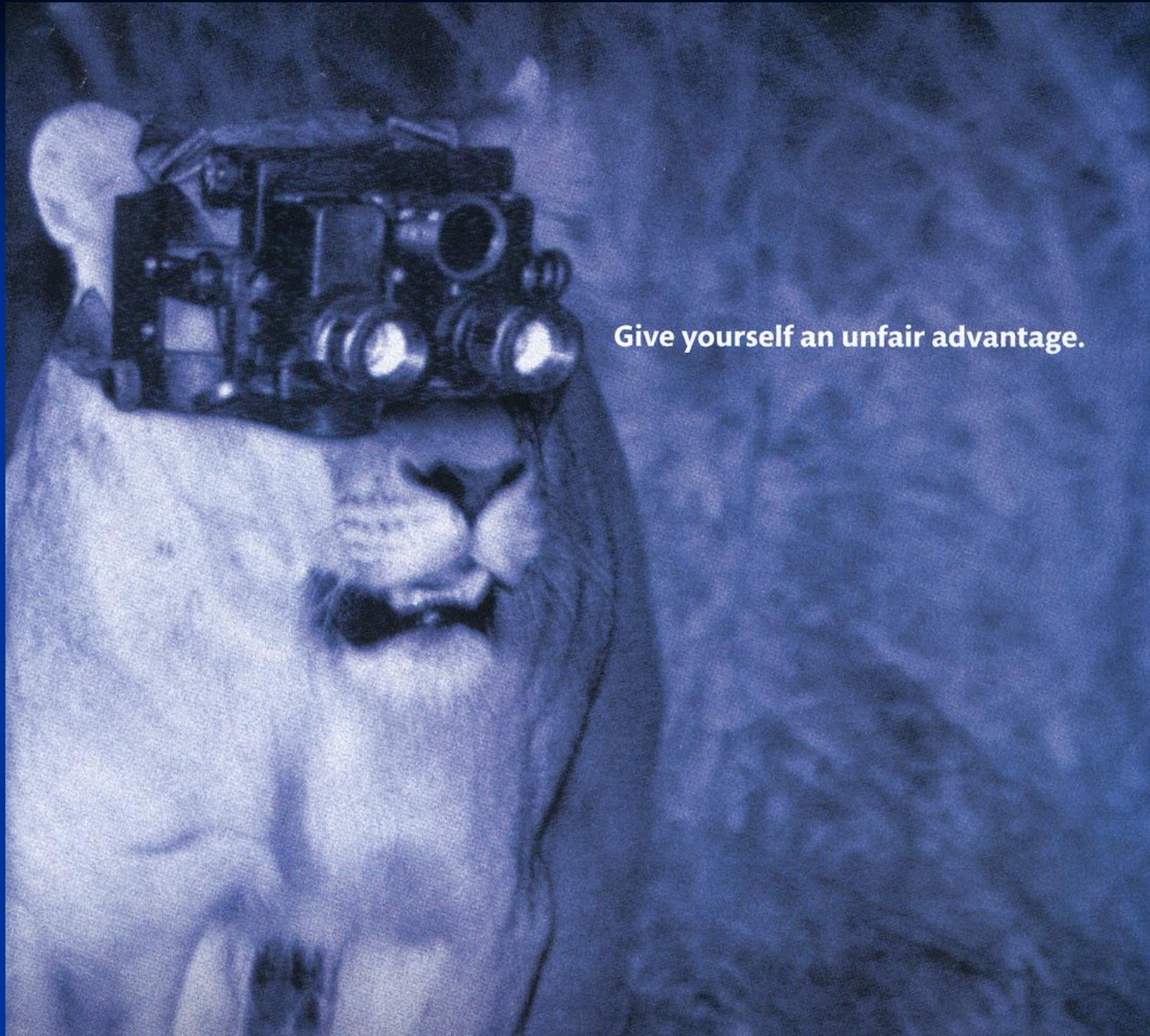
- Analysis of affected individuals and of facilities in case-control studies
- Association with consumption of frozen strawberries of one batch imported from China
- Batch size: 41,000 kilogram !

# Detection of Norovirus in one batch of frozen strawberries

- Detection of Norovirus in several samples of the identified batch of frozen strawberries through Landesamt für Verbraucherschutz, Sachsen-Anhalt and Bundesinstitut für Risikobewertung
- Molecular analysis at RKI revealed high homology between sequence of Norovirus from the strawberry batch and part of the patients

# “Splendor and misery” of a Federal System

- Responsibilities split between federal institutions and federal states, down to county level
- Requires complex interaction
- Particularly in the case of zoonoses (also veterinary services)
- Challenge: coordination of available capacity, competence, resources, goal-oriented, synergies
- Professional risk and crisis communication:  
By whom? To whom?
- Public health service: frequently rudimentary staff, rapid reaction and surge capacity?



**Give yourself an unfair advantage.**