Zoonosenforschung und Umsetzung in Deutschland im nationalen und internationalen Kontext

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Zoonotic and «one-health»-challenges -

SARS, Bird flu, H1N1, Hemorrhagic viruses (Ebola...) → Zoonoses

Trypanosomiasis, Dengue, Buruli ulcer, ... → Neglected diseases, re-emerging ↔ environment, often zoonoses and associated with social and political changes

Neglected diseases
Neglected people and animals
Neglected health and social systems

1400 pathogens 800 cross barrier animal-humans
24% of diseases clear environmental links
Approximate composition of determinants of health:
Incremental contribution of climate change to the overall determinants of health

- Lack of access to care
- Inadequate health systems
- Livestock
- Other environmental determinants
- Climate change
- Lack of environmental sanitation
The "one medicine" by Calvin Schwabe's has its origins in his work with Dinka pastoralists in Sudan in the 1960s.

"There is no difference of paradigm between human and veterinary medicine. Both sciences share a common body of knowledge in anatomy, physiology, pathology, on the origines of diseases in all species."

What does Calvin Schwabe’s „one medicine“ really mean?

1. Recognition of interdependence of humans and animals is only part of one medicine and one health. It is necessary but not sufficient.

2. Most of the papers in conferences are limited to this aspect, some include broader interactions.

3. Little theory of “One health”, an operational definition could by that:

4. “One health” is **anything that adds value** to the health of animals and humans, or economic savings, not achievable without cooperation of the two medicines.
One-Medicine - Related concepts

Veterinary Public Health (VPH)

Natural Nidality of Transmissible Diseases
1. E. Pavlovsky (1966): Concept of “disease nidality”: Pathogens occupy ecological niches much in the same manner as any living organism has a characteristic niche in nature.

Ecosystem health (IDRC)
1. Vision of improved health and well-being, sustainable ecosystems, more equitable development and less poverty.

Agro-ecosystem Health
1. Investigation of agricultural systems in holistic view encompassing ecology, economy and health.

Extension of health concept to whole ecosystem
• From “one medicine” to “one health” and possibly “one well-being”
Conceptual landscape of "one medicine"

- Ecohealth / Agro-ecosystem health
- One Health
- Medicine
- One Medicine
- Vet. medicine

From "us versus them" to "shared risks"

Syndrome Concept: mitigating syndromes of global change (NCCR)
Health Outcomes:
- Physical
- Emotional
- Spiritual (humans)

Health and Wellbeing

Psychological - Social - Cultural - Economic - Political – Determinants
- Governance, Infrastructure, Education,
- Public and animal health systems,
- Burden of disease, Health economics
- Livelihood, Vulnerability, Social resilience, Access,
- Actor centred approach and construction of actors realities
- Equity effectiveness of interventions, …

→ are also outcomes of health (mutual influence)

Ecosystems and their health related components:
- Vectors, Pathogens
- Vegetation and Natural resources
- Food, feed and Water
- Physical: Erosion, Climate change, …
- Urban – Rural: Industrial and agricultural production and pollution, …

Ecological System of Humans and Animals

A step towards a „theory of development research“

→ Communication with non-Western Epistemologies
Descriptive studies on zoonoses: Q-fever, Brucellosis
Methodology: HDSS for mobile populations
Health systems and interventions: Vaccination services in Sahel
Urban zoonoses: Rabies elimination through vaccination of dogs
Economic benefit and interventions: Brucellos central Asia/Mongolia, rabies
Joint human and animal disease surveillance
11 Verbundprojekte (Zoonosenverbünde) mit über 95 Teilprojekten gefördert:

- **FBI-Zoo** - Lebensmittelbedingte zoonotische Infektionen beim Menschen
- **FluResearchNet** - Pathogenität und Speziestransmission von Influenza A-Viren
- **Lyssaviren** - eine potentielle Gesundheitsgefahr
- **MedVet-Staph** - Interdisziplinäres Forschungsnetzwerk zur zoonotischen Bedeutung von Staphylococcus aureus / MRSA
- Pathogenese, Diagnostik und Epidemiologie des **Q-Fiebers** in Deutschland
- **RESET** - Resistenzen bei Tier und Mensch - gemeinsame Forschung in Deutschland
- **SARS** - Ökologie und Pathogenese einer archetypischen Zoonose
- **Toxonet02** - Ein Netzwerk zur Toxoplasmose bei Mensch und Tier in Deutschland
- **VibrioNet**: Vibrio-Infektionen durch Lebensmittel und Meerwasser in Zeiten des Klimawandels
- **ZooMAP** - Paratuberkulose: Von der Johne'schen Krankheit zum Morbus Crohn
- **Zoonotische Chlamydiener** - Modelle für chronische und persistente Infektionen bei Mensch und Tier
Conceptual landscape of „one medicine“

Ecohealth / Agro-ecosystem health

Vet. medicine

One Medicine

One Health

Medicine

 Syndromes Concept: mitigating syndromes of global change (NCCR)

From “us versus them” to “shared risks”
Publications: Zoonoses - Germany
Zoonoses - Germany: Citations and consequences

- Boost relatively late in relation to international agenda
- Platform/consortia approaches relatively late
- Zoonotic interactions and relevance of zoonoses
- Late international recognition
- National focus
- Little translational aspects or systemic approaches for impact
Foodborne outbreaks 2007 - 2011
Salmonella 2001 - 2011

Campylobacter 2002 - 2011

Abb. 4.3.1: Campylobacter-Infektionen beim Menschen 2002–2011 (Quelle: RKI, 2011)

Zoonosenbericht 2011, BfR
EHEC 2002 - 2011

Abb. 4.4.1: E. coli-Infektionen (EHEC) sowie sonstige E. coli-Infektionen beim Menschen 2002–2011

Zoonosenbericht 2011, BfR
Listeria 2002 2011


Zoonosenbericht 2011, BfR
The systems context

From Efficacy to Effectiveness

Efficacy → 80% → X Access → 80% → X Targeting Accuracy → 80% → X Provider Compliance → 75% → X Consumer Adherence → 75% → = Effectiveness → 29%

Health System Factors / Partnership
Q-fever in the Netherlands (2007)

Lack of communication between Veterinary and Public Health sectors
Key actions: The unfinished “One Health”  
(Zinsstag et al. 2009 Veterinaria Italiana)

1. Joint disease surveillance for humans and animals (Labs and IT)
2. Joining cancer registries for humans and animals
3. Joint surveillance of antimicrobial resistance (e.g. CIPARS, Canada)
4. Better use of the human-animal bond for the control of non-communicable disease like depression or obesity. Communication: It should just become normal that doctors and veterinarians work together as closely as possible.
5. Worldbank estimates > 6 Billion USD annual savings from closer cooperation between human and animal health in infrastructure, institutional reform and communication (2011).
Zoonoses and „One health“ today and in future

1. Comparative Pathology
2. Joint human and animal epidemiological studies
3. Human health benefits of interventions in animals
4. Joint human and animal health services
5. Joint surveillance: risks, antibiotic resistance…
6. Joint systemic approaches – incl. population dynamics

Surveillance as intervention / surveillance – response approaches

Diagram:
- Human (Well being and social equity)
- Livelihoods approach
- Pastures (Management)
  - Resource based
  - (System)
  - Water
  - Land
- Livestock (System)
  - System based
  - Agriculture
  - Forestry

Equity access to services and resources
Towards living „one health“

- Integrated human and animal disease surveillance

1. Demographic Surveillance Systems, including community surveillance leading also to cost savings

- Integrated human and animal epidemiological study design.

- Integrated human and animal health services provision

- Institutional reform and public health reforms including communication

**Germany:**

- Extend scope to systemic and transdisciplinary approaches
- Pursue translational medicine and translational public health concept – including surveillance and forecasting in a decentralized system:
- Become truly international: From approaches (questions, consortia) to funding (Horizon2020, Wellcome Trust, BMGF...)
- Develop and validate surveillance – response systems
Beyond „One Health“: Towards Health in Social-Ecological Systems (SES)

Health of animals and humans are part of and determined by SES:

*A diagnostic approach for going beyond panaceas* in natural resource management (Ostrom, PNAS 2007, Nobel Laureate in Economics 2009)
Mixed teams to integrate human and animal health
Thank you very much