Systematization of recording and use of equine health data and its potential for horse breeding

K.F. Stock¹*, S. Sarnowski¹, E. Kalm², R. Reents¹

¹ Vereinigte Informationssysteme Tierhaltung w. V. (vit), Verden, Germany
² Institute for Animal Breeding and Husbandry, Christian-Albrechts-University of Kiel, Germany

Email: friederike.katharina.stock@vit.de
Background: demands

- increased demands of sustainable and balanced breeding programs
  - performance
  - health, welfare and longevity

- new traits as factors of competitiveness among studbooks → relevance of health as breeding goal ↑

Equine health data (STOCK et al.), 28 Aug 2014, EAAP Copenhagen / DK
Background: demands & status quo

- increased demands of sustainable and balanced breeding programs
  - performance
  - health, welfare and longevity

- new traits as factors of competitiveness among studbooks
  → relevance of health as breeding goal ↑

- breeding measures to improve health in German riding horses
  - mainly indirect selection (indicator traits: conformation, performance)
  - some direct selection (extreme phenotypes / stallions)

- legal framework
  - animal breeding act (national)
  - breeding organization directive of the German FN (national)
  - regulations of the breeding societies (N=16 for riding horses)

Equine health data (STOCK et al.), 28 Aug 2014, EAAP Copenhagen / DK
Interdisciplinary national initiative

- **aim**: improved information basis on equine health
  - epidemiological figures
  - genetic parameters, breeding strategies
  → comprehensive approach to improving the health of horses

- **research consortium**
  - veterinarians
  - German studbooks, German FN
  - universities, IT service providers

Recent developments towards improved consideration of health in horse breeding in Germany:

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>since 2011</td>
<td>inclusion of defects traits and indications of disease in linear profiling protocols (Oldenburg, Holstein)</td>
</tr>
<tr>
<td>2012-2013</td>
<td>harmonization initiative of studbooks and veterinarians: health requirements for stallions (riding horses)</td>
</tr>
<tr>
<td>2013 / 2014</td>
<td>'equine health project' as national initiative: joint efforts, shared costs and support by private research foundation (all studbooks)</td>
</tr>
<tr>
<td>2014</td>
<td>adjustment of regulations of studbooks: role of health in horse breeding; 'central equine health data base'</td>
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Sources of information

- options for health data collection
  - owners and breeders (✓) difficult!
  - veterinary practitioners ✓ first choice (quality, quantity)
  - non-veterinary professionals (✓) possible?!

Fig.: Schematic of information flow on some health condition of a horse.
Sources of information

- options for health data collection
  - owners and breeders (✓) difficult!
  - veterinary practitioners ✓ first choice (quality, quantity)
  - non-veterinary professionals (✓) possible?! 

- requirements for using veterinary health data *
  - agreement with special needs of the veterinary profession
    legally: highly restrictive regarding data usage (conscious agreement of owners),
    practically: user-friendly implementation compatible with daily routines
  - highest standards regarding
    data security, data privacy, data protection
    highly restrictive regulations regarding data access
  - intense involvement of veterinary experts in R&D
    appropriate handling / processing of the data,
    interpretation and use of the results of health data analyses

* for general overview (stakeholders in the equine sectors), see Hartig et al. 2013a,b
Veterinary health data

- need for systematization and harmonization of recording

Tab.: Overview of current and prospective role of equine health data from veterinary sources.

<table>
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<th>Data characteristics</th>
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<td>general content</td>
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<tr>
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<td>heterogeneous in form (mostly free text) and detailedness (context-dependent)</td>
<td>standardized (uniform nomenclature, unambiguous code, clear hierarchy)</td>
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standard protocol ≠ standardized documentation
Veterinary health data

- need for systematization and harmonization of recording

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<tr>
<td>storage</td>
<td>decentral and heterogeneous (paper forms; practice software)</td>
<td>central and uniform (equine health data base)</td>
</tr>
<tr>
<td>use</td>
<td>at most within-practice statistics (vertical), on-request possible support of veterinary research</td>
<td>population-wide statistics (vertical, horizontal), optimum support of research and routines</td>
</tr>
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- comprehensive **recording standard** for equine health data
  - tool for standardized and simplified (!) recording
  - uniform coding as base requirement for data centralization

Tab.: Overview of current and prospective role of equine health data from veterinary sources.
Recording standard

- requirements
  - clear distinction between diseases (diagnoses) and findings of disease = direct outcome of examinations
  - unambiguous definitions of all health items to be recorded
  - unambiguous coding
  - praxis-oriented spectrum of recording options

- realization
  - distinct sections for diagnoses, radiographic and clinical findings
  - hierarchical structure
  - comprehensive reference
    - all organ systems
    - inherited and acquired conditions
    - descriptive and etiological aspects

Equine health data (STOCK et al.), 28 Aug 2014, EAAP Copenhagen / DK
Central equine health data base

- reliable logistics
- long-term perspective
  - system extension
  - use of health data (research, routines)
- consideration of needs of all stakeholders
Key factors of success: data flow

- **veterinarians**
  - general acceptance of the recording standard
    science-driven development with consultation of experts
    (spectrum of diagnoses and findings, terminology)
  - compliance to the standardized recording
    smart applications in veterinary practice software ensuring
    - ease of documentation (time, clearness),
    - flexibility (extent / detailedness of documentation),
    - coverage (appropriate documentation options, minimum of free text),
    - compatibility with documentation routines in the veterinary practice

- **horse owners and breeders**
  - understanding of aims and scope
  - trust in the whole system
Key factors of success: data usage

- breeding organizations
  - acceptance of necessary restrictions of data access (phenotypes)
  - support of measures to improve data quality
    accessibility of selected studbook data for participating veterinarians
    (base data to facilitate correct identification of horses)

- steering committee of the interdisciplinary research consortium
  - information policy
  - possible system extensions
    stronger / more direct involvement of 'the practice' (breeders, owners),
    information on potential influences of the individual health status of horses
  - strategic planning (R&D, routine applications)
Conclusions & prospects

- trustful and constructive collaboration of project partners
  - veterinarians of breeding societies as important drivers
  - strong support from the whole German horse breeding sector → installation of the central equine health data base
  - mediators between veterinary practitioners, science and breeding

- base work for future health data collection and analyses
  - regulation of conditions of routine use of equine health data (data security issues, regulations of breeding societies)
  - generation of mutual benefits of standardized health data recording veterinary practice, studbooks and their clients; test phase with pilot veterinary practices

Systematization of recording and use of equine health data as first step towards sustainable and targeted health improvement via inclusion of direct health traits in future breeding programs of horses
Thank you!

Contact persons in vit (genetic evaluation division):

PD Dr. habil. Kathrin F. Stock
   Email: friederike.katharina.stock@vit.de
   Phone: +49 - 4231 - 955623 oder +49 - 176 - 60931357

Sonja Sarnowski
   Email: sonja.sarnowski@vit.de
   Phone: +49 - 4231 - 955185
Linear schemes

Defect traits & indications of disease

- Oldenburg (OL, OS)
  - umbilical hernia
  - clinical limb status (joint swelling, swelling of tendon sheaths, epiphysitis), lameness
  - indications of imbalance (incoordination, tail tone, tail posture)
  - breathing sounds

- Holstein
  - umbilical hernia, scrotal hernia
  - overbite, underbite
  - lameness
  - indications of imbalance (incoordination, tail tone, tail posture)
  - breathing sounds

Equine health data (STOCK et al.), 28 Aug 2014, EAAP Copenhagen / DK
Recording standards (CATTLE)

- national
  - since June 2008: "Zentraler Diagnoseschlüssel Rind"
    Appendix 1 of the recommendation 3.1.1 of the German Cattle Breeders' Federation (ADR) for recording and use of health data in cattle;
    expert elaboration: Staufenbiel (FU Berlin) & coworkers;
    use as recording standard in herd management software
  - since 2012: "Zentraler Tiergesundheitsschlüssel Rind"
    Working group for health data of the umbrella organization of German milk recording agencies (DLQ); support / updates: Staufenbiel (FU Berlin), Stock (vit)

- international
  - since 2012: "Central Key for Health Data Recording"
    Appendix of the Guidelines for recording, evaluation and genetic improvement of health traits, compiled by the Functional Traits Working Group of the International Committee for Animal Recording (ICAR);
    english version of the German standard (Zentralen Tiergesundheitsschlüssels) as reference; support / updates: Stock (vit)
## Key of diagnoses (EQUINE)

<table>
<thead>
<tr>
<th>Diagnosis code</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Organ diseases</strong></td>
</tr>
<tr>
<td>1.01.</td>
<td>Diseases of skin, subcutis and coat</td>
</tr>
<tr>
<td>1.02.</td>
<td>Diseases of trunk and visceral cavities</td>
</tr>
<tr>
<td>1.03.</td>
<td>Cardio-vascular diseases</td>
</tr>
<tr>
<td>1.04.</td>
<td>Diseases of blood and blood forming organs</td>
</tr>
<tr>
<td>1.05.</td>
<td>Respiratory diseases</td>
</tr>
<tr>
<td>1.06.</td>
<td>Diseases of head</td>
</tr>
<tr>
<td>1.07.</td>
<td>Diseases of oral cavity, tongue, hyoid bone and teeth</td>
</tr>
<tr>
<td>1.08.</td>
<td>Gastrointestinal diseases</td>
</tr>
<tr>
<td>1.09.</td>
<td>Diseases of liver</td>
</tr>
<tr>
<td>1.10.</td>
<td>Metabolic diseases and tumorous disorders of hormone forming organs</td>
</tr>
<tr>
<td>1.11.</td>
<td>Diseases of the urinary tract</td>
</tr>
<tr>
<td>1.12.</td>
<td>Reproductive disorders</td>
</tr>
<tr>
<td>1.13.</td>
<td>Disease of nervous system and eyes</td>
</tr>
<tr>
<td>1.14.</td>
<td>Musculoskeletal diseases</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Infectious diseases</strong></td>
</tr>
<tr>
<td>3.</td>
<td>Parasitoses</td>
</tr>
<tr>
<td>4.</td>
<td>Behavioral disorders</td>
</tr>
</tbody>
</table>

**Structure:**
- 4 disease groups
- levels of increasing detailedness (max. 7)
- in total > 2000 recording options

Equine health data (STOCK et al.), 28 Aug 2014, EAAP Copenhagen / DK
Key of findings (EQUINE)

- distinct sections for
  - radiographic findings
  - clinical findings incl. outcomes of specific examinations (ophthalmological, cardiological, ...)

- general outline
  - clear base structure relating to examination conditions
  - unambiguous, purely descriptive, common terminology

Radiographic findings section
- documentation by projection
- categories of findings independent of projection and location:
  - structure changes (radiolucency, increased radiodensity),
  - contour changes (exostoses, indentions),
  - further changes (specific findings like canales sesamoidales, osseous fragments, ...)
Key of radiographic findings (EXAMPLE)

Rad. examination of the front limbs

<table>
<thead>
<tr>
<th>Befundschlüssel (Code) - R1</th>
<th>Befund</th>
<th>Zusatzinformation (Details)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00.</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>2.00.</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>3.00.</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>3.01.</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>3.01.01.</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>3.01.02.</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>3.01.03.</td>
<td>□</td>
<td>□ diffus □ umschrieben</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ lateral □ axial □ medial</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ ggr. □ mgr. □ hgr.</td>
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<td></td>
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Standardized documentation with 3-6 clicks:

Left front limb (Oxspring)
radiolucency in the proximal short pastern bone,
further characterized as
circumscribed, medially located, severe/marked

circumscribed radiolucent area in front left front limb visible on upright-pedal-view (Oxspring projection)
→ diagnosis: cyst-like lesion

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