

Quantitative and qualitative overview and assessment of literature on animal health in organic farming between 1991 and 2011 – Part II: pigs, poultry, others

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Abstract

On the subject of “animal health in organic farming” an evaluative review and assessment of searchable publications has been conducted. This overview is intended to provide recommendations for future research to optimize the organic farming. General results are described in Part I (Simoneit et al., 2012): 569 publications (thereof 33 % reviewed) related to animal health in organic farming were found. This included articles on general topics (42 publications), on cattle (211), on pigs (181), on poultry (100), on small ruminants (25) and on other species (10). In organic pig farming the health of fattening pigs, sows and piglets together account for only 57 % of articles. Mortality of piglets and poor body condition of sows after weaning, parasites and other difficulties tributary to free-range-system are described with priority. The remaining publications attend to general problems. Articles concerning health in poultry farming attend mostly to layers (54 %) and to broilers (26 %). E.g., feather pecking and hygienic problems due to the free-range system are described. Health especially in organic small ruminants and other minor species is described rarely. The problems concerning animal health in organic as in conventional farming are comparable. In general, an implementation-oriented, but at the same time high-quality scientific research is needed to optimize the conditions for animal health and animal welfare in organic farming.

Keywords: production animal, animal husbandry, animal welfare, ecological farming, organic livestock production, organic pigs, pigs, organic poultry, poultry, organic agriculture, animal health

Zusammenfassung

Quantitative und qualitative Übersicht und Bewertung der Literatur über Tiergesundheit in der ökologischen Tierhaltung zwischen 1991 und 2011 – Teil 2: Schweine, Geflügel, andere

Dazu ist eine bewertende Zusammenfassung und Einschätzung der recherchierbaren Veröffentlichungen durchgeführt worden. Dieser Überblick soll Empfehlungen für die zukünftige Forschung zur Optimierung des ökologischen Landbaus aussprechen. Allgemeine Ergebnisse sind in Teil I (Simoneit et al., 2012) beschrieben: Insgesamt wurden 569 Veröffentlichungen (davon 33 % reviewed) mit Bezug zur Tiergesundheit im ökologischen Landbau erfasst, davon zu allgemeinen Themen (42 Artikel), zu Rindern (211), Schweinen (181), Geflügel (100), Kleinen Wiederkäuern (25) und sonstigen Tierarten (10). Krankheiten von ökologisch gehaltenen Mastschweinen, Sauen und Ferkeln werden in insgesamt 57 % der Artikel genannt. Ferkelsterblichkeit und mangelhafte Kondition der Sauen beim Absetzen, Parasiten und andere Probleme, die durch das Auslaufsystem begründet sind, werden vorrangig beschrieben. Artikel über die Gesundheit in ökologischen Geflügelhaltungen beschäftigen sich hauptsächlich mit Legehennen (54 %) und Masthähnchen (26 %). Federpicken und Hygieneprobleme im Auslauf werden beschrieben. Gesundheitliche Probleme speziell bei ökologisch gehaltenen, kleinen Wiederkäuern und anderen Tierarten werden selten beschrieben. Die Probleme bei der Tiergesundheit in der ökologischen wie in der konventionellen Schweine- und Geflügelhaltung sind vergleichbar. Allgemein ist eine umsetzungsorientierte, aber dabei qualitativ hochwertige wissenschaftliche Forschung notwendig, um die Bedingungen für Tiergesundheit und Tiergerechtigkeit auch im ökologischen Landbau zu optimieren.

Schlüsselwörter: biologische Nutztierhaltung, ökologische Nutztierhaltung, Tiergesundheit, ökologische Schweinehaltung, ökologische Geflügelhaltung, Schweine, Geflügel, Tierwohlbefinden, ökologischer Landbau

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Introduction

A literature search and assessment was performed to achieve an overview on the published knowledge about animal health in organic farming in the period between 1991 and 2011. A number of 596 articles were retrieved; thereof 186 were published in reviewed journals. Detailed introduction, methods, general results and results on cattle are previously published in Part I of this review (Simoneit et al., 2012). The objective here is the presentation of results on pigs, poultry and other species.

Results of literature search on health of pigs

31 % (n = 56) of the 181 publications retrieved concerning pigs were published in a scientifically reviewed journal. A part of 29 % (n = 52) from all retrieved articles occupies with health problems in fattening pigs, 16 % (n = 30) with piglets and 12 % (n = 21) with sows. A high amount of publications was not assigned to a certain production system (43 %, n = 78).

Following the search order, the main focus of retrieved publications lay on "illnesses" (57 %, n = 104). 36 % (n = 65) concerns with "housing".

Within the articles concerning illnesses the "parasites" (27 %, n = 28) and "infection diseases" (20 %, n = 21) were predominate subcategories. Problems of the "digestion system" (n = 5) and of the "respiratory system" (n = 4) are described less frequently. Items like "reproductive system", "metabolism disorders", and "lameness" included the fewest number of publications. Most articles were not to assign to a certain disease (30 %, n = 31).

Review of selected articles on health of pigs

In the following section the main conclusions of the retrieved articles on health of swine livestock are drawn.

Published research results in organic pig production based on special organic conditions and on surveys with a satisfactory number of observations are scarce (Bonde et al., 2004).

In piglet production deficits exist in studies on housing, hygiene and health management (Werner et al., 2008). The increased losses of piglets in organic farms compared to conventional pig farms must be seen as an indicator for lower animal health status (Dietze et al., 2007; Bonde et al., 2006). Further studies on the influence of litter size on piglet mortality (Prunier et al., 2010) and on the reduction of this problem, e.g., the development of a special breeding program, should be done.

The incidence of poor body condition at weaning, especially in young sows, has to be reduced in organic sow herds. However, this cannot exclusively be explained by

the later weaning in organic farming (Kongsted et al., 2009). Results on influences of this lower body condition and their conclusions are needed. In swine production the financial pressure is obvious and drives the management decisions. The needs of an animal-welfare-based organic pig meat production should be scientifically evaluated including all financial implications.

Due to the free-range and litter systems, high endoparasite infection levels are often found in organic pig production (Carstensen et al., 2002; Roepstorff et al., 2011; Giessen et al., 2007). Even the simple presence of endoparasites induces a reduction in body weight (Kipper et al., 2011). This result should concern organic farming as well. Important research needs exist in the prevention of the parasite load in organic farming. Possible risk factors, e.g. of the environment or management, should be analysed. Animal husbandry following the 'all in / all out' concept, enabling an effective hygiene regime, was rare in organic farming (Dietze et al., 2007). However, no significant connection could be determined between hygiene management and the load with endoparasites (Werner et al., 2011; Werner et al., 2009). Therefore, there is a need in organic farming to develop new strategies for endoparasite control (Roepstorff et al., 2011). The usefulness of developing risk scores and the actual presence of infectious parasites in meat has to be reviewed (Kijlstra et al., 2007). The risk of transmission of endoparasites from wild animals to free-range pigs should be studied (Giessen et al., 2007) and we have to keep in mind, that especially *Trichinella spp.* in wild boar is increasing (via rats to farm pigs). Furthermore, many studies have been performed on the mechanisms behind the biological control of flies, but it is still largely unknown whether these methods pose threats to farm animal health or food safety (Meerburg et al., 2007). Leirs et al. (2004) provided a number of suggestions for preventative rodent control which need to be established in specific and controlled experiments. Difficulties exist as some organic farmers are reluctant towards stringent rodent control using rodenticides and/or traps since they consider these animals an integral part of the farm ecosystem (Kijlstra et al., 2008). Additionally, future research of other factors which may influence the transmission of parasites in outdoor housing such as pasture design (e.g., trees) or weather conditions should be carried out (Thomsen et al., 2001). Further research is needed to overcome a potential infection risk from contaminated soils by soil treatments such as ploughing (Jensen et al., 2006 a, b). In general, infection with parasites remains a major problem in organic pig farming and special studies to solve these problems are still missing.

Outdoor pig production may imply increased exposure to microbiological pathogens as well as a risk of attracting emerging diseases of zoonotic importance.

In housing on straw with outdoor access more lameness and illnesses of the respiratory systems as in conventional farming were found (Badertscher et al., 2002). Another study reveals no major differences between conventional and organic farming (Werner et al., 2008). Furthermore, the prevalence of leg disorders and other clinical diseases in outdoor herds might be under-estimated due to difficulties in diagnosing the problems in extensive production systems (Bonde et al., 2004). Better monitoring systems are needed in order to improve animal welfare in organic pig farming (Bonde et al., 2006). The routine control of risk factors at regular intervals to prevent lameness may be an option (Bonde et al., 2004). Other options are breeding for disease resistance and a good locomotive foundation or, in general, choosing more robust breeds in the production system (Bonde et al., 2004; Badertscher et al., 2002). Research for the development of animal-adapted production facilities better suited to control infectious diseases is needed as well as optimisation in feeding, hygiene and animal handling in relation to animal health and welfare (Bonde et al., 2006). Furthermore, alternative treatments against a wide range of disorders have no scientific justification (Hameenoja, 2001). **Therefore, the need for further research on alternative prevention and treatment is evident.**

Results of literature search on health of poultry

The literature search on animal health in organic poultry farming retrieved 100 articles, thereof were 52 % reviewed published. In the sum of all retrieved articles the production system "laying hens" was dominant (54 %). A part of 26 % occupies with "broiler", 6 % with "turkeys". 14 publications were not assigned to a certain production system. 20 articles attend to the item "feather pecking".

The main focuses of the publications lay in the area "illnesses" (48 %) and were followed by disorders caused by "housing" (31 %) or "genetics" (17 %).

Within the articles which concern illnesses "infectious diseases" (46 %, n = 22) were found most often. Further articles focus, for example, on "parasites" (n = 9).

Review of selected articles on health of poultry

In the following section the main conclusions of the retrieved articles on health of poultry are drawn.

Respective to the importance of poultry farming there is only a limited number of scientific publications related to animal health and welfare (Berg, 2001).

Contradictory results exist on the influence of housing systems on *Salmonella spp.* prevalence in organic chickens (Bailey et al., 2005; Van Hoorebeke et al., 2011). Still the true underlying mechanisms causing the prevalence of

Salmonella in organic farming remains unknown, because hen breed, condition of the equipment, disease status of the flock, rodent and insect load, etc., all contribute to the complexity of this issue (Van Hoorebeke et al., 2011). *Campylobacter* is highly prevalent in both organic and conventional poultry production systems (Luangtongkum et al., 2006). No evidence is provided that the free-range environment represents a major source of contamination which indicates that other potential sources should be examined (Colles et al., 2008). Future studies should develop alternative strategies to decontaminate the free range (Colles et al., 2008). There is a need for information about biosecurity, disease detection and disease prevention on organic poultry farms (Berg, 2001; Allen et al., 2011). However, the pathogens of organically raised poultry and turkeys seemed to be more susceptible to antimicrobials (Luangtongkum et al., 2006; Cui et al., 2005).

It is questionable if the prolonged withdrawal periods after pharmaceutical treatment in organic farming, which could lead to a possible under-treatment of diseases, followed by unnecessary suffering, is an issue in organic poultry as well (Berg, 2001). Similar problems may arise due to the fact that only a single treatment is allowed in organic broiler husbandry (Koopmann et al., 2011).

Mortality in laying hens in organic farming is high (Hegelund et al., 2006). Cannibalism is one of the causes of death in laying hens housed in free range systems (Fossum et al., 2009). Furthermore, a high proportion of feather pecking exists (Berg, 2001). Jones et al. (2002) explored enrichment devices to reduce feather pecking, but research is needed on whether this would reduce inter-bird pecking among herds known to contain feather peckers as well. Further studies on the type of feeding equipment, air quality, light and sound quality, as well as the role of changes between rearing and laying environment to reduce feather pecking would be valuable (Drake et al., 2010). It would be very interesting as well to monitor the amount of case-by-case exceptional permissions for beak-trimming in organic layers, as this could be an indicator for animal management which respects successfully animal needs.

Contradictory results to the foot health in organic poultry production exist (Berg, 2001; Pagazaurtundua et al., 2006). Further studies should review the influence of the breed, slaughter age and weight of birds on foot pad dermatitis (Pagazaurtundua et al., 2006). In general, it should be investigated what management tools are required to improve animal welfare in organic poultry farming (Hegelund et al., 2006).

Furthermore, future studies should examine factors which affect the hens' use of the run to create a more attractive environment (Hegelund et al., 2006; 2005). Alternative methods of sanitation procedures for the run should be developed as well (Berg, 2001).

Parasite infections present a major problem in the production of organic chickens (Thamsborg et al., 1999; Swinkels et al., 2007; Jansson et al., 2010; Hegelund et al., 2006). However, the significance of these infections in terms of disease and production losses on organic farms has not been assessed (Thamsborg et al., 1999). Future studies should be carried out to obtain a dataset on biosecurity measures (Jansson et al., 2010). Thamsborg et al. (1999) described some procedures for parasite control without a heavy reliance on antiparasitic drugs, but future studies are needed to confirm their efficacy under practical farming conditions.

Further on, aspects of adequate organic feeding while maintaining animal health (Hörning et al., 2003) and the effects of the extended growing period (Berg, 2001) should be examined. Future research should review the practical use of slow growing breeds and possible subsequent problems. Additionally, many studies have been conducted that have led to a variety of possible animal welfare indicators, but not all are ready to use (Bokkers et al., 2009). Therefore, the development of objective indicators to capture animal welfare in poultry is of great importance.

Studies on animal health in turkeys and water fowl are rare and should therefore be carried out increasingly.

Results of literature search on health of small ruminants and other species

Apart from the main search focus on the species cattle, pig and poultry, 25 articles were retrieved on health of sheep (n = 8), goats (n = 9) and small ruminants in general (n = 8). Thereof the production systems "milk" (52 %, n = 13), "landscape conservation" (16 %, n = 4), and "meat" (12 %, n = 3) are represented. The main health problems depend on parasites (n = 13).

Further on, 10 articles about other species as bees, fish and rabbits were found.

Review of selected articles on health of small ruminants and other species

In the following section the main conclusions of the retrieved articles on health of small ruminant livestock and other species are drawn.

Parasitic nematodes are a major threat to the health and welfare of small ruminants (Rahmann et al., 2007; Ganter et al., 2005). Future research needs exist above all in alternative prevention and the treatment of parasites. For example, the need to identify the role of dietary protein on the resilience and resistance of growing kids is evident (Hoste et al., 2005).

Very little literature is available on the health of lambs. A balanced feeding for small ruminants especially in the fattening period needs to be reviewed (Humann-Ziehank et al., 2006). The development of adequate housing of horned goats and studies which matter on the breeding of genetically hornless breeds should be the subject of further investigations (Waiblinger et al., 2011). Additionally, studies on alternative treatments as well as studies to improve animal health in the areas of infectious illnesses, illnesses of the digestive and respiratory system are important (Humann-Ziehank et al., 2006).

Publications on other species in organic farming (n = 10) such as rabbits (n = 5), bees (n = 3) and fish (n = 2) were rare. In contrast to all other species, the main focus was on "housing." Further research on these species is needed. Especially studies on a balanced feeding of rabbits and breeds adapted to organic farming should be carried out (Mergili et al., 2010). In fish a research need exists on alternative animal feed for carnivore fishes, developing methods to protect fish against predators and on alternative prevention and treatment strategies (Bergleiter et al., 2004).

Conclusion and Outlook

High-quality studies on organic swine and poultry husbandry are rare, mainly comparative studies with control groups within the organic system are essential to perform in the future.

As mentioned in Part I of this review data should be raised increasingly on the basis of scientific investigations and in a controlled environment. Status quo analyses matter to receive actual data from farms and to recognise the existing problems. Nevertheless, universally valid statements concerning the future improvement of animal health in organic husbandry are hard to be pulled out of these data because of the bias caused by a great amount of diversities between the different farms. Even as some of these differences may be measurable some are not e.g. the personal traits of the farmers. Studies to investigate solution attempts are lacking as well.

The research needed on pig-, poultry- and minor species-health in organic farming arises from the gaps of knowledge on the following questions:

- Improvement of management and housing
- Prevention and treatment of infections
- Parasite prevention and treatment
- Lameness and illnesses of the respiratory system
- Mortality of piglets
- Studies on organic turkeys and water fowls as well as fish and other minor species
- Conversion of slow growing breeds in organic poultry
- Studies on hornless goats.

In general, similar problems on animal health exist for both organic and conventional farming. Beside the high influence of the individual management skills of the owners, organic husbandry has to have an outstanding good status of animal health as a basic goal. The realization of that goal would exclude all possibilities of doubts and meet the consumer's perceptions. Finally, objective indicators especially on good animal health and welfare are needed to implement quantitative criteria which could help those farmers who realise completely an outstanding good status of animal health, in example by financial support.

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Even as a large amount of research need could be determined, the authors can give no guarantee of completeness.

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