



D4.3: BEST PRACTICE GUIDES – VERSION 1



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ABSTRACT

aWISH project aims to develop and offer a cost-efficient solution to evaluate and improve the welfare of meat producing livestock at a large scale, across Europe. This approach will be developed and evaluated in close collaboration with all actors involved, from primary producers up to policy makers and citizens.



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GLOSSARY OF ACRONYMS

Acronym / Term	Description
AW	Animal welfare
AWI	Animal welfare indicator
BP	Best Practice
BPG	Best Practice Guide
DOA	Dead on arrival
FPD	Footpad dermatitis
WP	Work package



1. EXECUTIVE SUMMARY

Deliverable 4.3 “Best Practice Guides – version 1” is designed to offer recommendations and advice to all stakeholders on how to improve animal welfare along the production chain. Specific measures (“Best Practices”) have been identified and structured into different Best Practice Guides (BPGs) to provide steps that can be taken in order to increase the welfare of both broiler chickens as well as fattening pigs. This version 1 contains summaries intended for practical usage. It was developed based on the available scientific literature and expertise from partners and scientific experts, who were consulted in a survey.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the rearing of the animals. These guides were divided into one on animal health and one on animal welfare/behaviour. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport/lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, focusing on the ones that can also be measured at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified. The following AWIs were used in the guides:

- For pigs, tail and ear lesions, skin lesions, lung lesions, liver lesions and bursitis were explored.
- For broilers, footpad dermatitis and hock burn, lameness, heat stress, catching damage and dead on arrival are indicators that were emphasised in the guides.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

DISCLAIMER

The information and views set out in this deliverable are those of the authors and do not necessarily reflect the official opinion of the European Union. Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the following information.



2. INTRODUCTION

2.1 OBJECTIVE

Deliverable 4.3 “Best Practice Guides – version 1” is part of WP 4 “Monitoring and Improving Animal Welfare”. The BPGs aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. Outcomes of the aWISH project will further be integrated into a second version of the BPGs: extensive reports that can be shared with policy makers, advisers and other stakeholders. This second version of BPGs will be available at the end of the project.

2.2 METHODOLOGY

2.2.1 Literature research

The methodology for creating the BPGs mainly consisted of two actions: a literature research and a survey with experts. The literature research was conducted using the databases PubMed (www.pubmed.ncbi.nlm.nih.gov), GoogleScholar (www.scholar.google.com) as well as Web of Science (www.webofscience.com), focusing on different animal welfare indicators and areas that are highly relevant to farm animal welfare. Partners of the project also provided access to documents published in their organisations that are relevant to the guides.

For pigs, the following indicators were chosen (based on the animal welfare indicators that are measured in the aWish-project):

- Tail lesions
- Ear lesions
- Skin lesions
- Bursitis
- Lung lesions
- Liver lesions
- Transport
- Slaughter/Stunning

For broilers, there was a focus on the following AWIs and areas:

- Footpad Dermatitis
- Hock burn



- Heat stress
- Lameness
- Catching damage
- Dead on arrival
- Transport

The abovementioned indicators were used as keywords for literature research, along with the animal species, namely “pig” or “broiler”. Additionally, for tail and ear lesions, the search terms “tail biting” as well as “ear biting” were used, in order to include other relevant publications. Since the search for liver lesions in pigs mostly provided publications regarding an infection with *Ascaris suum*, the keyword “ascariasis” was included. *Ascaris suum* is one of the most important parasites in pigs and causes so-called “milk spots” in the liver (Thamsborg et al., 2013). Furthermore, the search for Best Practices for transport was done simultaneously for both species, by adding “animal welfare” to the search term.

Only literature that contained measures to improve the AWI results, thus increasing the well-being and health of animals, was used. Measures were then collected in an excel sheet and validated.

Validation was done using a four point score that was specifically developed for this purpose. A score of zero meant that the Best Practice was only found in one publication. A measure found in two to four publications scored at one. Between five and ten publications, a score of two was achieved. The highest score (three) was accomplished when the Best Practice appeared in more than ten publications. Only Best Practices with a score of one or higher were then included in a subsequent survey with experts.

2.2.2 Survey with experts

Based on the results of the literature research, a survey was created using the online tool “LimeSurvey” to gain expert knowledge on the Best Practices that had been found. A preliminary version was shared with researchers in the Institute of Animal Hygiene, Animal Welfare and Farm Animal Behaviour of the University of Veterinary Medicine Hanover, Foundation, Germany (TiHo) to test the length of the survey and to eliminate questions that were unclear. The survey consisted of three parts:

1. Information on the participants’ backgrounds,
2. an evaluation of suggested Best Practices,
3. an evaluation of requirements for an automated monitoring system at the slaughterhouse.

Best Practices for a prevention/reduction of tail/ear lesions, skin lesions, lung lesions and bursitis in pigs and for footpad dermatitis (FPD)/hock burn, catching damage and dead on arrival (DOA) in broilers were assessed. Their suitability could be evaluated on a scale from 0 to 100%, where 0% meant that a measure is unsuitable in helping with the specific animal welfare issue, while 100% meant that a measure is very suitable. Participants were also able to add missing Best Practices via a comment section.

The survey was sent out to all project partners of aWISH, to the expert panel as well as to 128 animal welfare experts from 21 countries all over the world. These external experts were chosen regarding the



following criteria: a current employment in research and/or academia, at least post-doc status in their current role and at least one scientific publication on pig and/or broiler welfare in the last five years.

The survey was available to the project partners and the expert panel from 26th February to 15th March 2024. It was then sent out to the external experts who could participate between 19th March and 5th April 2024. The full questionnaire sent to the experts can be found in the annexes of this deliverable.

In total 130 people participated of which 73 completed the whole survey.

The full survey report including the detailed results of the survey is shown in the annexes of this deliverable.

After statistical analysis, the answers as well as the comments given in the survey were used in the development of the BPGs. In this first version (summaries), the BPGs are presented in clear and concise text form as well as in infographics which will later be available in the data platform's feedback tool. The graphics were developed by the partner BIOSENSE and can be further adjusted in accordance with the technical requirements of the feedback tool.

2.3 LINK TO OTHER TASKS OR WPS

The development of the BPGs is anchored in task 4.4 (WP 4). However, all other tasks from WP 4 are also connected to deliverable 4.3. The data platform/feedback tool (task 4.1) will be used to share the BPGs with all stakeholders and ensure that feedback of the AWI results from the slaughterhouse and advice on how to improve these results are connected. Task 4.2 and 4.3 will generate more data on potential Best Practices that can be used for version 2 of the BPGs – a more extensive version that will be available to policy makers, advisers and all other stakeholders.

Another link can be drawn to WP 2. This WP generated a list of animal welfare indicators (animal welfare catalogue) that was consulted for the guides.

Once the BPGs are shared via the data platform, the pilots (anchored in WP 3) are able to access them. Therefore stakeholders can assess the Best Practices and give feedback on their success. Again this knowledge will be implemented into version 2 of the guides.

Furthermore, WP 5 will evaluate the socio-economic impact of the BPGs once they are available to the public and are being used in the pilots.

Even when the project period is over, the guides will be available via the project website and the established feedback tools. WP 1 works on further distributing them to a broad audience.

2.4 STRUCTURE OF THE DELIVERABLE

The main body of this deliverable contains a description of the methodology used in the development of the BPGs, including the literature research and the survey with experts. Furthermore, a short overview of



the BPGs is described. The complete practical summaries of BPGs, and the detailed survey report can be found in the annexes.

The BPGs are structured as follows:

There are nine BPGs in total: Eight on specific animal welfare issues regarding pigs and broilers (four for each animal species) and one on automated AWI monitoring at the slaughterhouse and giving feedback on broiler and pig welfare throughout their lifetime. The current version of the guides focuses on the eight BPGs regarding pig and broiler welfare, since the guide on AWI monitoring will be based on project results rather than literature.

For pigs, there are two guides on rearing as well as one on transport and one on slaughter.

The guides for rearing are divided into one guide on animal welfare and behaviour containing Best Practices for tail and ear lesions as well as skin lesions and one guide on animal health with Best Practices for lung and liver lesions and bursitis (Figure 1). For lung lesions, an example of the infographics has been added to the deliverable (Figure 2).

For broilers, there are also two guides on rearing, again divided into animal health and animal welfare, as well as one on catching/loading and one on transport/lairage.

The guides on rearing are again divided into one guide on animal welfare with Best Practices for FPD/hock burn and heat stress and another guide on animal health containing the indicator lameness. Catching damage and DOA are presented in the guides for catching/loading and transport/ lairage (Figure 1).damage and DOA are presented in the guides for catching and loading and transport and lairage.

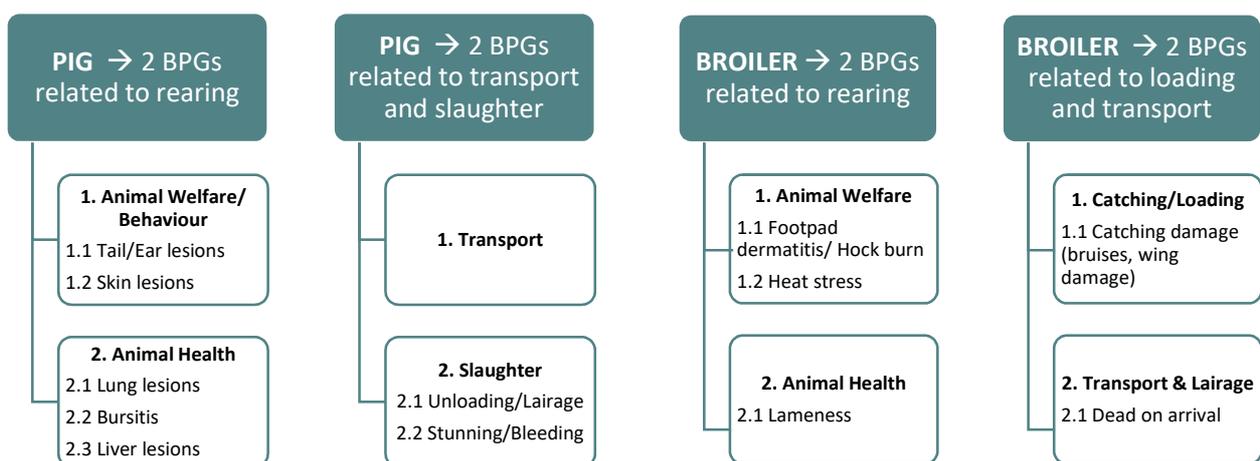


Figure 1: Overview of the BPGs



3. OVERVIEW OF THE BEST PRACTICE GUIDES

3.1 PIG: ANIMAL WELFARE/BEHAVIOUR

3.1.1 Tail and ear lesions

Tail and ear lesions are a severe animal welfare issue in pigs (D'Eath et al., 2014; EFSA AHAW Panel et al., 2007). Causes are multifactorial (Blokhuis et al., 2000) and include factors like genetics, health, management and husbandry. However, stress and the inability to cope with it seem to have a big impact on the occurrence of this AWI (Grothmann et al., 2016).

We identified five different areas where improvements can be made to prevent an outbreak of tail and ear biting: **housing environment, barn climate, animal health/hygiene, feeding management and the monitoring of tail biting including intervention strategies**. For each area, subcategories were determined and Best Practices were added.

In order to improve the **housing environment**, the provision of enrichment (preferably organic, manipulable material) is an important measure to take. Best Practices regarding housing, e.g. by lowering stocking densities, can also be applied.

The **barn climate** should be checked regarding temperature and humidity, noxious gases, ventilation and light. Measures to improve the individual parameters can be found in the annexes.

Focusing on the improvement of **animal health and hygiene** can further prevent an outbreak of tail and/or ear biting. The aim is to reduce infections and improve the management, e.g. by finding alternatives for painful procedures like tail docking.

Feeding and its management is a very important area to consider when trying to lower the occurrence of tail and ear lesions. Several factors including feed quality, access to feed and water as well as hygiene should be examined.

The **monitoring of tail and ear biting** is a crucial step in improving animal welfare. Farmers should undergo training to learn about signs of a pending tail biting outbreak. Moreover, **intervention strategies** such as separating biters and offering distractions are major tools to combat this injurious behaviour.

3.1.2 Skin lesions

The main reasons for skin lesions in pigs include fighting between individual animals and rough handling through staff at all production stages (Faucitano, 2001). These lead to stress that negatively affects the welfare of the animals.



To prevent the occurrence of skin lesions, Best Practices in three categories should be considered: **housing environment, feeding (nutrition) and management.**

For **housing**, improved grouping and handling, the provision of enrichment, improved pen design as well as checking the barn climate are all topics to consider. Pigs should not be regrouped unless absolutely necessary and animal handling needs to be gentle.

Feeding (nutrition) can be improved the same way as for tail and ear lesions with regard to feed quality and management, improved access to feed/water and the amelioration of feed/water hygiene.

Management of pigs in regard to skin lesions should focus on monitoring as well as on runt management. Runts need special attention since they are the first to suffer from aggressions in the pen.

3.2 PIG: ANIMAL HEALTH

3.2.1 Lung lesions

An important animal welfare indicator regarding pig health are lung lesions.

They can have different causes such as infectious agents (viruses, bacteria, fungi etc.), inhalation of harmful gases (esp. ammonia) or dust (Fraile et al., 2010).

Three different areas have been identified that can affect the occurrence of lung lesions: **Barn climate, animal hygiene and animal health.**

The improvement in **barn climate** mainly focuses on a reduction of the ammonia concentration below 20 ppm as well as a reduction of dust. However, ventilation and temperature are also variables to take into account.

To improve **animal hygiene**, pathogens must be reduced. Best Practices include the separation of sick animals and improvements in biosecurity (e.g. pest control).

Reducing infections is crucial when trying to improve **animal health**. Health monitoring of animals and consulting a veterinarian are actions to take for an enhancement of animal welfare.

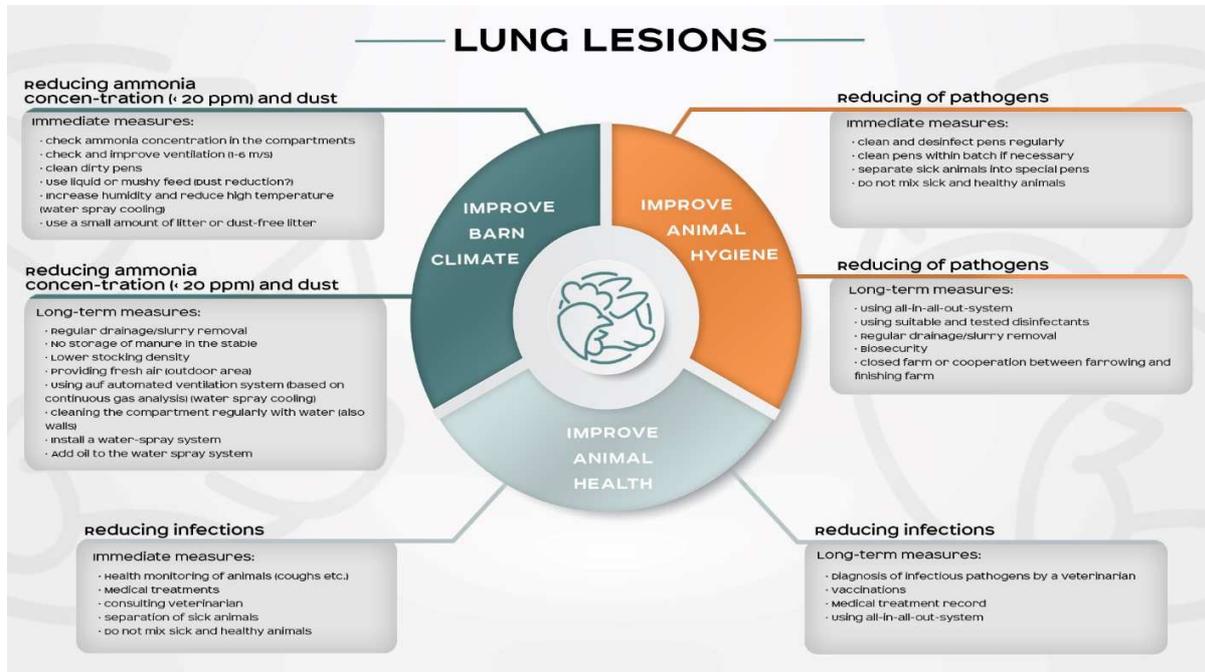


Figure 2: Infographic Best Practices Lung Lesions (BioSense)

3.2.2 Bursitis

Bursitis describes the development of fluid-filled sacs (bursae) on the hock joints of pigs (Mouttoutu et al., 1998). They form as a reaction of the skin to lying on hard surfaces or to trauma due to slippery or damaged floors (Smith, 1993). Complications through infections are rare but possible (Smith, 1993).

Regarding the prevention of bursitis, improvements should mainly focus on the **housing environment and animal health**.

Improving the floor design by using straw or switching to non-slatted floors can prevent bursae from forming. Measures regarding the housing **environment** should also focus on reducing trauma. This can be achieved by removing sharp edges from the pens or ensuring a good drainage/slurry removal to prevent slippery floors.

In order to avoid infections attention should be placed on **animal health** monitoring and the improvement of animal hygiene (e.g. biosecurity measures).



3.2.3 Liver lesions

Liver lesions are mainly caused by worm infections, one of the most prominent parasites being *Ascaris suum* (Thamsborg et al., 2013). After pigs ingest *Ascaris* eggs, these hatch in the gastrointestinal tract and then make their way to the liver where they leave behind characteristic milk spots (Vandekerckhove et al., 2019). These lesions are often found during inspections at the slaughterhouse.

Combatting liver lesions in pigs is achieved by focusing on **animal hygiene, animal health and barn climate**.

With regard to **animal hygiene**, the reduction of pathogens is an important step to prevent liver lesions. Measures include rotating pastures when pigs are kept outdoors, using tested and suitable disinfectants as well as improving overall biosecurity .

Animal health can be improved by reducing infections, especially regarding parasites such as *Ascaris suum*. Strategic deworming, banning dogs and cats from barns and consulting a veterinarian are ways to achieve a good health status.

3.3 PIG: TRANSPORT

At least once in their lifetime, animals used for meat consumption are being transported – when they go to the slaughterhouse. But also at earlier occasions, transport might be a common stressor that pigs have to face (EFSA AHAW Panel, 2022). Many farms are specialised on either farrowing, rearing or finishing, leading to the animals having to be transported from one location to the other (Faucitano & Goumon, 2018).

This makes it even more important to ensure that their welfare is considered and improved during the journey.

A first risk factor in transport starts before the journey even begins. During **loading**, gentle animal handling has to be ensured. Also all loading facilities should be designed to ensure optimal driving conditions. This includes factors such as floor conditions, lighting and temperature. A first risk factor in transport starts before the journey even begins. During **loading**, gentle animal handling has to be ensured. Also all loading facilities should be designed to ensure optimal driving conditions. This includes factors such as floor conditions, lighting and temperature.

Stocking density is a very important element to consider when aiming to improve transport conditions. Space allowances should be increased, especially in hot weather. Most importantly, pigs must be able to stand up and lie down.



One of the most crucial variables during transport is the **climate** on the transporter. Mitigation strategies for hot as well as cold weather should be applied. Examples would be water sprinkling during hotter months or the use of bedding when temperatures drop.

Another factor to be taken into account is the **grouping of animals**. Since fighting between animals leads to stress and injuries, the mixing of unfamiliar pigs is not recommended. Particularly aggressive individuals should be separated.

Overall, **transport durations** ought to be as short as possible. Drivers should undergo training and apply a gentle driving style.

3.4 PIG: SLAUGHTER

3.4.1 Unloading/Lairage

Once arrived at the slaughterhouse pigs have to be unloaded and driven into the lairage area. There, the animals get the chance to calm down after transport and await slaughter.

Again there are factors to consider in order to ensure optimal animal welfare: grouping and handling of pigs, climate and management.

As for the **grouping of pigs**, enough space should be ensured. Mixing of unfamiliar animals is not recommended, pigs should be kept in groups of about 10 pigs.

Animal handling should be gentle. Training provided to handlers on non-aversive handling methods can improve animal welfare and facilitate the driving process.

Climate as well as **management** in the lairage area are important factors to consider. Mitigation strategies for hot and cold weather should be applied. Additionally, facilities should be improved to ensure an optimal lairage stay for the pigs. Measures include scheduled arrivals at the slaughterhouse, a good floor condition and sound levels below 85dB.

3.4.2 Stunning & Bleeding

Stunning is an important area to evaluate animal welfare at the slaughterhouse. Proper stunning and the control hereof are critical to prevent animals from suffering pain, fear and distress.

The **drive to the stunning area** is the first area to evaluate regarding animal welfare. Training should be provided to slaughterhouse personnel on how to drive animals without force and in a gentle manner. The design of the raceway and environmental factors like lighting are also important. Depending on the type of stunning, several other factors have to be considered which can be found in the annexes.



Once stunning is completed, **stunning effectiveness** has to be checked. Several indicators can be assessed such as breathing, movements, reflexes and vocalisation.

Bleeding can only be executed when stunning is effective. Again, the **correct execution of bleeding** is important to avoid prolonged suffering. Personnel should be trained on the correct way to insert the knife and on how and when to restick if necessary.

3.5 BROILER: ANIMAL WELFARE/BEHAVIOUR

3.5.1 Footpad Dermatitis/Hock burn

One of the most prominent animal welfare issues in broilers is FPD, a contact dermatitis of the feet (Greene et al., 1985). Inflammation as well as necrosis leads to dark lesions on the footpads of affected birds (Shepherd & Fairchild, 2010). The main risk factor for FPD is wet litter, however, other factors like biotin intake, body weight and breed also have an effect on the occurrence of lesions (Mayne, 2005). Hock burn describes similar lesions on the plantar hocks of broilers (Hepworth et al., 2011).

The management of footpad dermatitis and hock burn targets several areas: housing **environment**, **feed/water management**, **barn climate as well as animal health and hygiene**.

A big impact on FPD can be achieved through **litter management**. Keeping litter dry and replenishing it when necessary are important measures to take. Improved housing with added perches and lower stocking densities can further improve litter quality and welfare of the birds. The provision of enrichment keeps broilers engaged. A big impact on FPD can be achieved through **litter management**. Keeping litter dry and replenishing when necessary are important measures to take. Improved housing with added perches and lower stocking densities can further improve litter quality and welfare of the birds. The provision of enrichment keeps broilers engaged.

Improving **feed composition and access to water** is another important factor. Feed should aim to combat digestive issues that lead to wet litter. Therefore, mitigation strategies such as feeding whole wheat or lowering salt content in feed can be applied. Switching to small cups or water nipples and adjusting water pressure and height of waterline according to animal size and age can further prevent the occurrence of wet litter.

In regards to **barn climate** ventilation plays a big role in keeping litter dry. Temperature and humidity should also be checked regularly and adjusted if necessary. Moreover, lighting schedules can improve the spatial distribution of animals in the house and therefore lead to drier litter.

Reducing infections (esp. digestive issues) by **health** monitoring, applying biosecurity measures and contacting a veterinarian can help to lower the prevalence of FPD and hock burn.



3.5.2 Heat stress

Heat stress is posing a great threat to poultry especially since due to climate change more countries are exposed to hot climate (Gregory, 2010). Due to their inability to sweat, broilers are unable to cope with temperatures outside their thermoneutral zone and suffer greatly when barn climate exceeds their limit (Zhang et al., 2017) .

Measures to avoid or alleviate heat stress can be categorised into housing **environment, barn climate and feeding management**.

In terms of **environment**, improved housing/grouping is an important action to take in order to prevent heat stressed broilers. Lowering stocking density (e.g. by thinning) can improve animal welfare immediately. Furthermore, providing perches (preferably cooled ones) helps birds escape the litter. Handling should be avoided in the hotter hours of the day.

Controlling **barn climate** is the most crucial step in keeping birds healthy during hot summer months. Ventilation as well as temperature and humidity have to be checked regularly and adjusted according to age specific preferences of the chickens. Switching to an intermittent light schedule can further help alleviate heat stress.

Another variable that can be adapted in hot weather is **feeding**. Changing the feed composition to avoid more heat production in the chickens, feeding only at certain hours of the day and improving the water access are measures to consider.

3.6 BROILER: ANIMAL HEALTH

3.6.1 Lameness

Lameness or bad gait scores in general are a problem in birds kept for meat production. Due to fast growth rates, more skeletal problems arise (Santos et al., 2022). Injuries, genetic components, infections and nutritional deficiencies can all lead to impaired animal health and welfare (Liu et al., 2023).

In order to improve the walking ability of broilers, attention should be payed to **housing, feeding, barn climate and overall animal health and hygiene**.

An improved **environment** and grouping can help facilitate walking for the birds and therefore prevent the occurrence of lameness. Reducing stocking density promotes locomotion. The provision of enrichment as well as perches is another way to keep broilers engaged. Handling should be performed gently to avoid injuries.



Feeding management, especially in the first few weeks of life, is very important when it comes to leg weakness and gait scores. Measures such as the adjustment of feed composition and ensuring good feed and water hygiene should be implemented. Contacting a veterinarian or feed adviser is a good way to check whether changes can be made.

Regulating **barn climate** in regard to light, ventilation, temperature and humidity is another factor to consider when trying to prevent lameness. A step-up lighting programme is one of the measures that can improve locomotion in the birds.

Moreover, an emphasis should be placed on **animal health and hygiene**. Monitoring gait scores and contacting a veterinarian in case of increased lameness in the flock can help to find causes. Vaccinations against diseases like Marek's Disease and selecting birds for good leg health are other options that can be implemented.

3.7 BROILER: CATCHING/LOADING

3.7.1 Catching damage

Catching poses a great risk to animal welfare when done incorrectly. Injuries such as broken wings and legs are easily caused by rough handling. Therefore, catching damage is an important animal welfare indicator that should be considered.

Changes to catching and/or depopulation can be made in two areas: the **handling** itself and the **catching conditions**.

The easiest way to improve **handling** is to provide training to all people responsible for catching. When recruiting a catching team, experienced and qualified personnel should be preferred. Only animals that are fit for transport should be caught. Moreover, a calm and gentle behaviour towards the birds is recommended. Ideally, broilers ought to be caught with both hands or at least upright.

Catching conditions include the environment, the condition of the crates that are being used and management. Working with dimmed light helps to calm the broilers. This can be achieved with headlamps that only emit blue or red light and also by using curtains that shade the entrance. Crates should be checked prior to usage and have to be placed in a way that falling is avoided. Catching duration has to be kept as short as possible to ensure good animal welfare.



3.8 BROILER: TRANSPORT & LAIRAGE

3.8.1 Dead on arrival

One indicator that is routinely measured at the slaughterhouse is the percentage of animals that arrive already dead (DOA). The most common cause for DOA are problems during transport, especially climate conditions that are not optimal for the broilers.

To avoid the death of animals during or even before transport, Best Practices should be applied regarding **catching, transport and lairage**.

When it comes to **catching**, all measures proposed in the guide on catching damage apply. We layed a focus on handling, monitoring and climate. Feed withdrawal is a variable that can be improved in order to prevent DOA, but also moving the catching to cooler parts of the day when it's very hot outside.

Transporting birds can lead to many welfare issues and should be optimised as much as possible. Lowering stocking density and ensuring enough space for each broiler is important to avoid losses regarding the birds crushing each other and being able to breathe. The climate in the vehicle poses one of the biggest threats to animal health and even life. Improvements can be made by avoiding transport above 30° C and by monitoring the temperature in the vehicle continuously. Changes should be made as soon as possible once the birds leave their thermal comfort zone. Transport duration and journey are also points to consider when aiming to improve animal welfare.

To improve **lairage** stays a focus on climate is again recommended. Unstacking crates to ensure a good air flow and parking the truck in a shaded area can help to alleviate heat stress and therefore keep animals alive.



4. CONCLUSION

This document, including its annexes, provides the first summaries of Best Practice Guides developed within the aWISH project. Based on the available scientific literature and expert knowledge, these summaries propose Best Practices that aim to improve the outcome of animal welfare indicators measured at the slaughterhouse and on farm level.

The amount of Best Practices identified for this first version of the BPGs indicates that there are many ways to improve animal welfare along the production chain. Aimed for practical usage, the guides as well as the infographics will be integrated into the feedback tool in order to provide all stakeholders involved with targeted measures to enhance the wellbeing of fattening pigs as well as broiler chickens. This should be reflected in an improvement in the animal welfare indicators collected at the slaughterhouse.

Therefore, a next step of the project is to monitor the effect that the Best Practice Guides have on animal welfare and adjust the proposed measures according to the results. This will lead to the development of a more extensive version of the guides that can then be made available to a broader audience, including policy makers, advisers and researchers.



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6. ANNEXES

6.1 BEST PRACTICE GUIDES

6.1.1 Best Practice Guides (Pig)

PIG – ANIMAL WELFARE/BEHAVIOUR



Executive summary

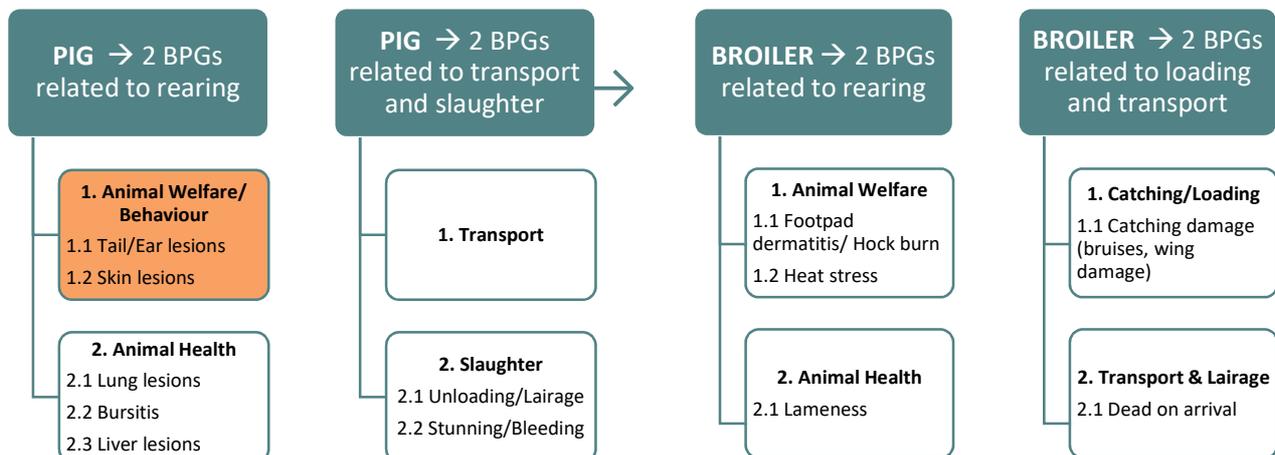
The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. They form the basis for the development of extensive reports for policy makers, advisers and other stakeholders which will include outcomes of the aWish project.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the upbringing of the animals. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport and lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Tail/ Ear lesions

Tail and ear lesions are a severe animal welfare issue in pigs that happen due to animals biting each other.¹⁰ Several factors like genetics, health, management and housing environment can play a role in the outbreak of a biting event and often more than one cause can be identified.⁷ Since tail/ear biting in pigs is a multifactorial problem, the specific causes should be identified for each individual farm. In general, there are five different areas where improvements can be made to prevent an outbreak of tail and ear biting: housing environment, barn climate, animal health/hygiene, feeding management and the monitoring of tail biting including intervention strategies. Find Best Practices regarding these areas below:

Improve enrichment

1. Provide enrichment

Immediate measures:

- Offer enrichment (e.g. straw, wood, sisal ropes); a maximum of 6 pigs per object^{1-12, 60}
- Change up enrichment material (during the batch), preferably daily^{12,13}
- Refill/replace enrichment material regularly (e.g. when broken and/or dirty)^{7,12-14, 60}
- Make sure exploration is possible for all pigs at the same time (e.g. providing enough enrichment material so that all pigs can explore it)¹²

Long-term measures:

- Invest in different organic manipulable enrichment materials: pressed molasses, wood, straw...^{5-11,15-19, 60}
- Make a plan on how often to check, replace and change up material (no running out)⁶⁰
- Offer straw, preferably 400g per pig per day^{9-11,15,16,19,20, 60}

2. Improve housing

Immediate measures:

- Lower stocking density below EU legislation^{10,17,20-23, 60}
- Provide pens to separate biters and victims⁶⁰
- Use bedding/straw^{1,7,15-17,19,20,24,25, 60}

Long-term measures:

- Lower stocking density (below EU legislation)^{10,17,20-23}
- Structure pens into lying, feeding and dunging area⁶⁰
- Provide fresh air (outdoor area)^{25,26, 60}
- No/little storage of manure in the stable (under the slatted floor)⁶⁰



Improve barn climate

1. Temperature & humidity

Immediate measures:

- Check temperature and humidity⁶⁰
- 18 – 22° C in growing phase, 15 – 18° C in finishing phase, humidity: 60 – 80%
- Contact adviser for barn climate and seek assistance⁶⁰
- Clean fans²⁷
- Shade windows in hot weather to avoid high temperatures⁶⁰
- Spray water onto barn roof in hot weather⁶⁰
- Humidify air using water spray⁶⁰

Long-term measures:

- Install a water spray system⁶⁰
- Plant trees and/or bushes to provide shade in summer⁶⁰
- Monitor lying pattern of animals¹²

2. Noxious gases

Ammonia <20ppm; CO₂ <2000ppm; H₂S <3ppm

- Keep resting area dry and clean⁶⁰
- Regular drainage/slurry removal⁶⁰
- Check and improve ventilation⁶⁰
- Cover slurry tanks²⁸
- Clean corridors with water²⁹
- No/little storage of manure in the stable (under the slatted floor)⁶⁰
- Lower stocking density⁶⁰
- Provide fresh air (outdoor area)⁶⁰
- Use of automated ventilation system (based on continuous gas analysis)⁶⁰
- Install a water spray system⁶⁰
- Switch to a nitrogen-reduced diet²⁸

3. Ventilation

- 0.2 m/s, in summer up to 0.6 m/s
- Check ventilation rate as well as for signs of draught^{7,10,30}
- Contact adviser for barn climate and seek assistance⁶⁰
- Clean fans²⁷
- Offer sheltered lying area³¹
- Check ventilation system twice per year (in spring and autumn)³²

4. Light

- Min. 80lux, photoperiod of at least 8h



- Avoid direct sunlight⁶⁰
- Offer daylight (at least 3% of barn)⁹

Improve animal health/hygiene

1. Reduce infections

Immediate measures:

- Health monitoring of animals (coughs, skin changes, etc.) through daily observation⁶⁰
- Consult veterinarian⁶⁰
- Medical treatments (according to the veterinarian's instructions)⁶⁰
- Separation of sick animals⁶⁰
- Do not mix sick and healthy animals⁶⁰

Long-term measures:

- Diagnosis of infectious pathogens by a veterinarian⁶⁰
- Vaccinations/medical treatments according to veterinarian's instructions/advice⁶⁰
- Medical treatment record⁶⁰
- Use all-in-all-out system⁶⁰

Improve feeding

1. Improve feed quality and management

Immediate measures:

- Check the feed composition and test feed/litter for mycotoxins → consult veterinarian or feed adviser¹²
- Use mycotoxin binding agents if necessary¹²
- Adjust crude fiber in accordance to age^{12,32}
- Provide roughage (to avoid stomach ulcers)^{12,13,32}
- Check milling of feed → too fine leads to ulcers³²
- When using liquid feed check concentration of dry matter regularly¹²
- Check amino acids (esp. lysine) as well as vitamin and mineral concentrations in feed^{11,32-35}

Long-term measures:

- Regular analysis of feed composition^{12,32}
- Contact feed provider to ensure optimal particle size as well as balanced diet^{12,33,34}
- Avoid sudden feed changes, instead slow transition via mixing of old and new feed³²



2. Improve access to feed and water

Immediate measures:

- Control functionality of drinkers regularly^{12,32}
- Repair drinking troughs if necessary¹²
- In the first weeks provide open drinking troughs for pigs that are not used to nipple drinkers¹²
- Ensure access to feeders and drinkers^{7,9,12,30,32, 60}
- Ad libitum feed or short feeding intervals (animal:feeder ratio = 1:1)^{11, 60}
- Check water pressure^{7,12,32}

Long-term measures:

- Provide enough feeding and drinking space per pig, preferably 1:1^{1,7,9,10,12,32,36,37}
- Provide additional feeders/drinkers¹²
- Lower stocking density¹²
- Move resources out of the lying area¹²

3. Improve feed and water hygiene

Immediate measures:

- Check and clean drinkers and feeders daily^{7,12,32}

Long-term measures:

- Regular checks of feed hygiene on all production stages (field to storage)³²
- Regular water checks^{12,32}
- Clean water and feed lines regularly⁶⁰
- Flush water lines prior to the arrival of new pigs¹²
- Clean storage silos regularly¹²

Improve monitoring of tail biting & intervention strategies

1. Strategic monitoring

- Undergo training by competent advisers⁶⁰
- Look for pigs with their tails between their legs, for pigs manipulating pen mates, for tail injuries, etc. → daily observation⁶⁰
- Monitor pigs regarding signs that improvements in other areas should be made (e.g. panting → climate; coughing → health status)¹²

2. Intervention strategies

- Offer distractions when biting occurs → emergency enrichment (use organic manipulable material such as straw, sisal ropes...)⁶⁰
- Identify and separate biters⁶⁰



- Separate victims, treat with pain medication if necessary⁶⁰
- Apply tar to tails⁶⁰
- Lower stocking density⁶⁰
- Try to identify causes and consult veterinarian and/or other competent adviser¹²
- Intensify monitoring (several times a day)¹²



Skin lesions

Skin lesions in pigs can be detected at the slaughterhouse and (in severe cases) can lead to downgrading of the carcass. The main reasons for skin lesions include aggressive behaviour like fighting between individual animals and rough handling through staff at all production stages.³⁸ This results in stress and pain that negatively affects the welfare of the animals.

To prevent the occurrence of skin lesions, housing environment, feeding (nutrition) and management should be evaluated.

Find Best Practices for these areas below:

Improve Housing

1. Improve grouping and handling

Immediate measures:

- Avoid regrouping/mixing of animals^{38-46, 60}
- Mix piglets from different litters during the suckling period (before weaning) → group farrowing, opening of pen walls etc.^{40,47, 60}
- Keep pigs in small groups (about 12 pigs)^{48,49}
- Use boards to move pigs or to create a barrier; do not hit animals³⁸
- Gentle animal handling: calm, no violence, no electric prods^{38,49, 60}
- Handle pigs regularly to get them used to it³⁸

Long-term measures:

- Keep littermates together from birth/weaning until finishing period^{39, 60}
- Mix only a few different litters⁶⁰
- Sorting pigs according to origin litter should be preferred over sorting by body weight⁶⁰
- If mixing is necessary, regroup at young age or co-house several litters prior to weaning and mix those litters⁶⁰
- Lower stocking density (below EU legislation)^{44,50-54, 60}

2. Improve pen design

Immediate measures:

- Remove any sharp edges or other hazards that could lead to injuries⁶⁰
- Repair broken drinkers, feeder, etc, especially when sharp edges are involved⁶⁰

Long-term measures:

- Structure pens into feeding, lying and dunging area⁶⁰
- Provide bedding (e.g. straw)^{51,55, 60}



Improve feeding

1. Improve feeding management

- Ensure access to feed for each pig (no competition)⁶⁰
- Ad libitum feed or short feeding intervals⁵⁴
- Pig:feeder ratio = 1:1⁶⁰
- Ensure access to organic manipulable material for each pig (no competition)^{41,51,53-59, 60}

Improve management

- Take time to observe the animals daily⁶⁰
- Separate severely injured animals (e.g. animals with wounds that are bleeding)⁶⁰
- Runt management: keep in separate pens, treat with medication if necessary, call veterinarian to look for causes, check feed quality and hygiene as well as water access^{31,60}



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PIG – ANIMAL HEALTH



Executive summary

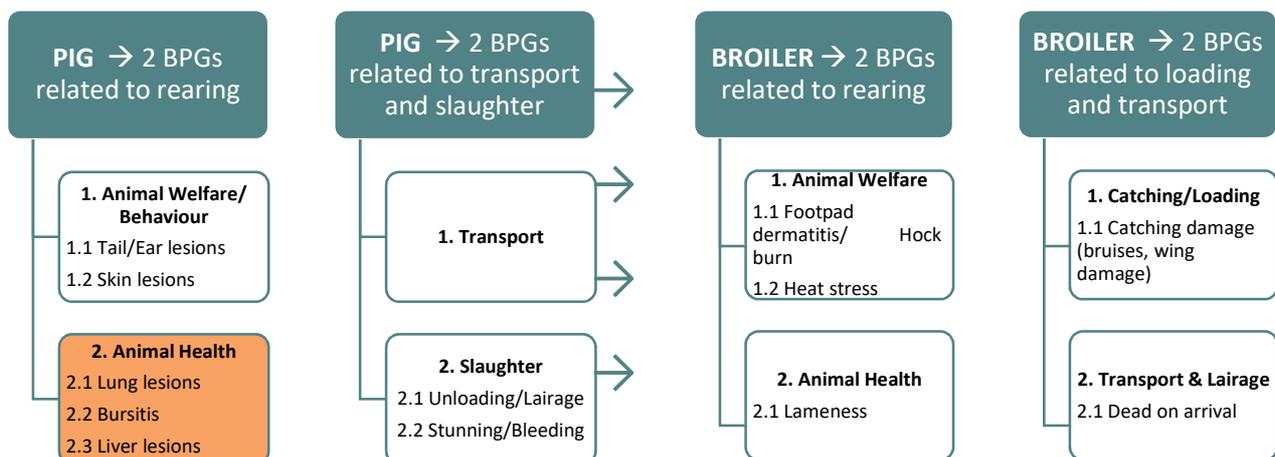
The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. They form the basis for the development of extensive reports for policy makers, advisers and other stakeholders which will include outcomes of the aWish project.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the upbringing of the animals. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport and lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Lung lesions

One of the most common findings in pig carcasses at the slaughterhouse are changes in the appearance of the lung tissue – so called “lung lesions”. These lesions can have several causes, e.g. infections (through viruses, bacteria, fungi, etc.) or the inhalation of harmful gases like ammonia.⁴ All these may lead to respiratory problems in the pigs.

In order to prevent lung lesions in pigs, three areas should be checked: barn climate, animal hygiene and animal health.

Find Best Practices regarding these areas below:

Improve barn climate

1. Reduce ammonia concentration (<20 ppm) & dust

Immediate measures:

- Check ammonia concentration in the pens⁴⁰
- Check and improve ventilation (0.1 – 0.6 m/s)^{1-4, 40}
- Clean dirty pens if they are clearly visibly soiled with faeces and urine^{3,5}
- Use liquid or mushy feed if feeders/equipment allow it⁴⁰
- Add oil to feed to bind dust particles (or contact feed mill)⁶
- Increase humidity and reduce high temperatures (→ water spray cooling)⁴⁰
- Use dust reduced litter (e.g. wood shavings)⁴⁰
- Cover slurry tanks⁷
- Clean corridors with water⁸

Long-term measures:

- Regular drainage/slurry removal^{3,5,9}
- No/little storage of manure in the stable (under the slatted floor)⁴⁰
- Lower stocking density below EU legislation^{9-11, 40}
- Provide fresh air (outdoor area)⁴⁰
- Use of an automated ventilation system (based on continuous gas analysis)⁴⁰
- Clean the compartment regularly with water (walls included) → all-in-all-out system⁴⁰
- Install a water spray system⁴⁰
- Add oil to the water spray system⁴⁰
- Switch to a nitrogen-reduced diet⁷
- Allow the pigs to use dunging areas (space allowance!)⁴⁰

2. Improve ventilation & temperature

Immediate measures:

- Check ventilation rate as well as for signs of draught⁴⁰
- Check temperature and humidity^{3,11, 40}
- Contact a barn climate expert/adviser and seek assistance³⁹



- Clean fans¹²
- Shade windows on hot days to avoid high temperatures⁴⁰
- Spray water onto barn roof in hot weather⁴⁰
- Humidify air using water spray⁴⁰

Long-term measures:

- Offer sheltered lying areas⁶
- Install a water spray system⁴⁰
- Plan regular barn climate checks⁴⁰
- Plant trees and/or bushes to provide shade in summer⁴⁰
- Check ventilation system twice per year (in spring and autumn)¹³
- Lower stocking density⁴⁰

Improve animal hygiene

1. Reduce pathogens

Immediate measures:

- Clean and disinfect pens regularly⁴⁰
- Let pens dry completely before using disinfectant⁴⁰
- Clean pens within batch if necessary⁴⁰
- Separate sick animals into separation pens⁴⁰
- Do not mix sick and healthy animals⁴⁰
- Do not mix batches⁴⁰

Long-term measures:

- Use all-in-all-out system^{4,10,14,15}
- Use suitable and tested disinfectants (follow label directions)⁴⁰
- Regular drainage/slurry removal^{3,5,9, 40}
- Improve biosecurity (e.g. quarantine new pigs, restriction of entrance to barns, hygiene barrier, pest control)^{10,14,16, 40}
- Closed farm or cooperation between farrowing and finishing farm^{10, 40}

Improve animal health

1. Reduce infections

Immediate measures:

- Health monitoring of animals (coughs, etc.) through daily observation⁴⁰
- Consult veterinarian⁴⁰
- Medical treatments (according to the veterinarian's instructions)¹⁰



- Separation of sick animals⁴⁰
- Do not mix sick and healthy animals⁴⁰
- Do not mix batches⁴⁰

Long-term measures:

- Diagnosis of infectious pathogens by a veterinarian⁴⁰
- Vaccinations (according to veterinarian's instructions)^{10,17}
- Medical treatment record⁴⁰
- Use all-in-all-out system^{4,10,14,15}
- Consider using an automated system for cough detection in the barn⁴⁰



Bursitis

Bursitis describes the development of fluid-filled sacs (bursae) on the hock joints of pigs.²⁵ They form as a reaction of the skin to lying on hard surfaces or to trauma due to slippery or damaged floors.²³

Complications through infections are rare but possible.²³

Regarding the prevention of bursitis, improvements should mainly focus on the housing environment and animal health.

Find Best Practices for these areas below:

Improve environment

1. Improve floor design

Immediate measures:

- Use straw or rubber floor mats, especially in the lying area^{18-21, 40}
- Provide bedding (e.g. straw) with a depth of 25 – 50cm^{21-26,27, 40}
- Repair or replace slats if necessary^{22, 40}

Long-term measures:

- Switch to non-slatted floors like soft or soil floors and/or use bedding^{20-26,28-33, 40}
- Repair/replace floor if necessary³⁹
- Improve pen design, get rid of steps^{22, 40}

2. Reduce injuries/trauma

Immediate measures:

- Remove any sharp edges or other hazards that could lead to injuries⁴⁰
- Clean pens regularly to avoid wet/dirty surfaces^{25,29, 40}
- Provide bedding (e.g. straw) with a depth of 25 – 50cm^{18-21,27, 40}
- Check calcium to phosphor ratio in feed → consult veterinarian or feed provider³⁹

Long-term measures:

- Increase space allowance (provide dry and clean lying area for each pig)
- Regular drainage/slurry removal^{25,29, 40}
- Repair or replace slats/floor if necessary⁴⁰
- Replace or improve drinkers and feeding troughs in order to avoid trauma (animal:feeder ratio = 1:1)⁴⁰



Improve animal health

1. Reduce infections

Immediate measures:

- Health monitoring of animals (lameness, swelling, etc.) through daily observation⁴⁰
- Consult veterinarian⁴⁰
- Medical treatment (according to veterinarian's instructions)⁴⁰
- Separation of sick animals⁴⁰
- Do not mix sick and healthy animals⁴⁰
- Do not mix batches⁴⁰

Long-term measures:

- Diagnosis of infectious pathogens by a veterinarian⁴⁰
- Vaccinations⁴⁰
- Medical treatment record⁴⁰
- Use all-in-all-out system⁴⁰
- Improve biosecurity (e.g. quarantine new pigs, restriction of entrance to barns, hygiene sluice, pest control)⁴⁰



Liver lesions

Liver lesions are occasionally found in pigs at the slaughterhouse. These changes in the liver tissue are often caused by an infection with worms (helminths), the most prominent of them being *Ascaris suum*. The eggs of this worm are eaten by the pigs with their feed and then hatch in the intestine.³⁶ Through the bloodstream they make their way to the liver where they leave behind characteristic white marks, the so-called “milk spots”.³⁶ In order to combat liver lesions in pigs, the infection with worms needs to be prevented. Therefore, actions should focus on improving animal hygiene and animal health. Find Best Practices for these areas below:

Improve animal hygiene

1. Reduce pathogens

Immediate measures:

- Avoid animals coming into contact with their own excreta (in order to avoid infections with worm eggs) → clean pens (regularly), remove manure when kept on straw⁴⁰
- Clean pens within batch if necessary⁴⁰
- Let pens dry completely after cleaning and before using disinfectant⁴⁰
- Disinfect pens regularly⁴⁰
- Disinfect pens using a disinfectant that is effective against worm eggs; follow label directions³⁴
- Separate sick animals into separation pens⁴⁰
- Do not mix sick and healthy animals⁴⁰
- Do not mix batches⁴⁰

Long-term measures:

- All-in-all-out system³⁵
- For pigs kept outdoors: rotate pastures³⁵
- Use suitable and tested disinfectants³⁴
- Regular drainage/slurry removal⁴⁰
- Improve biosecurity (e.g. quarantine new pigs, restriction of entrance to barns, hygiene sluice, pest control)⁴⁰
- Closed farm or cooperation between farrowing and finishing farm⁴⁰

Improve animal health

1. Reduce infections

Immediate measures:

- Consult veterinarian⁴⁰



- Medical treatments → Use anthelmintics³⁶⁻³⁸
- Health monitoring of animals through daily observation⁴⁰
- No access for dogs and cats to pig barns³⁹
- Separation of sick animals⁴⁰
- Do not mix sick and healthy animals⁴⁰

Long-term measures:

- Diagnosis of infectious pathogens by a veterinarian⁴⁰
- Parasite prophylaxis (Strategic deworming^{36,37})
- Medical treatment record⁴⁰
- Use all-in-all-out system³⁵



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PIG - TRANSPORT



Executive summary

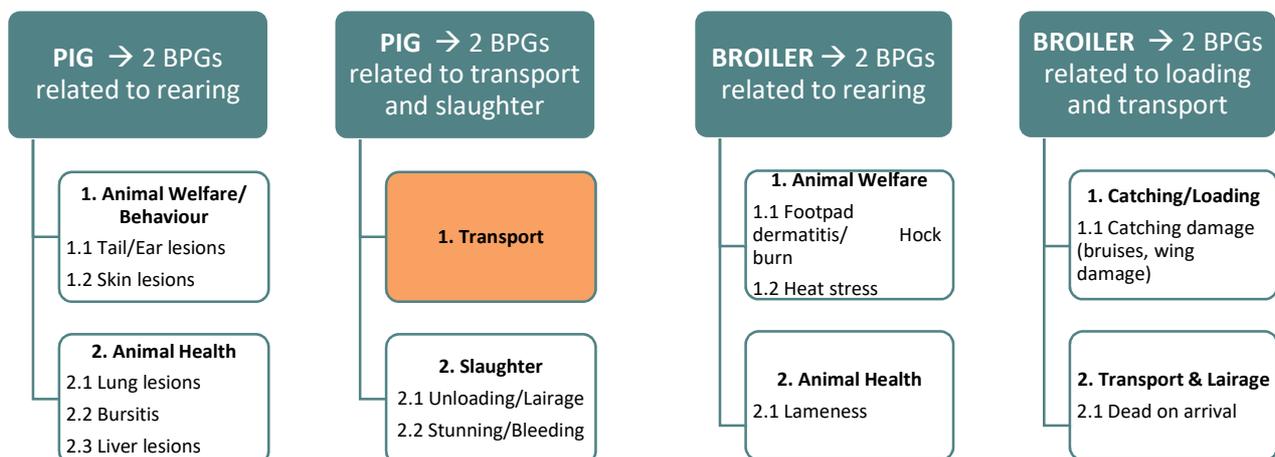
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Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Transport

At least once in their lifetime, animals used for meat consumption are being transported – when they go to the slaughterhouse. But even before transport is a common stressor that pigs have to face.¹ Stress can negatively impact the pigs' health as well as the meat quality.³

This makes it even more important to ensure that animal welfare is considered and improved during transport.

Find Best Practices for different areas regarding transport below:

Animal handling/loading

1. Handling

- Use training provided to handlers on non-aversive handling methods (e.g. through webinars or guides)¹⁻⁴
- Get animals used to handling prior to transport^{2,5-7}
- Check animals prior to loading for fitness for transport → e.g. large open wounds, severe lameness, hernias, severe emaciation^{1,2,4,6,8}
- Handle animals calmly and gently, no violence, quiet voice^{1,4,8}
- Move pigs in small groups (5 – 12 max.)^{6,8}
- Make use of the animals flight zone (= personal space) → moving animal forward: stepping into flight zone behind the shoulder at around 45° angle; walking deep into flight zone → animal moves in opposite direction^{4,7,9,10}
- Avoid sudden movements into the flight zone to avoid panic^{7,10}
- Keep moving distances short (0 – 30m)^{3,6}
- Use paddles and/or boards instead of electric prods; do not hit animals, use boards to create a barrier^{3,4,8,10}

2. Loading

- Floors should be non-slippery^{1,4,6,11}
- Steps should not exceed 15cm⁶
- Ramps should not be steeper than 20°^{1,4,6,11}
- If available use hydraulic lifts instead of ramps¹
- Provide shade in loading area/park vehicle in the shade¹
- No blind corners¹
- Minimise distractions: light reflections, dark entrances, dead ends, loose objects, air currents^{4,10}
- Use side boards to avoid distractions^{4,12}
- Avoid warmest hours of the day¹
- If temperatures exceed 23° C, use water sprinklers for 5min before leaving¹



Stocking Density

- Stocking density according to EU/national legislation^{1,7}
- Pigs must be able to lie down and stand up¹¹
- Increase of required surface area up to max. 20% in hot weather and long journeys^{4,11}
- Do not lower stocking density too excessively → chance of slipping increases¹⁹

Climate on transport vehicle

- Monitor temperature in vehicle continuously → adjust ventilation if necessary^{1,3,4}
- Minimum airflow rate 60m³/h/100kg live weight^{4,6}
- Use vehicles with mechanical ventilation^{4,6,12}
- Openings along vehicle on pig height to allow ventilation; in hot weather: open (40cm), in cold weather: partially or fully closed^{3,6}
- Overhead space at least 20cm above highest point of largest animal⁶
- Do not transport animals when temperatures exceed 30° C or fall below 5° C¹³
- Continuous access to water → drinkers at appropriate height and angle, enough space to access them, sufficient water in vehicle tanks^{1,4,12,14}
- Lower stocking density/increase space allowance in hot weather^{1,2,4}
- Water sprinkling and fans in hotter months^{1,3,4}
- In cold temperatures and for young animals: use bedding^{4,15}
- In cold weather use covering of the trailer to insulate^{4,5}

Grouping of pigs

- Separate animals according to age and origin¹¹
- Separate sexually mature males from females¹¹
- Avoid mixing of unfamiliar pigs^{1,2,6,7,16,17}
- Offer enough space and/or hiding places¹
- Separate aggressive individuals¹⁰
- Provide bedding for young animals and on long journeys¹¹

Transport duration and journey

- As short as possible, preferably <4h^{3,4,6,7,12,14,18}
- For long transports: duration according to EU legislation
- Drive smoothly, avoid roads with loads of traffic and bad road conditions^{1,4,6,12,18}



- Provide training to drivers^{4,5}
- Take into account waiting times at borders when preparing for transport (enough feed and water, ventilation)¹⁹
- For long journeys: clarify prior to transport where animals can be unloaded (especially for transports into third countries)¹



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PIG - SLAUGHTER



Executive summary

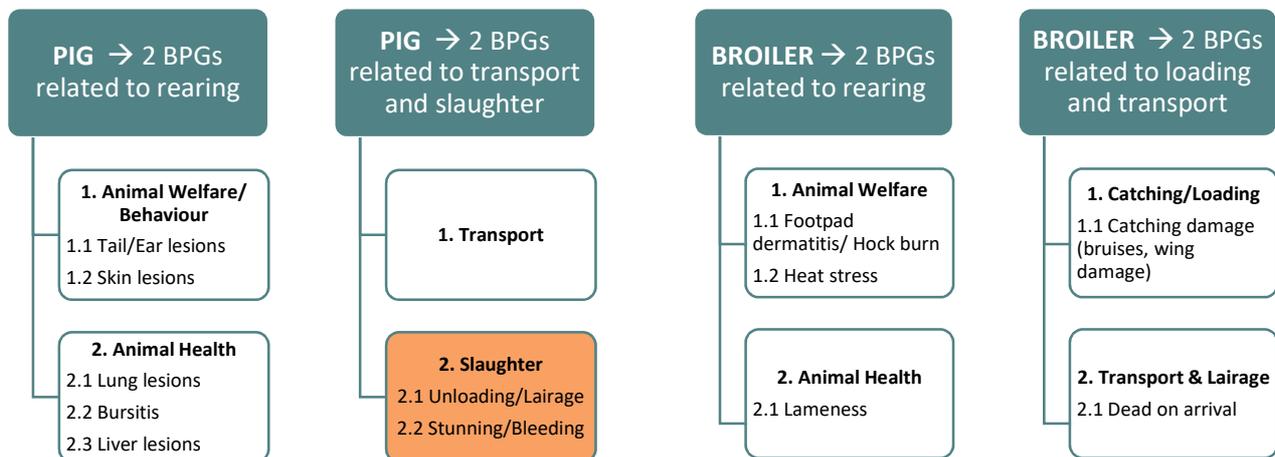
The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. They form the basis for the development of extensive reports for policy makers, advisers and other stakeholders which will include outcomes of the aWish project.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the upbringing of the animals. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport and lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Unloading/Lairage

Once arrived at the slaughterhouse pigs have to be unloaded and driven into the lairage area. There, the animals get the chance to calm down after transport and await slaughter. Both unloading as well as the stay in the lairage area should be as stressfree as possible since stress affects animal welfare and can have a negative impact on meat quality.

Find Best Practices for different areas regarding unloading/lairage below:

Grouping of pigs

- Enough space to lie down, stand and move around for each pig¹⁻⁴
- Keep animals in familiar groups/no mixing¹⁻⁴
- Keep pigs in small groups (about 10 animals)^{1,2}
- Do not mix different species in the same lairage area⁵
- Solid walls to avoid contact to other groups^{1,2}
- Keep lairage time as short as possible, but give pigs enough time to rest after the journey (preferably between 1 and 3 hours)^{2,4}

Animal handling

- Provide training to handlers on non-adversive handling methods (e.g. through webinars or guides) and/or use available training materials¹⁻³
- Handle animals calmly and gently, no violence, quiet voice^{1,2}
- Check animals for health and severe injuries → do not unload severely injured or sick animals, consider emergency slaughter on the vehicle¹⁻³
- Move pigs in small groups (5 – 6 max.)^{2,3,6,7}
- Unload pigs from transporter one compartment at a time^{2,7}
- Make use of the animals flight zone (= personal space) → moving animal forward: stepping into flight zone behind the shoulder at around 45° angle; walking deep into flight zone → animal moves in opposite direction^{3,8-11}
- Avoid sudden movements into the flight zone to avoid panic^{8,11}
- Keep moving distances short (0 – 30m)^{6,12}
- Use paddles and/or boards instead of electric prods; do not hit animals, use boards to create a barrier^{2,3,7,10-12}
- Use pigs' curiosity: they normally leave the truck by themselves^{2,3,7}
- Drive animals using voice and sounds (e.g. knocking on driving board)⁷

Climate

- Provide shade in outside lairage areas²
- Provide shelters in outside lairage areas to protect pigs from wind^{1,2}
- Increase space allowance in hot weather⁴



- At temperatures > 23° C use water sprinkling for 5min before unloading^{1,2}
- In extreme heat provide ventilation as well as sprinkling or nebulising water, preferably right before moving pigs to stunning¹⁻⁴
- If necessary at low temperatures: heating systems in lairage area^{1,2}

Management at the slaughterhouse

- Floors should be non-slippery¹⁻³
- Ramps should not be steeper than 20°, gaps between vehicle and ramp should be covered¹⁻³
- Steps should not exceed 15cm
- If available use hydraulic lifts instead of ramps^{1,2}
- No blind corners^{1,2}
- Minimise distractions: light reflections, dark entrances, dead ends, loose objects, air currents^{2,3,10,11}
- Schedule arrival of trucks so that lairage areas are always available¹⁻³
- Unload pigs immediately, especially in extreme weather conditions¹⁻³
- Keep in mind feed withdrawal times and prioritise animals in order to avoid prolonged hunger¹
- Keep lairage stays as short as possible²
- Lairage area should give pigs access to water¹⁻⁴
- Lairage area should be free of sharp edges and in good condition¹⁻³
- Keep sound level below 85dB, for instance by replacing metal gates with plastic ones^{2,4,13}



Stunning & Bleeding

Stunning is a crucial point to evaluate animal welfare at the slaughterhouse. Proper stunning and the control hereof are critical to prevent animals from suffering pain, fear and distress.¹ Furthermore, executing bleeding in the correct manner is important to ensure that the pigs are killed before the effect of stunning wears off.

Find Best Practices for stunning and bleeding below:

Drive to stunning area

- Provide training to staff^{1,2,4}
- Handle animals calmly and gently, quiet voice^{1,2,4,13}
- Move animals in small groups, but at least 2 pigs at a time^{1,2,4,7}
- Use mobile driving walls to limit movement and to move pigs into a corner (for individual manual electrical stunning)⁷
- Provide a quiet environment (especially for individual manual electrical stunning)^{2,3,7,13}
- Good lighting, green light if possible^{1-3,13}
- No sharp turns, steep slopes or slippery floors¹⁻³
- Minimise distractions: light reflections, dark entrances, dead ends, loose objects, air currents^{2,3}
- Curved raceways can help ensure a constant flow of animals to stunning^{1,2,13}
- Make use of the animals flight zone (see “Unloading/Lairage”)
- Use paddles and/or boards instead of electric prods²⁻⁴
- When using gondolas pigs should have enough space to stand (CO₂ stunning)²
- At least 2 pigs per gondola, but no overcrowding (CO₂ stunning)^{2,4}
- Pigs need to be able to stand on solid ground and in an upright position in the gondolas (CO₂ stunning)²
- Select pigs regarding size when using automatic electrical stunning⁷
- Give animals time to adjust to walking behind each other when being separated for automatic electrical stunning^{2,7}

Stunning

1. Electrical stunning

- In the interest of animal welfare, preferably use electrical stunning (with head-heart flow) instead of CO₂ stunning^{2,13}
- Ensure that tongs are clean, well-maintained and the right size^{1,2,13}
- Check function of electrodes every day²
- For head stunning, place the electrodes between the eyes and the base of the ears; never place them behind the ears^{1,2}



- For heart stunning, ensure that the heart is in between the electrodes; never use heart stunning when pigs are still conscious²
- Use a minimum current of 1.3A, increase when pigs are heavier than 110kg (minimum 2A for 150kg pigs)^{2,13}
- Use low frequencies (100Hz for the head, 50Hz for the heart)²
- Improve stunning effectiveness by misting pigs with water in the lairage area²
- After stunning, check whether animals are unconscious:
 - Animal collapses immediately^{1,4}
 - Rigid state: forelimbs are stretched out, hindlimbs are drawn in, fixed^{1,4,7}
 - Spasm state can occur after rigid state: convulsions^{4,7}
 - Animal does not breathe^{1,4,7}
 - No vocalisation^{4,7}
 - Touching of eyelids does not lead to a reflex^{1,4,7}
 - Pupils do not react to light¹
 - Eyeballs are fixed or rotated into socket^{1,4}
 - No reaction to pain → e.g. nose pricks^{1,4,7}
- Re-stun if: rhythmic breathing (re-stun at the latest after third breath), blinking (spontaneous or through papebral reflex), deliberate or rhythmic eye movements, narrow pupils or movement of pupils, vocalisation, attempts to stand up, movements of the head and body or directed movements of the legs or angling of the legs^{1,2,7}

2. CO₂ stunning

- In the interest of animal welfare, preferably switch to electrical stunning (with head-heart flow) instead of CO₂ stunning^{2,13}
- Use a minimum CO₂ concentration of 80%^{1,2,13}
- Preferably stun pigs irreversibly: CO₂ concentration of 90% for 3 – 5 minutes²
- Ensure that the gas mixture is warm and humidified, therefore reduces discomfort and fear¹
- Provide enough space so all pigs in the gondola are able to lie down (at least 0.5m² per pig)^{1,2}
- Pigs that have lung problems (signs: coughing, sitting dog-like, breathing with difficulty) should not be stunned with CO₂; emergency killing with electric tongs or captive bolt stunner instead²
- After stunning, check whether animals are unconscious:
 - Animal is collapsed^{1,4,7}
 - No movement, relaxed muscles⁷
 - Animal does not breathe^{1,4,7}
 - No vocalisation^{4,7}
 - Eyes are fixed and pupils are dilated^{1,4}
 - No blink, corneal or pupillary reflex^{1,4,7}
 - No reaction to pain → e.g. nose pricks^{1,4,7}



- Re-stun if: rhythmic breathing (re-stun at the latest after third breath), blinking (spontaneous or through papebral reflex), deliberate or rhythmic eye movements, narrow pupils or movement of pupils, vocalisation, attempts to stand up, movements of the head and body or directed movements of the legs or angling of the legs^{1,2,4,7}

Correct execution of bleeding

- Execute bleeding immediately after stunning^{1,2,4,13}
- Max. time between stunning and bleeding:
 - electrical stunning, bleeding lying down: 10s²
 - electrical stunning, bleeding hoisted on rail: 20s
 - CO₂ stunning: 20s (after leaving gondola) or 30s (after last stop in CO₂ atmosphere²)
- Stick pigs on a horizontal conveyor belt to keep time between stunning and bleeding short¹
- Stay as close to the stunning area as possible¹
- Check whether animals are properly stunned and unconscious prior to bleeding^{1,2,4}
- Use sharp knives that are long enough to reach the brachiocephalic trunk^{1,2}
- Stick pigs at the base of the neck, 2 – 3 fingers head wards from the breast bone in the direction of the opposite shoulder blade or towards the tail or aim towards the heart^{1,2,7}
- After inserting the knife, move it diagonally to cut blood vessels close to the heart; do not do this when using a hollow knife!⁷
- Stick swiftly and accurately¹
- When sticking animals while they are lying down, take their upper frontlimb and move it upwards⁷
- Incision should be large enough to have blood profusely leaving the body; when done correctly, a lot of blood should gush out^{1,2,7}
- If blood is not gushing out, restick immediately → same way as before, thrusting knife into chest, possibly enlargening the opening^{1,2,7}
- Look for signs of death before moving animals to scalding: no muscle tone, ceased bleeding, dilated pupils^{1,2}



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6.1.2 Best Practice Guides (Broiler)

BROILER – ANIMAL WELFARE



Executive summary

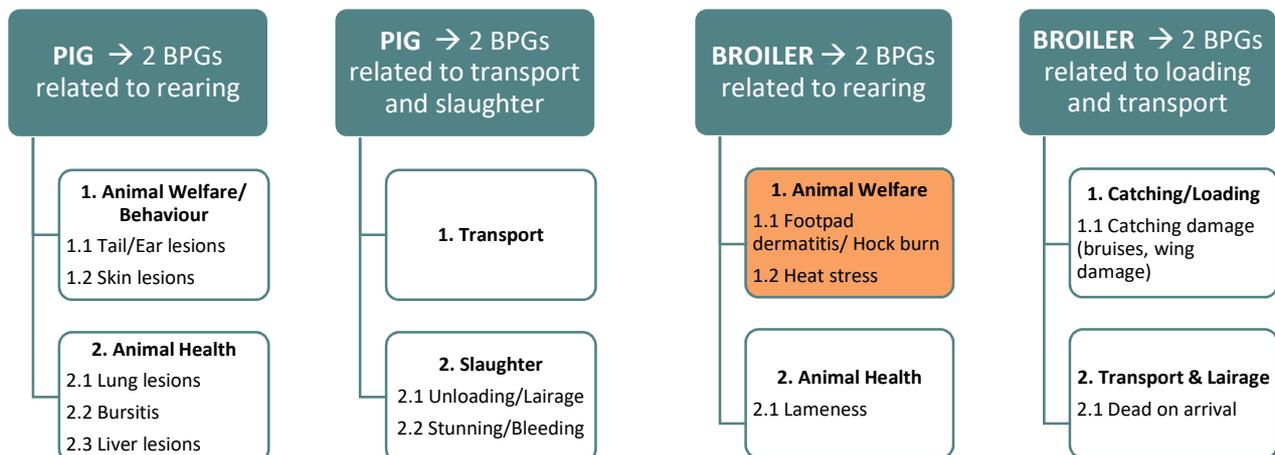
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The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Footpad Dermatitis/ Hock burn

One of the most important animal welfare issues in broilers is footpad dermatitis (FPD), an inflammation of the skin of the birds' feet.⁹ Dark spots can be found on the footpads of affected birds. The main risk factor for FPD is wet litter, however other factors like feed composition, body weight and breed also have an effect on the occurrence of this condition.²² Hock burn describes similar spots on the hocks of broilers.

The management of footpad dermatitis and hock burn targets several areas: housing environment, feed/water management, barn climate as well as animal health and hygiene.

Find Best Practices for these areas below:

Improve environment

1. Litter management

Immediate measures:

- Replenish/replace litter in risk areas and/or when wet (e.g. around water lines)^{1-7,8, 66}
- Add/remove litter layers; max. thickness: 5cm^{9-12, 66}
- Add zeolite to litter⁶⁶
- Remove feed paper after first 3 days⁵

Long-term measures:

- Use litter other than straw (e.g. peat, wood shavings, pellets); aim for litter that is highly absorbent but can also release moisture easily^{1,6,9,11-22, 66}
- Litter management (e.g. windrowing, tilling)^{4,22, 66}
- Preheat stable/floor prior to arrival of animals^{5,22, 66}
- Install floor heating^{6,22, 66}
- Do not reuse litter^{2,23}
- Lower stocking density (below EU legislation)

2. Improve housing

Immediate measures:

- Offer at least 2m of usable perch space per 1000 birds (e.g. straw bales, platforms) or 1% of the total barn surface^{24-27, 66}
- Use platforms or straw rather than actual perches^{25,27}

Long-term measures:

- Lower stocking density (below EU legislation)^{15,22,28-37, 66}
- Disinfect perch space after every flock²⁶
- Ensure thorough drainage around stable²²



3. Provide enrichment

Immediate measures:

- Offer at least 2 pecking substrates per 1000 birds (e.g. straw bales, pecking blocks)^{38,39, 66}
- Renew enrichment regularly⁶⁶
- Provide several different enrichment materials³⁸

Long-term measures:

- Invest in different enrichment materials³⁸
- Encourage dust bathing by providing substrates like sand or rice hull baths³⁸

Improve feed and water management

1. Improve feed composition

Immediate measures:

- Contact feed adviser to ensure optimal composition^{11, 66}
- Add whole wheat to feed to balance out reduced crude protein requirements^{5,30}

Long-term measures:

- Regular analysis of feed composition⁶⁶
- Contact feed adviser to adapt feed: lower crude protein content, controlled digestibility (Na, K, crude protein), good quality fat (unsaturated)^{5,9,22,40, 66}
- Avoid high salt content in feed^{22, 66}

2. Improve water access

Immediate measures:

- Adjust height of waterline to animal size daily^{5, 66}
- Adjust water pressure according to age^{6, 66}
- Clean water lines and drinkers regularly (at least after every flock)⁴¹
- Check water system for leakage^{5,6,8}

Long-term measures:

- Switch to small cups or water nipples instead of bell drinkers^{6,9,22,41, 66}
- Add drip cups to nipple drinkers^{5,22}
- Repair/replace drinkers that cause leakage^{5,42}
- Check and improve insulation of pipes and tanks⁶
- Regular water checks/analysis (at least twice a year)⁴²
- Replace the whole drinking system every 5 to 7 years⁵

3. Improve feed and water hygiene

Immediate measures:

- Check feed quality (using senses: sight, smell, touch)⁴³



- Clean water and feed lines (at least after every flock)⁴¹
- Flush water lines regularly, especially in the first days after the arrival of new chicks⁹
- Flush water lines before arrival of new animals⁴²

Long-term measures:

- Regular water analysis (at least twice a year)⁴¹
- Clean and disinfect water lines regularly (after every flock and after treatments via the water system)^{9,44}
- Check and if necessary replace water and feed pipes (preferably every six months)⁶⁶
- Ensure good feed quality → contact feed adviser⁴⁴
- Clean feed storage regularly⁶⁶

Improve barn climate

1. Improve ventilation & temperature

Immediate measures:

- Check and improve ventilation rate and temperature^{22,30,45,46, 66}
- Ensure that there is always a minimum level of ventilation⁵
- Ensure that air intakes go up and away from litter⁶
- Check and repair ventilation and heating system^{5,30}
- Check cooling system for leakage⁵
- Clean fans⁴⁷

Long-term measures:

- Improve insulation of barn⁴⁸
- Use internal circulation fans for the first days⁵
- Decline temperature slowly when adjusting to the needs of growing broilers⁵
- Switch to a central heating system⁵

2. Improve humidity

Immediate measures:

- Continuously monitor humidity (50 – 70%)^{5,49, 66}
- Use spray cooling system in high temperatures when humidity is too low⁵
- Use extra ventilation and heating when humidity is too high^{5,11}

Long-term measures:

- Install a spray cooling system⁵

3. Improve lighting

Immediate measures:



- Check lighting^{50, 66}
- Clean light sources regularly⁵⁰
- Improve distribution of light throughout the barn: avoid sun beams as well as uneven light to prevent birds from huddling^{22, 8, 66}

Long-term measures:

- Contact adviser to improve light distribution in barn⁵⁰
- Add natural light (e.g. through windowed houses or semi-transparent roofing)⁶⁶
- Use a transition period (dusk/dawn) to switch between dark and light periods⁵⁰
- Implement an intermittent light schedule⁵

Improve animal health and hygiene

1. Reduce infections

Immediate measures:

- Health monitoring of animals (lameness, mortality, etc.) through daily observation⁴⁴
- Check litter for signs of digestive issues⁸
- Contact veterinarian⁶⁶
- Medical treatments according to veterinarian's advice⁶⁶
- Use disinfectants that are effective against coccidia

Long-term measures:

- Improve biosecurity (e.g. restriction of entrances to barn, change of clothes, hygiene sluice, pest control)⁴⁴
- Vaccinations (e.g. against coccidia)^{22,44}
- Diagnosis of infectious pathogens by veterinarian⁶⁶
- Medical treatment record⁶⁶
- Ensure good feed quality and hygiene, especially regarding mycotoxins in feed⁴⁴
- Clean and disinfect water lines regularly (after every flock and after treatments via the water system)⁴⁴

2. Improve genetics

- Switch to slow growing breeds^{31,51,52, 6}



Heat stress

Heat stress is posing a great threat to poultry especially since due to climate change more countries are exposed to hot climate. Since broilers cannot sweat, they are unable to cope with temperatures outside their comfortzone and suffer greatly when barn climate exceeds their limit.⁶² This can lead to high losses and negatively impact meat quality.

Measures to avoid or alleviate heat stress can be categorised into housing environment, barn climate and feeding management.

Find Best Practices for these areas below:

Improve environment

1. Improve housing/grouping

Immediate measures:

- Lower stocking density in or prior to hot weather^{25,53,54}

Long-term measures:

- Improve insulation^{56,57}
- Consult experts when designing a new broiler house⁵⁶
- Switch to slow growing breeds⁶⁶
- Provide access to an outdoor area⁶⁶

2. Provide enrichment

Immediate measures:

- Provide perches or platforms so birds can escape litter²⁵
- Provide shelters in outdoor areas²⁵

3. Improve handling

- Have a person present at all times to check on animals and technology⁵⁵
- Monitor animals for signs of heat stress (e.g. panting)⁶⁶
- Do not move birds during the hottest hours of the day, e.g. for catching^{56,57}
- Move inspection rounds to early in the morning and late at night⁵⁵

4. Mobile houses

- Place house in shade²⁵
- Move entrance to the west²⁵
- Ensure roof is properly insulated²⁵



Improve barn climate

1. Improve ventilation

Immediate measures:

- Check ventilation rate and adjust (1m/s up to 3m/s in hot weather)^{55,56}
- Increase ventilation through fans, add sprinklers^{53,55,57,60,61}
- Flush sprinklers regularly to avoid hygienic problems⁶⁶
- Add fans when barn is naturally ventilated⁵⁵
- Clean fans⁴⁷

Long-term measures:

- Check functionality of ventilation system prior to hot period⁶²
- Install fans and/or a cooling system^{53,55,60}
- Switch to a mechanical ventilation system^{61,63}

2. Improve temperature and humidity

Immediate measures:

- Check weather as well as enthalpy score → > 50 kJ/kg leads to heat stress^{55,62}
- Check temperature and humidity and adjust ventilation accordingly⁶⁶
- Cool down using water mist⁵⁴
- Shade windows in summer to avoid high temperatures, sun beams and uneven lighting⁵⁵
- Spray water onto barn roof in hot weather⁵⁵

Long-term measures:

- Install a pad-cooling system²⁵
- Install a sprinkler, misting or fogging system → consult adviser in order to avoid wet litter and animals getting wet^{54,55}
- Plant trees and/or bushes to provide shade in summer⁶⁶
- Insulate the roof⁵⁷
- Lower stocking density

3. Improve lighting

- Implement an intermittent lighting schedule (1h of light, 3h of darkness → 6x per day)⁶⁴

Improve feeding management

1. Improve feeding composition

Immediate measures:

- Add vitamins and minerals/electrolytes to the feed^{25,53,55,59,60,62,65}



- Add phytochemicals to the feed^{57,60,63}
- Substitute carbohydrates for fat^{53,62}
- Feed wet mash, pellet or crumble feed^{57,60,65}

2. Improve feeding management

Immediate measures:

- Feed outside the hottest hours of the day, feed at night^{25,53,60-62,65}
- Opt for restricted or intermittent feeding^{54,55,57,59,60,65}
- Feed withdrawal six hours before the hottest temperatures → have birds empty feed lines prior to highest temperatures^{55,61}

3. Improve access to water

Immediate measures:

- Check water lines and drinkers regularly⁴²
- Provide cold water, e.g. by putting ice in the water tanks or by flushing water lines regularly^{53,55,61,62,65}
- Shade water tanks and pipes^{53,57}
- Consult veterinarian regarding addition of vitamins and yeasts to water^{61,62}

Long-term measures:

- Insulate water pipes to keep water cold⁵³



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BROILER – ANIMAL HEALTH



Executive summary

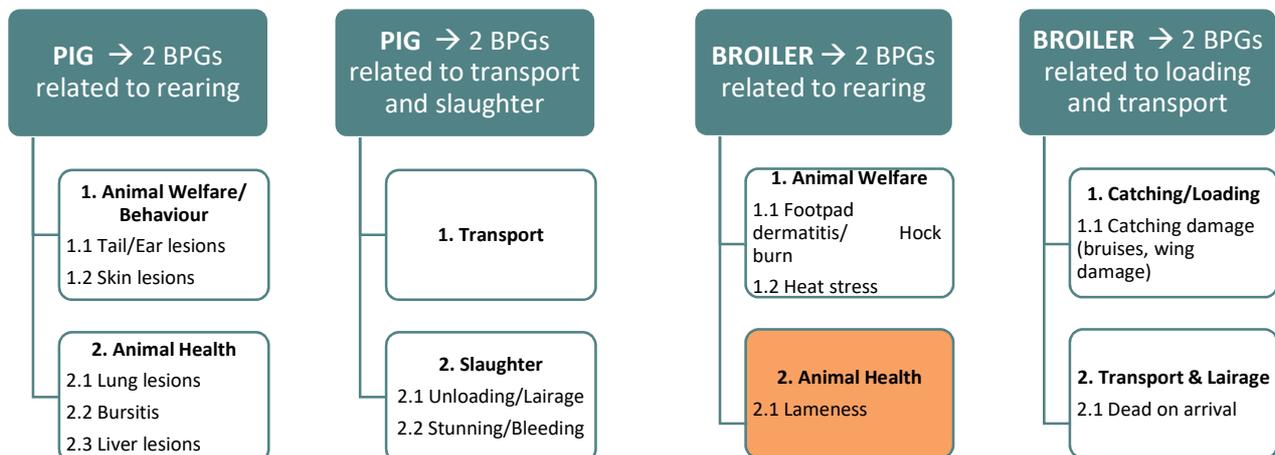
The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. They form the basis for the development of extensive reports for policy makers, advisers and other stakeholders which will include outcomes of the aWish project.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the upbringing of the animals. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport and lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Lameness

Lameness or bad gait scores in general are a problem in birds kept for meat production. Especially with fast growing breeds, the broilers gain weight quickly which can lead to skeletal problems.¹⁸ Other factors like injuries, infections and nutritional deficiencies can further impair animal health and welfare.¹⁹

In order to improve the walking ability of broilers, attention should be paid to housing, feeding, barn climate and overall animal health and hygiene.

Find Best Practices for these areas below:

Improve housing management

1. Improve environment/grouping

Immediate measures:

- Remove any sharp edges or other hazards that could lead to injury¹⁶

Long-term measures:

- Lower stocking density below EU legislation^{1,17-21}

2. Improve litter management

- See Guide “Animal Welfare – Broilers” under “Footpad Dermatitis / Hock burn”
- Provide high quality litter^{19,21-23}
- Lower stocking density^{1,17-21}

3. Provide enrichment

Immediate measures:

- Offer at least 2m of usable perch space (e.g. elevated platforms, bales of lucerne hay) or 1% of the total barn surface^{8,20,24}
- Use platforms or straw/hay bales rather than actual perches⁵
- Switch up the position of the enrichment to regain interest in them⁸

Long-term measures:

- Provide perches/platforms from the beginning to get broilers used to them⁸
- Disinfect perch space after every flock⁸
- Provide several different enrichment materials⁹

4. Improve handling

- Gentle animal handling to avoid injuries²⁷



Improve feeding

1. Improve feeding composition and management

Immediate measures:

- Check for good feed quality (using senses: sight, smell, touch)^{1,18,19}
- Add whole wheat to feed¹⁸
- Feed a low-protein diet¹⁹
- Add supplements like vitamin D3, pro-, pre- or synbiotics → in accordance with veterinarian or feed adviser^{1,16,19,20}
- Contact veterinarian/feed adviser for an analysis of vitamins, minerals etc. in feed (especially calcium to phosphorus ratio)²⁷

Long-term measures:

- Reduced nutrient density in first 2 weeks of life^{1,18-20}
- Regular analysis of feed composition²⁷

2. Improve feed and water hygiene

Immediate measures:

- Check feed quality (use senses: sight, smell, touch)²⁵
- Clean water and feed lines regularly (at least after every flock)²⁷
- Flush water lines prior to arrival of new animals¹¹

Long-term measures:

- Ensure good feed quality^{1,26}
- Clean and disinfect water lines regularly (after every flock and after treatments via the water system)^{11,26}
- Regular water analysis (at least twice a year)²⁷

Improve lighting

Immediate measures:

- Check lighting¹²
- Clean light sources regularly¹²
- Improve distribution of light throughout the barn: avoid sun beams as well as uneven light to prevent birds from crowding¹²

Long-term measures:

- Implement a step-up lighting programme^{18,20}
- Add natural light (e.g. through windowed houses or semi-transparent roofing)²⁷



- Contact adviser to improve light distribution in barn¹²
- Use transition period (dawn/dusk) to switch between dark and light period¹²

Improve animal health and hygiene

1. Reduce infections

Immediate measures:

- Health monitoring of animals (lameness, immobile birds, mortality etc.) through daily observation²³
- Consult veterinarian when health problems arrive²⁷
- Medical treatments according to the veterinarian's advice (e.g. coccidiostatica)¹

Long-term measures:

- Implement a monitoring system using gait scoring²³
- Improve biosecurity (e.g. restriction of entrances to barn, change of clothes, hygiene sluice, pest control)^{18,23,26}
- Vaccinations (e.g. against Marek's Disease) → consult veterinarian^{18,19}
- Implement a preventative health programme with a veterinarian
- Diagnosis of infectious pathogens by veterinarian¹

2. Improve genetics

- Switch to slow growing breeds¹⁹
- Select for good leg health¹⁸



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BROILER – CATCHING/LOADING



Executive summary

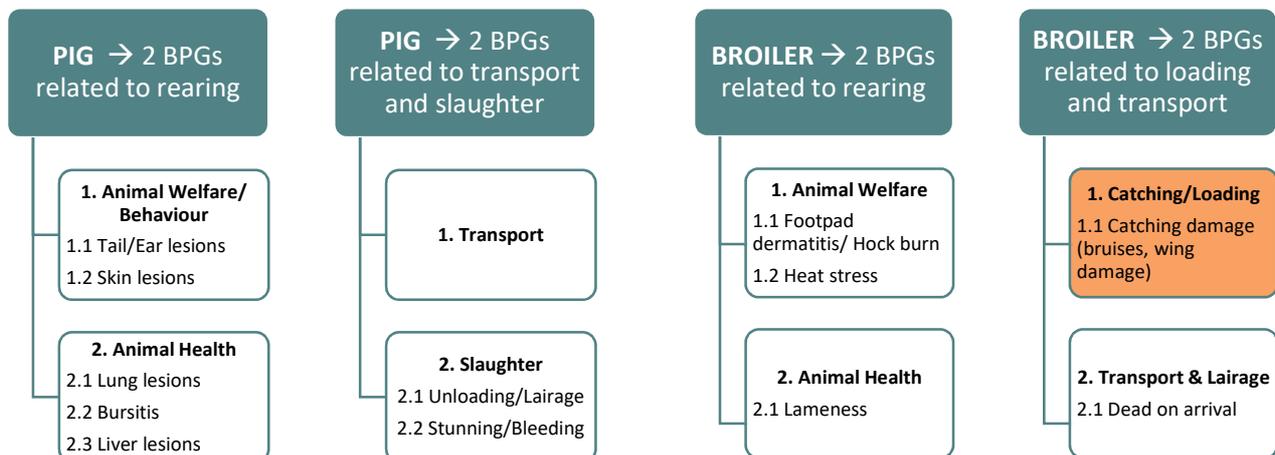
The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. They form the basis for the development of extensive reports for policy makers, advisers and other stakeholders which will include outcomes of the aWish project.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the upbringing of the animals. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport and lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Catching damage

Catching poses a great risk to animal welfare when done incorrectly. Injuries such as broken wings and legs are easily caused by rough handling and lead to pain and suffering in the birds. Catching damage also causes economic losses when birds are discarded at the slaughterhouse.¹² Therefore, catching damage is an important animal welfare indicator that should be considered.

Changes to catching and/or depopulation can be made in two areas: the handling itself and the catching conditions.

Find Best Practices for these areas below:

Improve handling

- Provide training to handlers (e.g. via hands-on training) and ensure all new handlers are fully trained^{1-6, 17}
- Enlist experienced, qualified staff for catching, preferably in possession of a certificate from an endorsed authority^{7,8, 17}
- Adapt the number of people as well as the available material to the farm size^{7, 17}
- Only catch animals that are fit for transport → continuously check for signs of illness (e.g. cachexia, dehydration, difficulty walking) and humanely kill animals that are unfit⁷⁻⁹
- Do not hurry, move calmly^{7-9, 17}
- Speak quietly and limit noises^{8,9}
- Avoid cornering birds and/or chasing them into corners → smothering^{8,9}
- Keep crates/drawers close to the birds in order to avoid long walking routes^{7,8,10, 17}
- Do not pick broilers up by their legs or wings^{1,6,8,9, 17}
- Carry broilers upright with hands around the breast or hold both legs^{6,8,11,12, 17}
- Ideally, catch broilers with both hands¹³
- Do not catch more than 3 birds >2kg or 5 birds < 2kg; when holding 3 birds in one hand use the other hand to stabilise them under the belly⁶⁻⁸
- Be careful when dropping birds into the crates, gently lower them and avoid hitting the edges or injuring them when closing the crates^{1,6,9,11, 17}
- Stick to the legal requirements of birds for each crate, do not try to fit in more animals⁶⁻⁹
- Ensure that handlers/catching teams get enough breaks¹⁷

Improve catching conditions

- Keep lights dimmed while catching, use red or blue light (e.g. headlamps)^{1,5-8,12,14,15, 17}
- Use curtains to shade the entrance when crates are being moved into the stable^{5,12}
- Check crates before usage → no breakage, easy to close, no sharp edges, clean^{5-8,10, 17}
- Ensure crates have large openings^{5,10}



- Preferably use crates that can be accessed from the sides¹⁰
- Ensure that crates stand steady, avoid falling^{7,10}
- Do not stack crates too high (not above shoulder height) → risk of falling & too difficult to handle carefully¹⁰
- If possible use a chicken harvester instead of catching manually^{4,16, 17}
- When using a chicken harvester, check the speed of the conveyor belt regularly and adjust if necessary⁸
- Keep the catching duration as short as possible^{2,15, 17}



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BROILER – TRANSPORT & LAIRAGE



Executive summary

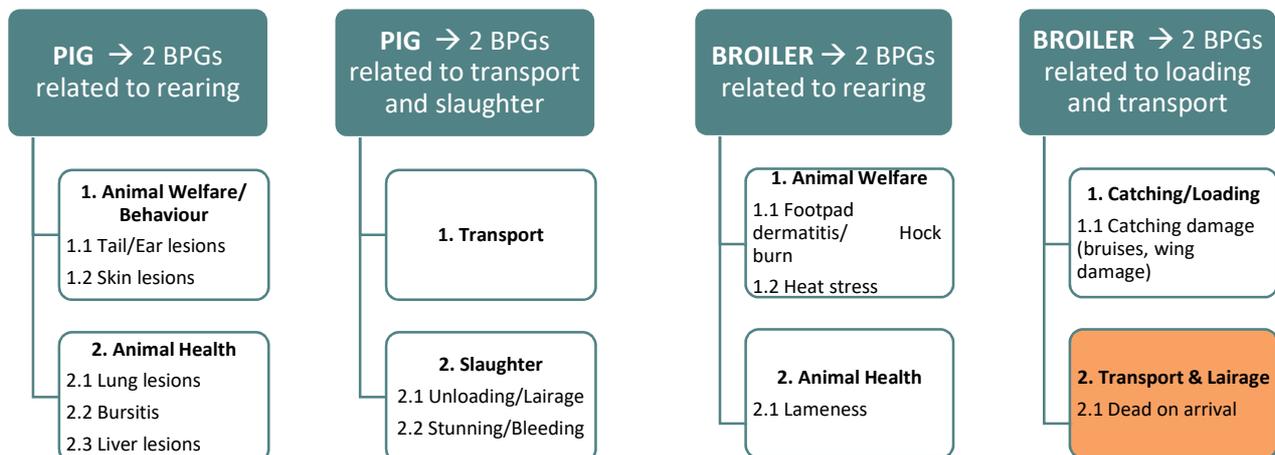
The **Best Practice Guides (BPGs)** aim to improve animal welfare by giving recommendations and advice to all stakeholders that are involved in the production of fattening pigs as well as broiler chickens. This version 1 is intended for practical usage and thus contains a summary of measures (“Best Practices”) that can be taken to ameliorate the well-being of the animals in all stages of the production chain. The identified Best Practices are based on the results of earlier scientific studies and a consultation of experts. They form the basis for the development of extensive reports for policy makers, advisers and other stakeholders which will include outcomes of the aWish project.

Eight guides were developed – four on broiler welfare and four on pig welfare. For both species, two BPGs relate to rearing, offering advice to farmers and others responsible for the upbringing of the animals. Additionally, for pigs, one guide on transport and one on Best Practices in relation to slaughter were created to further ensure that welfare needs of the animals are being met throughout their whole life span. In regards to broilers, an emphasis was also put on catching as well as transport and lairage since these areas are critical points regarding welfare in the birds’ lives.

The BPGs are based on animal welfare indicators (AWI) that can be measured at different points of the production chain, mainly at the slaughterhouse. The recommendations provided should thus lead to an increase in pig and broiler welfare that is reflected in the automatic welfare monitoring at farm and slaughterhouse level. Concrete Best Practices for important indicators were identified.

Furthermore, Best Practices were divided into immediate and long-term measures to give users a simple overview over which measures can be tried right away and which might need more time or effort to be implemented.

The main structure of the eight guides is as follows:





Dead on arrival

Transport is a very stressful event in the life of broilers. One indicator that is routinely measured at the slaughterhouse is the percentage of animals that are dead on arrival (DOA) after the journey.¹⁰ The most common cause for DOA are problems during transport, especially heat or cold stress since broilers are unable to cope with extremes in weather.

To avoid the death of animals during or even before transport, measures should be applied regarding catching, transport and lairage.

Find Best Practices for these areas below:

Improve catching and loading

1. Improve handling

- Provide training to catching staff (e.g. by hands-on training) and ensure all new handlers are fully trained^{1-7, 18}
- Carry broilers upright^{3,5,6}
- Do not carry more than 3 broilers <5kg or 5 broilers <2kg
- Use crates with large openings^{3,4}
- Check crates before usage → no breakage, easy to close, no sharp edges, clean^{6,8}
- When using chicken harvester ensure that it is used by trained personnel⁴⁻⁶
- See BPG “Catching/Loading”

2. Improve monitoring

- Examine broilers regarding signs of illness prior to catching (e.g. cachexia, dehydration, difficulty walking, broken wings)^{2,4-6,8, 18}
- Check plumage condition (coverage, wetness)^{6, 18}
- Do not catch/load animals that are not fit for transport⁵
- Treat or humanely kill animals that are not fit for transport^{3,5,6,8}
- Provide training to catching teams to recognise fitness for transport³
- Do not load animals that are wet⁹
- Improve feed withdrawal → no more than 12h or less than 4h (transport included), access to water until catching is started^{3,6, 18}
- Check for entrapments of wings, legs and heads of the broilers before loading the crates on the vehicle¹⁸

3. Improve climate

- Catching and transport during cooler/warmer parts of the day to avoid heat/cold stress^{10, 18}
- Park truck in shade and use fans to cool down in hot weather^{1-3,6,11}



Improve transport

1. Stocking density

- Lower stocking density in crates during hot weather^{1,2,6,7,10, 18}
- Space allowance according to EU/national legislation^{4,6}
- Head of birds should not touch the top of the crate when sitting^{3,6}

2. Improve climate on vehicle

- Use climate controlled vehicles^{6,12, 18}
- Monitor temperature in vehicle continuously^{3,6,7, 18}
- Keep effective temperature above 10° C³
- Do not transport animals when temperatures exceed 30° C^{9, 18}
- Keep in mind hot and cold zones in the vehicle and load crates accordingly, e.g. leave crates empty in hot zones when it is hot outside^{3,6,8}
- Lower stocking density in crates during hot weather^{1,2,7,10,13, 18}
- Leave some crates empty to improve circulation during transport^{3,8}
- Use curtains to protect birds from hot or cold air^{3,6,8}
- Stop to adjust curtains when weather changes⁸
- In hot weather open ventilation flaps if present / close in cold weather¹
- In hot temperatures use fans and/or water sprinkling to cool animals^{1,6}
- Avoid unnecessary stops during transport, keep truck moving to ensure good ventilation^{6,12}
- Choose a shaded area for stops^{6,8}

3. Improve transport duration and journey

- Short transport time and distance, preferably under 4h^{2,4,6,10,13-16, 18}
- Maximum transport duration including feed withdrawal: 12h; if temperatures are high (apparent equivalent temperature [AET] > 40): 4h³
- Choose quickest and smoothest route⁸
- Avoid routes with lots of traffic and/or bad road conditions^{3,6,12}
- Drive gently^{6,8, 18}
- Enlist qualified and experienced truck drivers^{1,3,6, 18}
- Ensure good vehicle maintenance (e.g. tyre pressure)^{3,6}
- Check vehicle prior to transport (cleanliness, ventilation, light, etc.)^{6,8}

Improve lairage stays

1. Improve climate

- Short lairage stays at the slaughterhouse^{13,15, 18}

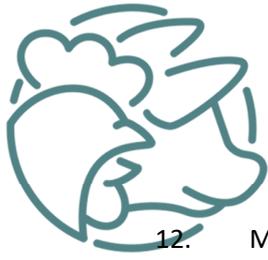


- Unstack crates in lairage area to ensure air flow⁷
- Shaded lairage^{3,6,7}
- In hot weather, park trucks in a shed equipped with fans to cool down¹⁷
- Cool birds in lairage area using fans or water sprinkling^{3,7, 18}



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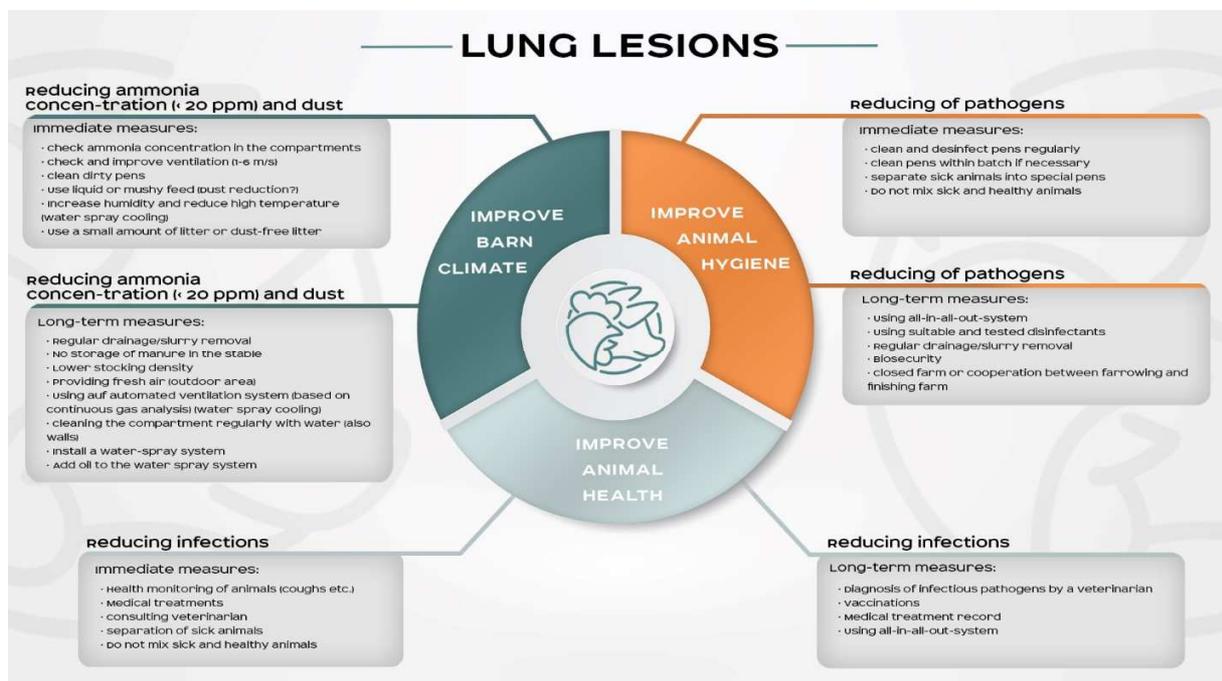


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6.1.3 Best Practice Guides: examples for infographics (made by BioSense) showing the applied design

6.1.3.1 Lung lesions in pigs





6.1.3.2 Lameness in broilers

LAMENESS

1

IMPROVE HOUSING MANAGEMENT

1. Improve environment/grouping
Immediate measures:
 - Remove any sharp edges or other hazards that could lead to injury
Long-term measures:
 - Lower stocking density below EU legislation

2. Improve litter management
 - See Guide "Animal Welfare - Broilers" under "Footpad Dermatitis/ Hock Burn"
 - Provide high quality litter
 - Lower stocking density

3. Provide enrichment
Immediate measures:
 - Offer at least 2m of usable perch space (e.g. elevated platforms, bales of lucerne hay) or 1% of the total barn surface
 - Use platforms or straw/hay bales rather than actual perches
 - Switch up the position of the enrichment to regain interest in them
Long-term measures:
 - Provide perches/platforms from the beginning to get broilers used to them
 - Disinfect perch space after every flock
 - Provide several different enrichment materials

4. Improve handling
 - Gentle animal handling to avoid injuries

2

IMPROVE FEEDING

1. Improve feeding composition and management
Immediate measures:
 - Check for good feed quality (using senses: sight, smell, touch)
 - Add whole wheat to feed
 - Feed a low-protein diet
 - Add supplements like vitamin D3, pro-, pre- or synbiotics - in accordance with veterinarian or feed adviser
 - Contact veterinarian/feed adviser for an analysis of vitamins, minerals etc. in feed (especially calcium to phosphor ratio)
Long-term measures:
 - Reduced nutrient density in first 2 weeks of life
 - Regular analysis of feed composition

2. Improve feed and water hygiene
Immediate measures:
 - Check feed quality (use senses: sight, smell, touch)
 - Clean water and feed lines regularly (at least after every flock)
 - Flush water lines prior to arrival of new animals
Long-term measures:
 - Ensure good feed quality
 - Clean and disinfect water lines regularly (after every flock and after treatments via the water system)
 - Regular water analysis (at least twice a year)

3

IMPROVE LIGHTING

Immediate measures:
 - Check lighting
 - Clean light sources regularly
 - Improve distribution of light throughout the barn: avoid sun beams as well as uneven light to prevent birds from crowding

Long-term measures:
 - Implement a step-up lighting programme
 - Add natural light (e.g. through windowed houses or semi-transparent roofing)
 - Contact adviser to improve light distribution in barn
 - Use transition period (dawn/dusk) to switch between dark and light period

4

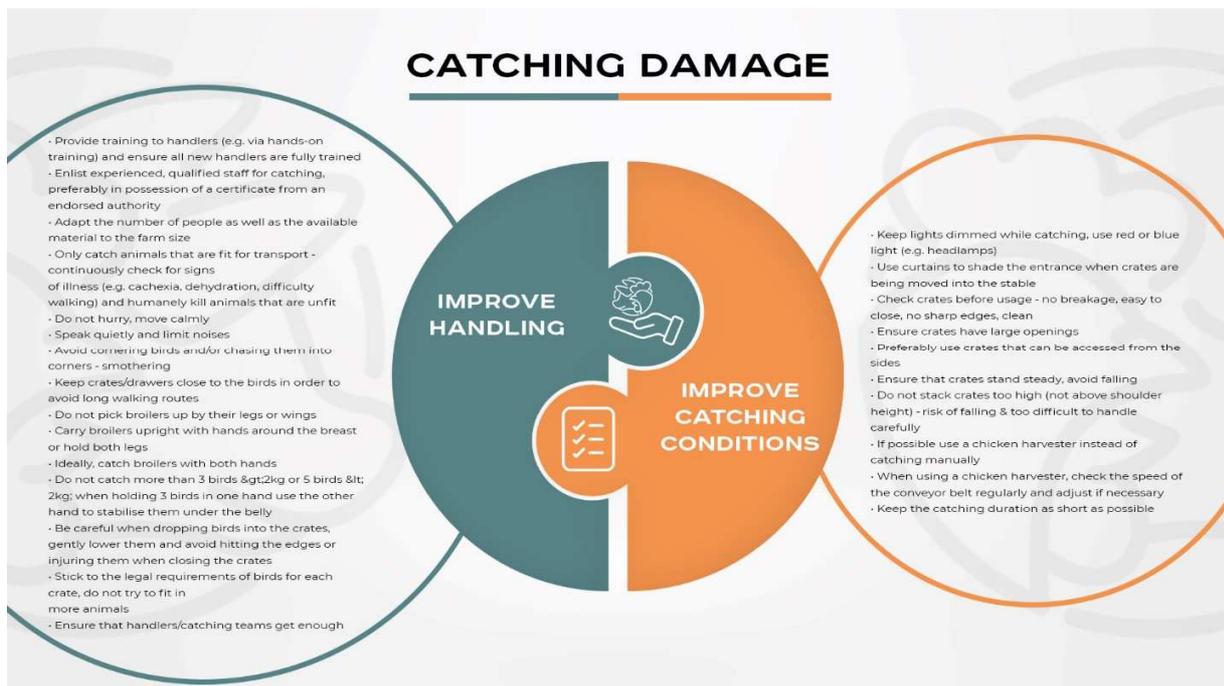
IMPROVE ANIMAL HEALTH AND HYGIENE

1. Reduce infections
Immediate measures:
 - Health monitoring of animals (lameness, immobile birds, mortality etc.) through daily observation
 - Consult veterinarian when health problems arise
 - Medical treatments according to the veterinarian's advice (e.g. coccidiostats)
Long-term measures:
 - Implement a monitoring system using gait scoring
 - Improve biosecurity (e.g. restriction of entrances to barn, change of clothes, hygiene sluice, pest control)
 - Vaccinations (e.g. against Marek's Disease) - consult veterinarian
 - Implement a preventative health programme with a veterinarian
 - Diagnosis of infectious pathogens by veterinarian

2. Improve genetics
 - Switch to slow growing breeds
 - Select for good leg healthy



6.1.3.3 Catching damage in broilers





6.2 SURVEY TEMPLATE

Identifying Best Practices to improve Animal Welfare for broiler chickens and fattening pigs

This survey is part of the EU project “Animal Welfare Indicators at the Slaughterhouse” (aWISH), Grant Agreement ID 101060818.

For more information on aWISH see our project website: <https://www.awish-project.eu/>

Within this project, Best Practice Guides will be developed that provide practical recommendations to improve animal welfare for broilers and fattening pigs along the production chain.

The aim of this survey is to gather expert knowledge regarding those best practices.

There are three parts in this survey:

1. Information on the participants’ background
2. Evaluation of Best Practices regarding Animal Welfare Indicators (AWI)
3. Evaluation of requirements for automated monitoring at the slaughterhouse

It will take about 15 to 20 minutes to complete.

Your responses are completely anonymous. The information collected will be used in the development of the afore mentioned Best Practice Guides.

We really appreciate your input!

If you have any questions regarding the survey, please do not hesitate to contact us via email:

maite.marie.jachens@tiho-hannover.de

TiHo (aWISH partner)

Part 1: Participant’s background

1) What is your background?

- Research/Academia
- Technology provider
- Consulting
- Industry
- Slaughterhouse
- Other (please specify)

2) Are you part of aWISH?



- Yes, I am working for one of the aWISH partners.
- Yes, I am on the expert panel.
- No, I am not part of the aWISH project.

3) Please indicate how many years of experience you have in the field listed below.

- Animal behaviour/Animal welfare
- Animal production/Agriculture
- Veterinary medicine
- Food inspection/Meat hygiene

4) Do you have experience in any other relevant field that is not mentioned above? If so, please specify:

5) Which country do you currently work in?

6) What animal do you specialise in?

- Broiler
- Pig
- Both
- Other (please specify):

Part 2: Evaluation of Best Practices regarding Animal Welfare Indicators (AWI)

A literature research was conducted to identify Best Practices on farm, on transport and at the slaughterhouse for specific animal welfare indicators (AWI).

Below you will find a list of measures for each AWI. Please rate the suitability of these measures on a scale from 0 to 100%.

If you are unsure about a measure and/or would prefer not to rate it, please use the “reset” button.

Pigs

Tail lesions/Ear lesions:



- Organic manipulable material on farm except straw (wood, sisal ropes, pressed molasses, etc)
- Non-organic manipulable material on farm (metal chains, chewable plastic material, etc)
- Provision of straw or hay as enrichment (in racks, feeders, etc.)
- Provision of straw as bedding on farm
- Regular refilling of manipulable or bedding material on farm (so it doesn't run out)
- Stocking density on farm according to EU legislation
- Lowering stocking density on farm below EU legislation / more space allowance per pig
- Very small group size on farm (similar to litter size: 10-16 pigs)
- Small group size on farm (< 40 pigs per group)
- Bigger group size on farm (> 40 pigs per group)
- Keeping littermates together from birth to the fattening/finishing period (no mixing)
- As little regrouping / mixing of animals on farm as possible
- Structuring of the pen (lying, feeding, dunging area)
- Pens with outdoor area
- Good health status
- Good barn climate / air quality (e.g. little ammonia, optimal air flow, etc)
- No storage of manure in the stable (under the slatted floor)
- Good feed quality (e.g. no mycotoxins, balanced)
- Enough feeding space per pig (preferably 1:1)
- Good feeding management (e.g. ad libitum, short feeding intervals)
- Genetic aspects (genetics that are preferred in countries without tail docking)

Skin lesions:

- As little regrouping / mixing of animals on farm as possible
- Little regrouping / mixing of animals for transport
- Little regrouping / mixing of animals in lairage area at the slaughterhouse
- Keeping littermates together from birth to the fattening/finishing period (no mixing)
- Organic manipulable material on farm except straw (wood, sisal ropes, pressed molasses, etc)
- Non-organic manipulable material on farm (metal chains, chewable plastic material, etc)
- Provision of straw or hay on farm as enrichment (in racks, feeders, etc.)
- Provision of straw as bedding on farm
- Regular refilling of manipulable or bedding material on farm (no running out)
- Stocking density on farm according to EU legislation



- Lowering stocking density on farm below EU legislation / more space allowance per pig
- Very small group size on farm (similar to litter size: 10-16 pigs)
- Small group size on farm (< 40 pigs per group)
- Bigger group size on farm (> 40 pigs per group)
- Structuring of the pen (lying, feeding, dunging area)
- Short lairage stays at the slaughterhouse
- Stocking density on transport according to EU legislation
- Short transport duration (< 9 h)
- Gentle animal handling on farm
- Gentle animal handling on transport
- Gentle animal handling at the slaughterhouse

Lung lesions:

- Good ventilation in stables
- Fresh air (outdoor areas)
- Ammonia level < 20ppm
- Fully slatted floor
- No storage of manure in the stable (under the slatted floor)
- Regular drainage/slurry removal
- Stocking density on farm according to EU legislation
- Lowering stocking density on farm below EU legislation / more space allowance per pig
- All-in-all-out system (cleaning and disinfection after each batch)
- Good barn climate (e.g. light, air, temperature)

Bursitis:

- Bedding (e.g. straw)
- Soft or soil floors, no slats
- When using slats: plastic rather than concrete or metal ones
- Non-slatted concrete floor
- Rubber floor mats
- Good floor condition (e.g. no breakage, non-slippery)



Broilers

Footpad Dermatitis/Hock burn:

- Lowering stocking density on farm below EU legislation / more space allowance per broiler
- Slow growing breeds
- Litter other than straw (e.g. pine shavings, wood shavings, pellets, etc.)
- Adding/removing litter layers
- Regular replenishment/replacement of litter (esp. in risk areas)
- Litter management (e.g. raking, windrowing, tilling etc.)
- Litter amendments (e.g. acidifiers)
- Preheating stable/floor prior to arrival of animals
- Feed additives (e.g. biotin, zinc, vitamin D3, etc.)
- Feed additives to stabilise gut microbiota
- Avoiding high salt content in feed
- Black soldier fly larvae in feed
- Small cups or water nipples instead of bell drinkers
- Age appropriate adjustment of water pressure
- Height of waterline adjusted to animal size
- Good ventilation in stables (e.g. ventilation rate)

Catching Damage:

- Careful handling
- Handler experience
- Training provided to handling personnel
- Low light intensity / blue or red light during catching
- Carrying broilers upright
- Not picking broilers up by their wings or legs
- Keeping the catching duration as short as possible
- Good condition of crates (e.g. no breakage, easy to close)
- Avoiding animals hitting the edge of the crate
- Method of catching (manual vs. mechanical)



Dead on arrival:

- Short transport time and distance
- Short lairage stays at the slaughterhouse
- Lowering stocking density in crates during hot weather
- Catching and transport during cooler parts of the day
- Good health status
- Manual catching instead of mechanically
- Ensuring good ventilation on transport
- Temperature control (all production stages) to avoid heat stress

Part 3: Evaluation of requirements for automated monitoring at the slaughterhouse

Below you will find a list of requirements for technologies that are installed at the slaughterhouse to monitor animal welfare. Please rate the importance of these requirements on a scale from 0 to 100%.

If you are unsure about a requirement and/or would prefer not to rate it, please use the “reset” button.

- Good validation by experts before installation (output validation & welfare relevance validation)
- Easy to install (e.g. can be integrated into existing IT-system)
- Easy to clean & disinfect
- User friendly
- Categorisation of findings (e.g. mild – moderate – severe)
- Installation in an area where findings are relevant
- Easy maintenance and rebooting
- Alarm system for outage
- Alarm system for severe findings
- Breakdown of findings that is easy to understand (e.g. colour-coded)
- Technical support available
- Reliable data storage, allocated to each animal
- Reliable functioning (especially under slaughterhouse conditions)
- Resistant against environmental influence (e.g. humidity, cleaning agents, water)



- Able to detect interference factors (e.g. animals that are not in the correct position, dirt on lens)

Are there any other requirements for automated monitoring at the slaughterhouse that are missing from the ones above? If so, please state here:

Any additional comments:

Thank you for your participation! If you have any questions regarding this survey, please do not hesitate to contact us via email: maite.marie.jachens@tiho-hannover.de.

TiHo (aWISH partner)

Privacy policy and declaration of consent

1. Purpose of processing

We collect and process the personal data to be used for participation in the above survey. The purpose of this survey is to identify Best Practices regarding animal welfare of broilers and fattening pigs.

The results of the survey will be used by the Institute of Animal Hygiene, Animal Welfare and Farm Animal Behaviour (ITTN) for research, presentation and publication purposes; if personal information is available, it will be anonymized beforehand, Art. 6 I 1 lit. e in conjunction with 89 GDPR, § 3 I 1 No. 1 NHG, § 13 NDSG.

2. Legal basis of data processing

Participation in the survey is voluntary. When completing the survey, your IP address will be transmitted to the clinic server and stored there - at least temporarily. By participating in the survey, you agree to this storage in accordance with Art. 6 I 1 lit. a GDPR. No other personal data will be processed. All data will be treated securely and confidentially. The survey was designed using software provided for this purpose by LimeSurvey on the clinic server. In addition, data protection notices from LimeSurvey can be viewed online: <https://www.limesurvey.org/de/richtlinien/datenschutzrichtlinie>.

The possibility of use for teaching, research, lecture and publication purposes results from Art. 6 I 1 lit. e GDPR in conjunction with. § 13 NDSG. The possibility to process data for evaluation purposes can be derived from Art. 6 I 1 lit. e GDPR in conjunction with. § 5 NHG.

3. Duration of processing



The personal data will be stored for the duration of the survey and the research project beyond. Deletion takes place automatically, at the latest 6 months after the end of the project. Legal storage obligations remain unaffected by this.

4. Rights of the persons concerned

You have a right of access to the personal data concerning you and, if applicable, to correction, deletion or restriction of the processing of this data and a right to object to the processing as well as a possible right to data portability vis-à-vis the institution named below. You may withdraw your consent, if any, at any time with effect for the future, Art. 7 III GDPR. In addition, you have a right to submit complaints to the supervisory authority if you believe that the processing of personal data concerning you is in conflict with the law. The competent supervisory authority is the State Commissioner for Data Protection of Lower Saxony.

Supervisor	Contact person	Data protection officer
Institute of Animal Hygiene, Animal Welfare and Farm Animal Behaviour (ITTN) University of Veterinary Medicine, Foundation (TIHO)	Institute of Animal Hygiene, Animal Welfare and Farm Animal Behaviour (ITTN) University of Veterinary Medicine, Foundation (TIHO)	University of Veterinary Medicine, Foundation (TIHO)
Michaela Fels	Maite Jachens	Wolfgang Rottwinkel
Bischofsholer Damm 15 (Gebäude 116) 30173 Hannover	Bischofsholer Damm 15 (Gebäude 116) 30173 Hannover	Bünteweg 2, 30559 Hannover
Tel.: +49 511 953 8954	Tel.: +49 511 953 8966	Tel.: +49 511 953 8015
		Fax: 0511 953 828015
E-Mail: michaela.fels@tiho- hannover.de	E-Mail: maite.marie.jachens@tiho- hannover.de	E-Mail: datenschutz@tiho- hannover. de



6.3 SURVEY REPORT

SURVEY REPORT: IDENTIFYING BEST PRACTICES TO IMPROVE ANIMAL WELFARE FOR BROILER CHICKENS AND FATTENING PIGS

THE AIM OF THE SURVEY WAS TO GAIN EXPERT KNOWLEDGE REGARDING BEST PRACTICES TO IMPROVE ANIMAL WELFARE FOR BROILER CHICKENS AND FATTENING PIGS AS WELL AS REQUIREMENTS FOR AN AUTOMATED MONITORING SYSTEM AT THE SLAUGHTERHOUSE.

IT WAS SEND OUT TO ALL MEMBERS OF THE AWISH PROJECT, THE EXPERT PANEL AND 128 ANIMAL WELFARE EXPERTS FROM 21 COUNTRIES ALL OVER THE WORLD.

THE INFORMATION GATHERED WILL BE USED IN THE DEVELOPMENT OF BEST PRACTICE GUIDES THAT WILL PROVIDE PRACTICAL RECOMMENDATIONS TO ALL STAKEHOLDERS ON IMPROVING ANIMAL WELFARE ALONG THE PRODUCTION CHAIN.

TOTAL NUMBER OF PARTICIPANTS: 130

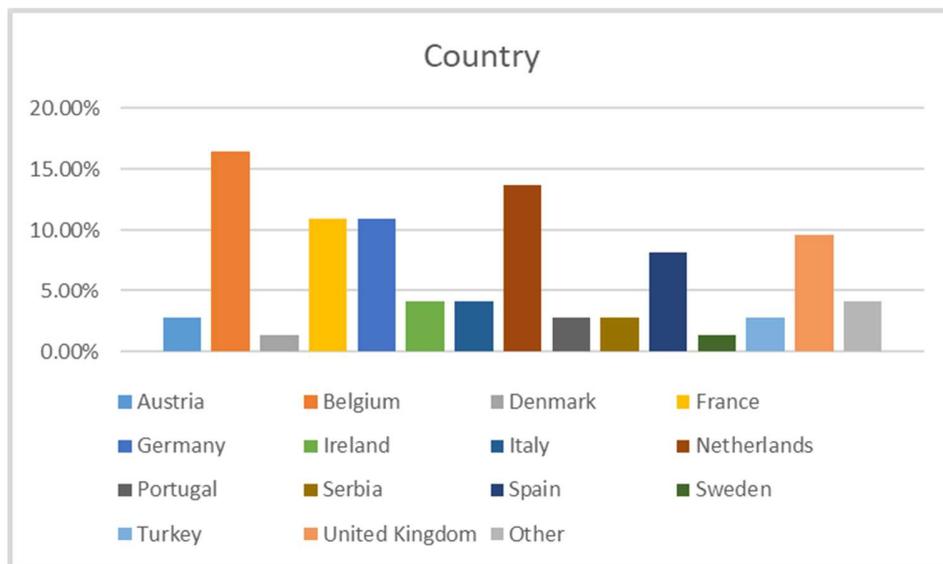
COMPLETE ANSWERS: 73

FOR THE ANALYSIS ONLY COMPLETE ANSWERS (N= 73) WERE EVALUATED.



PARTICIPANTS' BACKGROUND

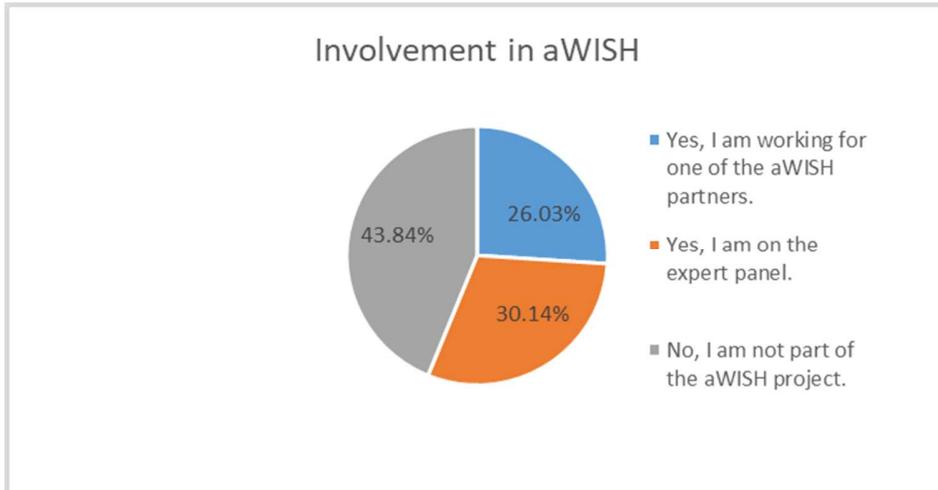
73 PARTICIPANTS FROM 17 DIFFERENT COUNTRIES:



OTHER COUNTRIES: CANADA, UNITED STATES OF AMERICA

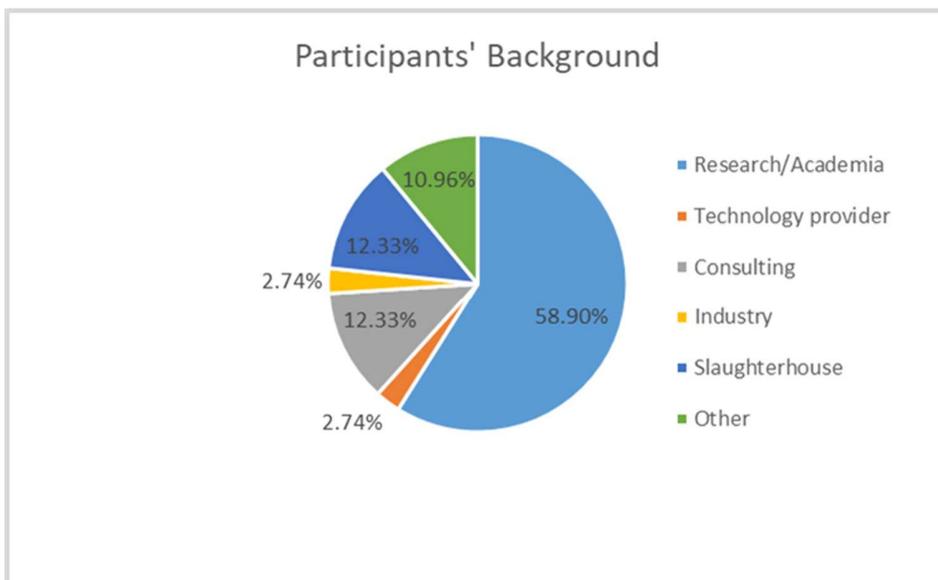


INVOLVEMENT IN THE AWISH PROJECT:



EXTERNAL EXPERTS WERE CHOSEN FROM ACADEMIA AND RESEARCH INSTITUTES ALL OVER THE WORLD.
CRITERIA: AT LEAST POST-DOC STATUS AS WELL AS A PUBLICATION ON ANIMAL WELFARE OF PIGS AND/OR BROILERS IN THE LAST 5 YEARS.

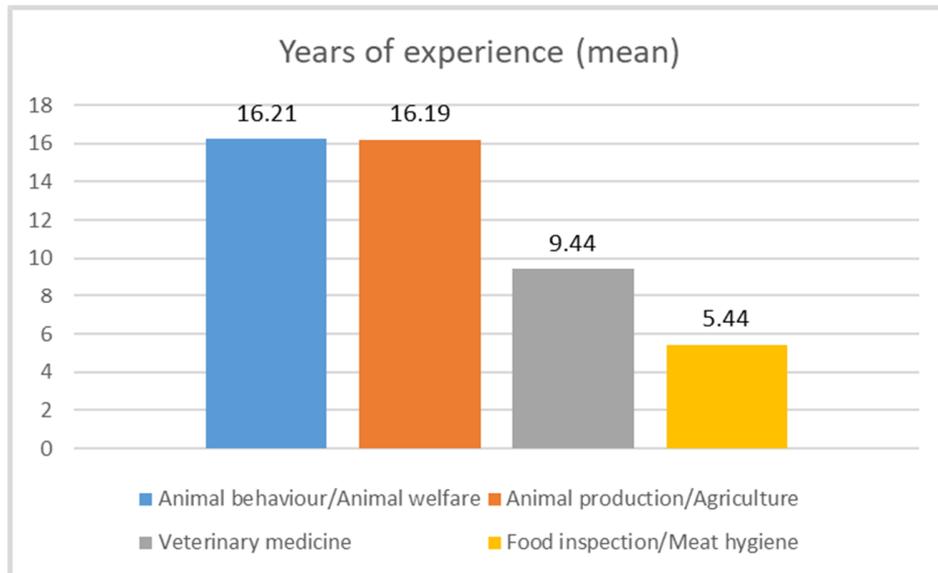
WORK BACKGROUND OF PARTICIPANTS:





OTHER BACKGROUNDS: NGO, INDUSTRY ASSOCIATION, TECHNICAL ASSOCIATION, VETERINARY ASSOCIATION

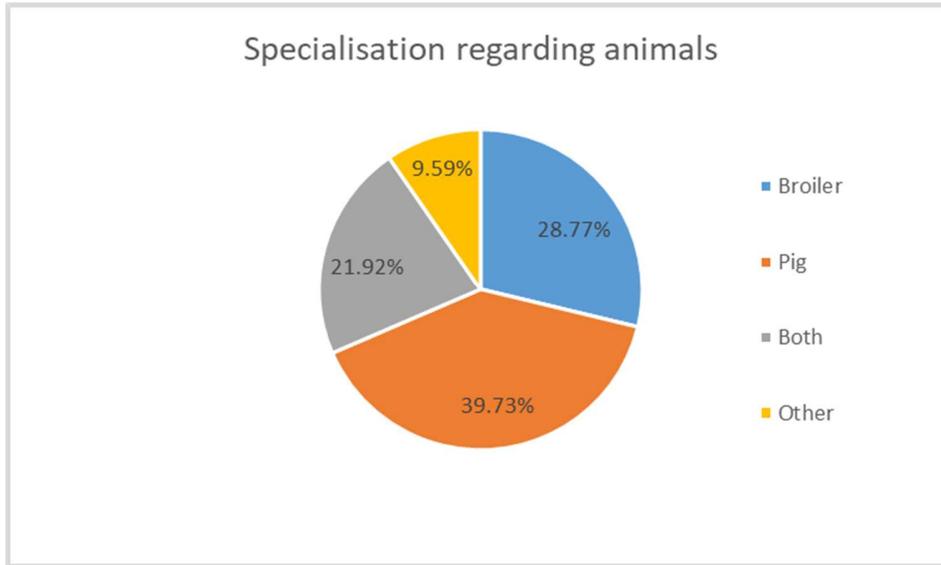
MEAN EXPERIENCE IN THE GIVEN FIELDS:



OTHER FIELDS OF EXPERIENCE: DATA ANALYSIS, ANIMAL WELFARE LAW, AI, MICROBIOLOGY, FOOD SAFETY/SCIENCE/TECHNOLOGY, PLF, STATISTICS, ETHICS, ARTIFICIAL INSEMINATION, ANIMAL NUTRITION, R&D, EMISSIONS, ENVIRONMENTAL PROTECTION, EDUCATION...



SPECIALISATION:



OTHER ANIMALS PARTICIPANTS SPECIALISED IN: CATTLE, LAYING HENS, ALL FARM ANIMALS.
SOME PARTICIPANTS ALSO STATED NOT BEING SPECIALISED.



EVALUATION OF BEST PRACTICES REGARDING ANIMAL WELFARE INDICATORS (AWI) – PIGS

COLOUR-CODING:

■ : > 70% MEAN AGREEMENT ■ : > 50% AND < 70% MEAN AGREEMENT ■ : < 50% MEAN AGREEMENT

TAIL/EAR LESIONS (N= 48)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
Good health status	79.5	15	100
Enough feeding space per pig (preferably 1:1)	78.77	10	100
Good barn climate/air quality (e.g. little ammonia, optimal air flow, etc.)	78.58	13	100
Regular refilling of manipulable or bedding material on farm (so it doesn't run out)	75.96	5	100
Good feed quality (e.g. no mycotoxins, balanced)	74.65	5	100
Good feeding management (e.g. ad libitum, short feeding intervals)	74.64	12	100
Provision of straw as bedding on farm	71.17	1	100
Structuring of the pen (lying, feeding, dunging area)	70.62	10	100
Organic manipulable material on farm except straw (wood, sisal ropes, pressed molasses, etc.)	68.65	1	100
Provision of straw or hay as enrichment (in racks, feeders, etc.)	68.26	1	100
Lowering stocking density below EU legislation/more space allowance per pig	67.7	5	100
Genetic aspects (genetics that are preferred in countries without tail docking)	64.34	6	100
Keeping litter mates together from birth to the fattening/finishing period (no mixing)	63.27	1	100
As little regrouping/mixing of animals on farm as possible	62.46	1	100
Pens with outdoor area	60.09	1	100
No storage of manure in the stable (under the slatted floor)	56.5	1	100
Stocking density on farm according to EU legislation	51.07	0	100
Very small group size on farm (similar to litter size: 10 - 16 pigs)	45.04	0	100
Non-organic manipulable material on farm (metal chains, chewable plastic material, etc.)	44.02	0	93
Small group size on farm (<40 pigs per group)	40.93	0	100
Bigger group size on farm (>40 pigs per group)	28.24	0	92

COMMENTS ON MISSING BEST PRACTICES:

<i>Identification and separation of biters and victims (5x)</i>
<i>Solid floor (at least 75%) (4x)</i>
<i>Increasing weaning age to 40 days/ 4-5 weeks (4x)</i>
<i>Close monitoring/surveillance of tail/ear biting and immediate intervention (emergency enrichment, separation, applying hooftar etc.) (3x)</i>
<i>Selecting for decreased litter size (max. 14 piglets) (3x)</i>
<i>Providing straw as well as roughage (3x)</i>
<i>400g of straw per pig per day (3x)</i>
<i>Availability of drinking nipples, non-competitive access (2x)</i>
<i>Training of farmers to detect early signs of tail biting (2x)</i>
<i>Not practising painful procedures on piglets (e.g. teeth reduction, tail docking)</i>
<i>Good early life condition and good transition from weaning</i>
<i>Spraying pheromones or odour masking while mixing pigs</i>
<i>Runt management</i>
<i>Immunocastration of males</i>



SKIN LESIONS (N=47)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
As little regrouping/mixing of animals on farm as possible	82.96	20	100
Keeping littermates together from birth to fattening/finishing period (no mixing)	82.7	10	100
Gentle animal handling on farm	78.18	19	100
Gentle animal handling on transport	78.16	10	100
Little regrouping/mixing of animals in lairage area at the slaughterhouse	76.15	20	100
Gentle animal handling at the slaughterhouse	75.93	0	100
Little regrouping/mixing of animals for transport	72.79	10	100
Lowering stocking density on farm below EU legislation/more space allowance per pig	68.39	1	100
Short lairage stays at the slaughterhouse	62.47	0	100
Short transport duration (< 9h)	61.84	3	100
Structuring of pens (lying, feeding, dunging area)	60.98	1	100
Regular refilling of manipulable or bedding material on farm (no running out)	60.72	1	100
Stocking density on transport according to EU legislation	59.98	6	100
Provision of straw as bedding on farm	59.04	1	100
Provision of straw or hay on farm as enrichment (in racks, feeders, etc.)	57.85	1	100
Organic manipulable material on farm except straw (wood, sisal ropes, pressed molasses, etc.)	55.24	1	100
Very small group size on farm (similar to litter size: 10 - 16 pigs)	54.21	1	100
Stocking density on farm according to EU legislation	53.61	0	100
Small group size on farm (< 40 pigs per group)	42.67	1	100
Non-organic manipulable material on farm (metal chains, chewable plastic material, etc.)	39.33	0	90
Bigger group size on farm (> 40 pigs per group)	32.31	0	100

COMMENTS ON MISSING BEST PRACTICES:

<i>Solid floor (at least 75%) (3x)</i>
<i>Increasing weaning age to 40 days (3x)</i>
<i>Selecting for decreased litter size (max. 14 piglets) (3x)</i>
<i>Providing straw as well as roughage (3x)</i>
<i>400g of straw per pig per day (3x)</i>
<i>Early mixing from young age as piglets</i>
<i>Caretaker taking time to observe animals</i>
<i>Good bedding during transport</i>
<i>Feeding/water around transport</i>
<i>Lower stocking density for transport & lower transport duration</i>
<i>Driving conditions (smooth driving)</i>
<i>Castration</i>
<i>Runt management</i>
<i>No sharp edges (farm, transport, slaughterhouse)</i>



LUNG LESIONS (N=46)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
Good ventilation in stables	90.15	50	100
Good barn climate (e.g. light, air, temperature)	90.11	57	100
All-in-all-out system (cleaning and disinfection after each batch)	82.52	0	100
Ammonia level < 20ppm	80.55	13	100
Fresh air (outdoor areas)	71.89	1	100
Regular drainage/slurry removal	70.51	1	100
No storage of manure in the stable (under the slatted floor)	64.58	0	100
Lowering stocking density on farm below EU legislation/more space allowance per pig	64.28	1	100
Stocking density on farm according to EU legislation	55.95	0	100
Fully slatted floor	35.75	0	90

COMMENTS ON MISSING BEST PRACTICES:

<i>Preventative strategies like vaccinations (6x)</i>
<i>Good health status (interventions when needed, spf free) (5x)</i>
<i>Solid floor (at least 75%) (3x)</i>
<i>Increasing weaning age to 40 days (3x)</i>
<i>Selecting for decreased litter size (max. 14 piglets) (3x)</i>
<i>Providing straw as well as roughage (3x)</i>
<i>400g of straw per pig per day (3x)</i>
<i>Excellent hygiene and cleaning</i>
<i>Dust reduction</i>
<i>Optimal environment (including air temperature)</i>
<i>Closed farm or good cooperation between farrowing and finishing farm</i>
<i>Health classification of farms</i>
<i>Biosecurity</i>
<i>Referring to all-in-all-out system: no mixing of batches</i>
<i>Medical treatment record</i>



BURSITIS (N=42)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
Bedding (e.g. straw)	76.65	1	100
Good floor condition (e.g. no breakage, non-slippery)	76.48	14	100
Soft or soil floors, no slats	72.28	1	100
Rubber floor mats	66.79	1	100
When using slats: plastic rather than concrete or metal ones	58.11	1	95
Non-slatted concrete floor	50.14	1	99

COMMENTS ON MISSING BEST PRACTICES:

<i>Solid floor (at least 75%) (3x)</i>
<i>Increasing weaning age to 40 days (3x)</i>
<i>Selecting for decreased litter size (max. 14 piglets) (3x)</i>
<i>Providing straw as well as roughage (3x)</i>
<i>400g of straw per pig per day (3x)</i>
<i>Good drainage in order to avoid wet slurry</i>
<i>Calcium:Phosphor ratio in feed</i>
<i>Free farrowing</i>
<i>Environment design in order to avoid trauma (drinkers, feeders, etc.)</i>
<i>Dry laying area</i>
<i>Structuring pens</i>
<i>Genetic resilience</i>



EVALUATION OF BEST PRACTICES REGARDING ANIMAL WELFARE INDICATORS (AWI) – BROILERS

COLOUR-CODING:

■ : > 70% MEAN AGREEMENT ■ : > 50% AND < 70% MEAN AGREEMENT ■ : < 50% MEAN AGREEMENT

FOOTPAD DERMATITIS/HOCK BURN (N=37)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
Good ventilation in stables (e.g. ventilation rate)	80.42	20	100
Height of waterline adjusted to animal size	74.24	4	100
Regular replenishment/replacement of litter (esp. in risk areas)	71.38	15	100
Litter management (e.g. raking, windrowing, tilling, etc.)	70.97	5	100
Age appropriate adjustment of water pressure	69.94	5	100
Adding/removing litter layers	67.35	13	100
Slow growing breeds	66.91	0	100
Preheating stable/floor prior to arrival of animals	63.27	3	100
Small cups or water nipples instead of bell drinkers	62.78	6	100
Lowering stocking density on farm below EU legislation/more space allowance per broiler	62.22	2	100
Litter other than straw (e.g. pine shavings, wood shavings, pellets, etc.)	60.55	0	99
Avoiding high salt content in feed	53.35	1	100
Litter amendments (e.g. acidifiers)	48.89	0	100
Feed additives to stabilise gut microbiota	47.13	4	100
Feed additives (e.g. biotin, zinc, vitamin D3, etc.)	46.4	3	100
Black soldier fly larvae in feed	38.95	0	100

COMMENTS ON MISSING BEST PRACTICES:

<i>Attention to buffering capacity of feed and water in first week of age</i>
<i>Control digestibility of feed (Na, K, crude protein)</i>
<i>Being cautious with feeding of soy beans (wet litter)</i>
<i>Lower crude protein content in feed</i>
<i>Good feed formulation to avoid intestinal issues</i>
<i>Addition of natural light (5x)</i>
<i>At least 50lux of light (3x)</i>
<i>Light distribution</i>
<i>Controlling humidity in stable</i>
<i>Max. stocking density of 11kg/m² (EFSA) (3x)</i>
<i>No thinning (3x)</i>
<i>Environmental enrichment (perches, bales, exploratory enrichment) including it's renewal (2x)</i>
<i>At least 2m of usable perch space & 2 pecking substrates per 1,000 birds (3x)</i>
<i>Floor heating to keep litter dry</i>
<i>Litter layer thickness max. 5cm</i>
<i>Adding zeolite to litter</i>
<i>Peat as bedding material</i>
<i>No cages or multi-tier systems (3x)</i>
<i>CAS instead of electrical water bath stunning</i>
<i>On farm hatching</i>
<i>Chick incubation and transport practices</i>



CATCHING DAMAGE (N=36)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
Careful handling	94.64	50	100
Training provided to handling personnel	84.89	10	100
Good condition of crates (e.g. no breakage, easy to close)	82.14	10	100
Handler experience	82.09	10	100
Avoiding animals hitting the edge of the crate	80.06	20	100
Low light intensity / blue or red light during catching	76.24	30	100
Not picking broilers up by their wings or legs	73.7	2	100
Keeping the catching duration as short as possible	67.41	5	100
Method of catching (manual vs. mechanical)	63.97	0	100
Carrying broilers upright	62.44	0	100

COMMENTS ON MISSING BEST PRACTICES:

<i>Crates or drawers close to birds (2x)</i>
<i>Using containers instead of crates</i>
<i>Chicken harvester instead of manual catching</i>
<i>Adapt number of people and available material to farm size</i>
<i>While catching: avoid hurrying as well as long (walking) routes</i>
<i>Communication with farmer (goal setting rather than telling them what to do)</i>
<i>No thinning</i>
<i>Genetics: avoiding breeds that are easily frightened</i>



DEAD ON ARRIVAL (N=37)

Best Practice	Percent of agreement (mean)	Minimum	Maximum
Good health status	89.68	15	100
Ensuring good ventilation on transport	87.47	14	100
Catching and transport during cooler parts of the day	84.57	14	100
Temperature control (all production stages) to avoid heat stress	83.92	0	100
Lowering stocking density in crates during hot weather	83.03	7	100
Short transport time and distance	76.89	6	100
Short lairage stays at the slaughterhouse	69.65	5	100
Manual catching instead of mechanically	38.93	0	100

COMMENTS ON MISSING BEST PRACTICES:

<i>Driving style of truck driver</i>
<i>Qualified truck drivers</i>
<i>Examining broilers regarding cachexia, severe dehydration and other signs of serious illness or injury prior to transport</i>
<i>Plumage condition (coverage, wetness) prior to transport</i>
<i>Duration of water and feed withdrawal prior to transport</i>
<i>Avoiding cold stress (higher stocking densities in cold periods, avoiding extremely cold temperatures)</i>
<i>Cooling of birds in lairage area</i>
<i>Training of all staff</i>
<i>Climate controlled vehicles</i>
<i>No fast growing hybrids/slower growing breeds (2x)</i>
<i>Deloading and emptying of crate/containers</i>



EVALUATION OF REQUIREMENTS FOR AUTOMATED MONITORING AT THE SLAUGHTERHOUSE

N=70

COLOUR-CODING:

■ : > 80% MEAN AGREEMENT ■ : < 80% MEAN AGREEMENT

Requirement	Percent of agreement (mean)	Minimum	Maximum
Resistant against environmental influence (e.g. humidity, cleaning agents, water)	89.99	27	100
Reliable functioning (esp. under slaughterhouse conditions)	89.41	30	100
Good validation by experts before installation (output validation and welfare relevance validation)	87.29	40	100
Installation in an area where findings are relevant	86.51	10	100
Easy to clean and disinfect	85.52	12	100
Able to detect interference factors (e.g. animals that are not in the correct position, dirt on lense)	84.69	30	100
User friendly	82.37	10	100
Technical support available	81.68	21	100
Easy maintenance and rebooting	77.7	14	100
Breakdown of findings that is easy to understand (e.g. colour-coded)	75.37	10	100
Categorisation of findings (e.g. mild - moderate - severe)	75.27	10	100
Easy to install (e.g. can be integrated into existing IT-system)	74.71	13	100
Reliable data storage, allocated to each animal	74.7	4	100
Alarm system for outage	72.58	10	100
Alarm system for severe findings	71.66	10	100

COMMENTS ON MISSING REQUIREMENTS:

<i>Validation vs. Human scoring (because of 2D view compared to 3D problem)</i>
<i>Thorough manual assessment of carcasses following a clear and objective protocol since video cameras are missing out on internal issues like myopathies</i>
<i>Clear thresholds that state point of necessary interventions</i>
<i>Respect staff's right to privacy where applicable</i>
<i>Standardised and easy to compare to data of other abattoirs</i>
<i>Affordable (not a productive investment) (2x)</i>
<i>Staff training on how to use the equipment & protocol/service available for staff (2x)</i>
<i>Adaptable to different settings and comparable between countries and systems</i>
<i>Official veterinarian present at all stages (unloading to slaughtering) (3x)</i>
<i>Keeping records from automated monitoring for at least 1 year (3x)</i>
<i>Using AI to better detect problems (3x)</i>
<i>Infringements for non-compliance</i>
<i>Standardisation between different systems/Uniformity</i>
<i>Easy access to results for official veterinarians</i>
<i>Installation of replacement system in case of outage</i>
<i>Data sharing/open data agreement in order to avoid monopolisation</i>
<i>Integrated system with on-farm data collection</i>

SUMMARY

THE SURVEY “IDENTIFYING BEST PRACTICES TO IMPROVE ANIMAL WELFARE FOR BROILER CHICKENS AND FATTENING PIGS” RECEIVED 130 ANSWERS IN TOTAL OF WHICH 73 WERE COMPLETE AND COULD BE EVALUATED. THERE WAS A STRONG PARTICIPATION OF EXTERNAL EXPERTS WITH NEARLY 44% OF PARTICIPANTS NOT BEING INVOLVED IN THE aWISH-PROJECT. RESEARCH/ACADEMIA WAS THE MOST REPRESENTED BACKGROUND (58.90%).

THE EVALUATION OF BEST PRACTICES SHOWED A BIG DISTRIBUTION OF INDIVIDUAL RESPONSES. MOST MEASURES REVEALED A RANGE BETWEEN 0 AND 100%.

FOR EACH ANIMAL WELFARE INDICATOR A GREAT NUMBER OF ADDITIONAL SUGGESTIONS WERE PROPOSED, RESULTING IN THE IDENTIFICATION OF MISSING AREAS AND MEASURES.

IN PIGS, MEASURES REGARDING FEED, BARN CLIMATE AND BEDDING AS WELL AS GENTLE HANDLING AND A STABLE GROUP COMPOSITION RECEIVED GOOD FEEDBACK. ALL PROPOSED GROUP SIZES WERE SCORED BELOW 50% INDICATING THAT THE GROUP SIZE HARDLY AFFECTS THE OCCURRENCE OF TAIL LESIONS OR SKIN INJURIES. HOWEVER, THE PARTICIPANTS’ RESPONSES COULD HAVE BEEN INFLUENCED BY WORDING, SINCE A CLEAR DEFINITION FOR GROUP SIZE WAS MISSING (I.E. GROUP SIZE IN RELATION TO STOCKING DENSITY).

IN BROILERS, LITTER MANAGEMENT, GENTLE HANDLING AND IMPROVED VENTILATION WERE THE TOP SCORED MEASURES. THERE WAS ALSO A CONSIDERABLE AMOUNT OF COMMENTS SUGGESTING NATURAL LIGHT AS WELL AS ENRICHMENT LIKE PERCHES AND STRAW BALES WHICH WILL BE TAKEN INTO ACCOUNT FOR THE DEVELOPMENT OF THE BEST PRACTICE GUIDES.

ALL PROPOSED REQUIREMENTS FOR AN AUTOMATED MONITORING AT THE SLAUGHTERHOUSE RECEIVED A POSITIVE FEEDBACK WITH NO MEAN SCORE BELOW 70%. NEVERTHELESS, THERE WAS STILL A BIG RANGE IN INDIVIDUAL ANSWERS.

THIS TOPIC ALSO RECEIVED PLENTY OF COMMENTS WITH FURTHER SUGGESTIONS THAT CAN BE INCLUDED IN THE GUIDES.

WE WOULD LIKE TO THANK ALL PARTICIPANTS FOR THEIR INPUT!

THE INFORMATION WE HAVE GATHERED FROM THIS SURVEY WILL BE USED IN THE DEVELOPMENT OF THE BEST PRACTICE GUIDES (SEE WORK PACKAGE 4, TASK 4).

- NICOLE KEMPER, MICHAELA FELS & MAITE JACHENS
(TEAM TIHO)

