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Extreme breeds in pigs: Why breeding strategies need to be refocused

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Abstract: "Qualzucht" directly translates into"extreme breeds"- a term that already reveals the whole problem. In companion animal breeding the so called "extreme breeds" are mostly popular species, like Pugs or French Bulldogs. The term "extreme breeds" is widely accepted in this area, basing on studies regarding e.g. health issues resulting of the underlying breeding strategies. Other terms used in this context are "hyper types" or "torture breeding". All these words have in common that they are associated in a negative way. In farm animals however, the used wording is "high-performance-breeding", not "torture breeding". What is the difference, what is criticized from an animal welfare point of view and what might be distinct examples of extreme breeding in farm animals, especially in pigs? This literature review gives an overview of discussions regarding torture breeding in fattening pigs and sows and shows, why different strategies need to be taken into account.

I. Introduction

Expert opinions and reports about torture breeding in companion animals, especially in dogs and cats, are frequent content of discussions. In farm animals on the contrary, people still talk about high-performance breeding, instead of the in most cases appropriate terms agony or torture breeding. So where is the threshold? Can we really act on the assumption that the breeding strategies e.g. in pigs do not cause the offspring pain, suffering or harm? The German Animal Welfare Act (Tierschutzgesetz) defines in §11b that torture breeding starts where it must be assumed that breeding strategies or bioengineering lead to genetic determined pain, suffering or harm for the offspring or the animal itself. The assumption that this applies to farm animals in some cases as well seems likely from an animal welfare point of view, regarding that high-performance has been ranked higher than fitness- and health parameters for a long time. This review article establishes the term "torture breeding" for the species of pigs, as it can be found in conventional farming systems, on a literature basis.

II. Review

According to the BMEL's interpretation of §11b of the German Animal Welfare Act which prohibits torturebreeding, one speaks of agony breeding, if a vertebrate is caused pain, suffering or harm through genetically determined features, morphological or physiological changes or behavioural disorders [1]. According to the German Animal Welfare Act, paragraph 3 number 1 also bans demanding performances from animals, which obviously exceed its strength [2]. Anyhow, the aims and strategies of high-performance breeding (which are highest performance, mass production, improvements in productivity and maximizing profit) demand

highest requirements from the animals. Resulting from these breeding strategies is the so called performance-related health disorder [3]. This describes a katabolic phenomenon and pathological processes, both of which are linked to high performance and connected breeding strategies. Also common terms are "production diseases" [4] and "production related disorders" [5]. Bergmann (1992) [6] differs in primary performance-related health disorders (the problem directly resulting from the breeding strategy itself) and secondary disorders. The selection of abnormalities as in blue and white Belgians, would count for a primary one. Typical performance-related disorders are, as described in literature, reproduction disorders, udder- and claw-infections, lameness or pathological heart- and circulation-problems and so forth. But also behavioural disorders are apparent in high-performance-breeds. All those problems have to be graded as highly relevant from an animal welfare point of view. They are often linked to pain and suffering and strain animals and their health and welfare enormously [7]. Nowadays these "disorders" are considered as every-day problems and their treatment takes place in veterinary medicine studies.

A counterpart is the so called "Erhaltungszucht", a German term describing conservational breeding strategies. It emphasizes general fitness, genetic diversity, sustainability and multi-use-breeds [8], conserving geno- and phenotypes of the underlying breeds. Multi-use breeds are seen as insufficiently productive in high-performance breeding, the main reason why those breeds are nowadays largely threatened with exstinction- for example almost all German domestic pig breeds [9].

High-performance and torture breeding in pigs have already been examined in literature, with the most popular examples being the number of weaned piglets per sow and osteochondrosis and myopathies in fattening pigs. The number of piglets per litter [10] and weaned piglets per sow and year are the most important economical parameters in pig production, which was focused on over decades. Through shortened suckling periods and breeder's interfering with litter sizes, the economical parameters were constantly increased. Parallel to increasing numbers of live born piglets the number of dead born piglets increased as well though [11]. Also the shortened suckling period leads to increased health-stress for the sows, because time for involution of the uterus is shortened as well. Shorter suckling periods than 21 days are not sensible, as the involution of the uterus needs at least 18 days. Therefore EU-regulations banned suckling periods of less than 21 days for a good reason [12]. Short suckling periods favour the development of reproduction-disorders and can reduce life expectancy of sows

[13]. Piglets weaned earlier are described as frail because of lower weight at weaning and the younger age. Another problem is that sows give birth to more piglets per litter, than they have teats to suckle those. Therefore the redundant piglets have to be raised with natural or artificial foster sows or any other complex management. A direct consequence to the massive litter size is however, that because of limited uterus capacity, birth weight of piglets is increasingly inhomogeneous and considerably lower. This again increases piglet losses due to hypothermia, hypoglycaemia and crushing [14], distinctly: While breeding towards higher number of piglets per litter, the capacity of the uterus stayed widely unnoticed. That means, more embryos nest in the uterus than physiologically reasonable and therefore cannot develop homogenously and adequately. Also the nutrient-supply in the uterus is limited, which leads to prenatal competition between the piglets. The direct result is a higher amount on underweight and faint piglets, born with low energy reserves and therefore a higher risk of dying of hypothermia and hypoglycaemia or being crushed. Studies showed that vitality of the piglets directly correlates with the number of piglets per litter. In brief, decreasing losses in suckling piglets, which has a clear relevance from an animal welfare point of view, can only be reached genetically through breeding towards smaller litter sizes [15].
Regarding fattening pigs breeding strategies for a long time focused on a high lean meat percentage. This resulted in myopathies, also called sensitivity towards stress. This disease complex includes degeneration of muscles, disorders in the heart- and circulation-system, possibly leading to the death of the animals. The responsible defective gene resulted directly in breeding for higher lean meat percentages and is prominent in breeds with high growth rates and a high abundance of meat [16]. Those breeds, e.g. Pietrain, especially tend to develop myopathies [17],[18],[19],[20]. Regardless Pietrain pigs are the most common breed used on the boar's side for the production of fattening pigs [21]. The heavy muscling does not result of more, but thicker muscle

fibres with a higher calibre of muscle cells [22]. Early studies showed a prevalence of 65-100% regarding sensitivity towards stress, with no other breed combining such high lean meat percentages with such high stress sensitivity. By now, so called MHS-tests are used to find out NN- and NP-animals for breeding [23]. The abbreviation "MHS" stands for malignant hyperthermia syndrome and characterizes the underlying defective gene [24],[25],[26]. MHS positive pigs show a massively higher susceptibility to sickness and a higher mortality [27],[28]. Fujii et al. (1991) were the first authors to identify a mutation in the so called Ryanodin-receptor-gene, which is said to be causing the myopathy [29]. These results were confirmed by different authors and are widely acknowledged by now. To provoke the MHS certain triggers are needed [30],[31], such as stress due to transportation, regrouping, fights for hierarchy, fixation of sows, or birth [32]. Bickhardt (1996; 1997; 1998) stated, that hybrid pigs which were bred for high lean meat percentages and high growth rate can possibly react with a deadly myopathy to normal, physiological stressors [33],[34],[35]. According to Wendt (2004) the pathomorphological disorders regarding the myopathy in pigs are ranged as relevant welfare problems, especially regarding §11b of the Protection of Animals Act [36]. Wendt et al. (2000) stated that pigs carrying the mutation in their genome are certainly caused harm, pain and suffering, which washes away any doubt as to this sickness being massively painful and, as the author states further on, shows that animals are widely unable to cope with their housing and production systems, as even physiological stressors can lead to deadly myopathies [37]. Matzke et al. (1985) also conclude that selective breeding towards high meat percentage has lead to diminution of adaptability regarding environmental factors [38].

The second problem regarding breeding strategies in pig production is high growth rates in fattening pigs leading to pathologically degenerated joints due to osteochondrosis. The juvenile skeleton cannot cope with the high growth rate of the musculature, authors describing prevalences of 55-90% [39]. Osteochondrosis counts as main cause for lameness in pigs [40],[41] and is described mostly in fast growing pigs [42]. The connection of the disorder and the high growth rate as well as high meat percentage is widely accepted by now, as literature proofs [43],[44],[45],[46]. Bickhardt (1998) states that high growth rates and high meat gain are suggested as the main reason for osteochondrosis [47]. Even the German federal government accepts that osteochondrosis in pig production is an undesirable development resulting from selective breeding [48]. In spite of scientific knowledge about the genetic disposition of osteochondrosis [49],[50],[51], it is a so called multifactorial disorder [52],[53]. Clinical symptoms develop in four to six months old pigs and can range from indefinite leg disorders to massive lameness [54]. Dewey (2006) described the clinical signs as chronical and progressive lameness [55]. Affected animals develop increasing disorders in their movement [56]. They show pain while standing up, move around very stiffly [57], have massive weaknesses in their hind limbs and abnormal disorders in their posture [58]. It is obvious that osteochondrosis has a negative effect on the welfare of the animals [59]. Wendt (2004) expects pain and harm for the affected pigs, which is relevant in the regard of the Protection of Animals Act [60]. Other authors confirm that osteochondrosis has to be classified as painful [61],[62],[63]. Bickhardt (1997) and Wendt et al. (2001) call the osteochrondrosis a painful sickness of the joints and a massive infringement of the idea of animal welfare [64],[65]. Herzog (2001) suggested to start genetic selection to diminish osteochondrosis, because selection on daily weight gain transgresses §11b [66]. Pursuing genetic selection as practiced until now could even worsen the situation [67].

III. Conclusion

In all faming animals we can distinguish similar aspects: Tibial dyschondroplasia in poultry, osteochondrosis in pigs and cattle, ruptures of the aorta and sudden heart failure in poultry and myopathies in line with circulation-disorders in pigs. In all species we repeatedly find similar disorders resulting out of the same basic problems: genetic selection towards high and fast weight gain and generally high performance, leading to an overload of the skeleton and the inner organs. Steadily increasing performance parameters in animals by means of breeding strategies affects health and fitness of the animals in a negative manner. Certain disorders and diseases are direct results of the high productivity. This is widely accepted even though the Animal Welfare Act has been prohibiting torture breeding since 1986. Sadly the enforcement of §11b regarding breeding strategies of farming animals has not yet happened [68]. Stricter enforcement of §11b in Germany and Europe in general should be aimed at from an animal welfare point of view. Also discussions about more animal welfare in modern farming

systems need to refocus and from now on include breeding strategies as already happening in other countries. Austria for example included piglets' vitality scores in their breeding agenda, because the piglets' fitness and vitality corresponds directly to litter size and birth weight, as scientists showed [69]. The more the piglets weigh at birth, the higher the score, therefore showing the genetic link between litter size and piglet losses. Using the vitality score for genetic selection, could reduce piglet losses on a long term. A Norwegian breeding company for example, focuses on robustness, including e.g. vitality and stability of extremities. Also mothering ability in sows, homogenous litters and the social skills of pigs are important factors for their selection. All of which are providing good results. What does that show us? Germany and other countries need to catch up! Breeding towards even higher litter sizes or thicker muscle fibres is simply wrong, not only from an animal welfare point of view. Fitness, robustness and high vitality in suckling piglets must be the goals for modern farming and breeding, especially in terms of a potential future with free farrowing systems. It is important to draw attention to this important topic and change the focus of breeding strategies for more animal welfare in modern farming in the future.

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