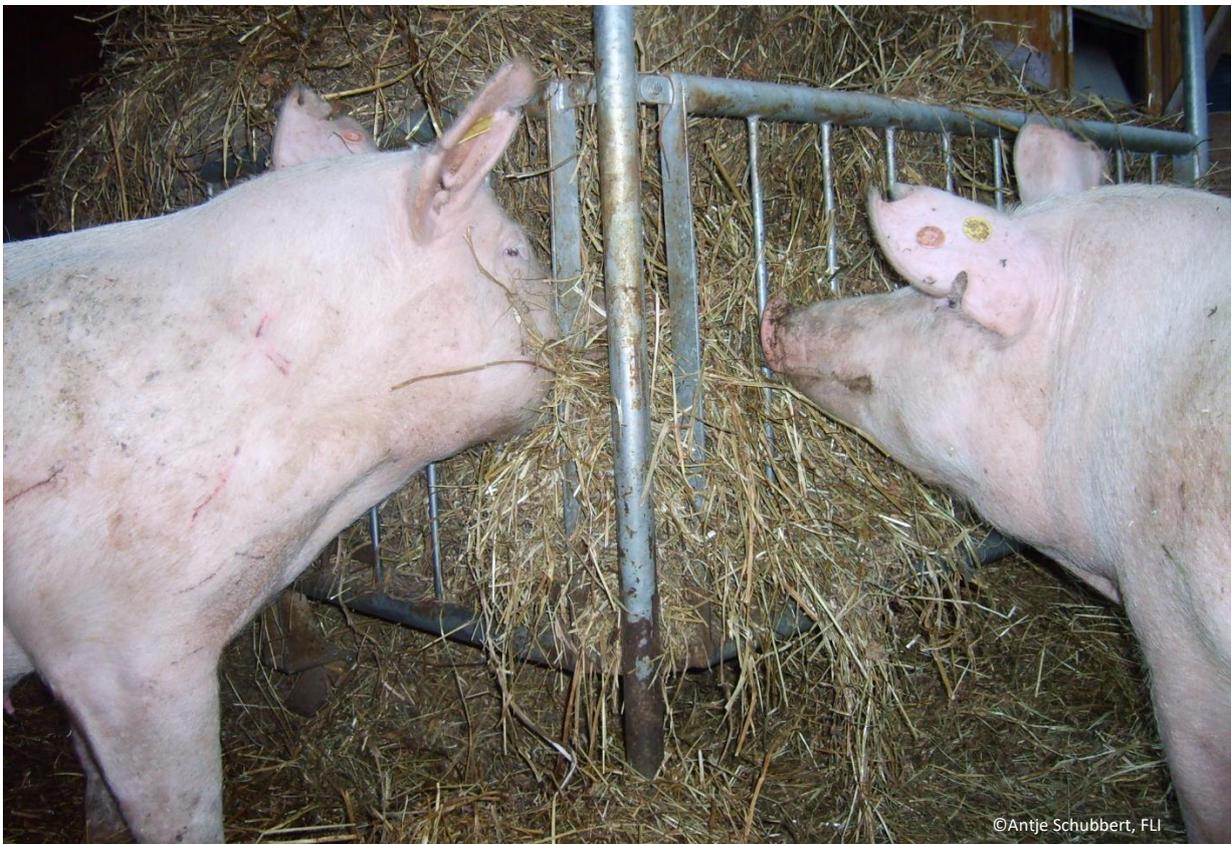


Enrichment materials for sows during pregnancy - Short review

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Enrichment materials for sows during pregnancy - Short review

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This short review provides background on the behavioural needs of sows in terms of feeding and exploring and describes different types of enrichment materials. Furthermore, it highlights different methods to offer enrichment material to sows during pregnancy.

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1 General introduction

This short review provides background on the behavioural needs of sows in terms of feeding and exploring and describes different types of enrichment materials. Furthermore, it highlights different methods to offer enrichment material to sows during pregnancy. However, compared to weaners and growing pigs (Greenwood et al., 2018) there are only few scientific publications on effective enrichment for sows (van de Weerd & Ison, 2019). The knowledge compiled in this short review is related to the EURCAW-Pigs Reviews [“Hunger induced behaviours: aggression and stereotypies”](#), [“Group housing and mixing of sows”](#) and [“Alternatives to stalls for sows after weaning and in early pregnancy”](#).

2 Background

In commercial housing, pregnant sows are fed restricted with one or two meals per day to prevent excessive weight gain in pregnancy, which may cause problems around farrowing (Meunier-Salaün et al., 2001). However, restrictively fed sows are often not satiated (Danielsen & Vestergaard, 2001; Meunier-Salaün et al., 2001) and still show a high feeding motivation, which is a sign of hunger and may provoke stereotypies (Lawrence & Terlouw, 1993; Marchant-Forde, 2009). Thus, pregnant sows and gilts must be given a sufficient quantity of bulky or high-fibre food in addition to a high-energy food in order to satisfy their hunger and given their need to chew [Council Directive 2008/120/EC, Article 3(7)].

Feed intake is accomplished with foraging performed by sows for 40-70 % of the day in semi-natural environments (Gustafsson et al., 1999; Jensen, 2002). Pigs perform exploratory behaviour also at objects of the housing environment (e.g. chains) even when a biological stimulus (e.g. organic substrate or food) is absent. This indicates that exploratory behaviour is also intrinsically motivated (Wood-Gush & Vestergaard, 1989). According to EU legislation, sows must have permanent access “to a sufficient quantity of material to enable proper investigation and manipulation activities, such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such, which does not compromise the health of the animals” [Article 3(5) and Annex I, Chapter I, Point 4].

3 Enrichment materials

Research on effective enrichment for pregnant sows is scarce and their motivation to interact with enrichment differs from that of growing pigs fed *ad libitum* (van de Weerd & Ison, 2019). For instance, restricted fed sows are mainly motivated to forage rather than to explore, because for most of the day they are not satiated by feeding (Day et al., 1998; Lawrence & Illius, 1989). However, this does not mean that exploration material is not important, but materials allowing sows both to forage and to explore such as silage should be preferred. The use of enrichment material may be affected by sow’s social status (Elmore et al., 2011; Roy et al., 2019). For instance, dominant sows spent more time with enrichment and may prevent subordinate sows from using enrichment (Elmore et al., 2011). Subordinate sows then may shift to times at which the enrichment is less used by others (Elmore et al., 2011) or they can deal with enrichment while dominant sows occupy an electronic feeding station (Roy et al., 2019).

Enrichment material should remain attractive to the sows (e.g. regularly replenished) and supplemented in sufficient quantities, allowing all sows simultaneous access. Otherwise, enrichment will become a limited resource and may provoke agonistic interactions. Furthermore, substrates should be delivered regularly during the day in order to minimize times of absence, allowing subordinate sows to use enrichment at non-peak times (Roy et al., 2019). However, often economic factors determine the choice of enrichment in commercial housings rather than the animals' interests (Greenwood et al., 2018). According to European Council Directive 2008/120/EC enrichments should be **edible, chewable, investigable and manipulable**. Enrichment is effective for pigs when it addresses the interest of exploration and feeding (Day et al., 1998).

4 Object-based enrichment

Object-based enrichment is often provided in housing systems with slatted floors, where the slurry system does not allow the removal of solids (EFSA, 2007; Roy et al., 2019). Metal chains, plastic containers and pieces of wood are mainly used as objects (Pierozan et al., 2020). However, these objects have no long-term effects because they provide no novelty over time and the animals quickly habituate and lose interest (Day et al., 1998). In some EU member states (e.g. Denmark, Germany, The Netherlands), the sole provision of metal chains is not allowed by national legislation. Sows prefer ropes in comparison to objects of rubber, wood and plastic (Greenwood et al., 2018; Horback et al., 2016). Ropes contain organic fibres what makes them more interesting for sows due to their destructibility (Horback et al., 2016). Destructible objects remain novel as object, because they are constantly changing and stimulate exploration (Day et al., 2002; Studnitz et al., 2007). Novelty can also be maintained, when objects are provided in alternating order or with an acoustic signal (e.g. bell, whistle) (Roy et al., 2019). An effective enrichment addresses the motivation for exploration and feeding (Day et al., 1998). Young et al. (1994) deployed a so called "Edinburgh football" as an enrichment object for restrictive fed sows, which delivered feed in form of meal, when the animal is pushing the ball with the snout while walking. The sows used the ball, when it contains food, but showed less motivation when no food was provided within the ball.

5 Substrate-based enrichment

Substrate-based enrichments fulfil the need of feed-restricted sows for appetitive behaviour and alleviate some of the behavioural problems related to lack of satiety (Jensen et al., 2015; Studnitz et al., 2007). In addition, dietary fibre is recommended by the World Organisation for Animal Health to prevent gastric ulcers, which is a welfare issue in nearly 50 % of culled sows (Cybulski et al., 2021). Furthermore, substrates contain edible parts, which are the most effective way to prevent stereotypies in sows (EFSA, 2014; Spooler et al., 1995). Sows also value substrates that simultaneously elicited different foraging behaviours like rooting, grazing, biting and chewing (Moser et al., 2019).

In addition, roughages such as straw, hay or other silages allow sows to root, which makes these substrates an effective enrichment material (Day et al., 1998). Roughages will be valued by sows, when it has a low dry matter content, a low NDF content and a high crude protein content (Aubé et al., 2019). Nowadays, pregnant sows are still fed amounts of feed that are far below their intake capacity. Strategies of *ad libitum* feeding while avoiding obesity in pregnant sows should be explored further (Read et al., 2020). The *ad libitum* feeding of roughage in combination with a concentrate feed adapted to ingredients of the roughage is recommended

for restrictive-fed sows (Verdon et al., 2015) and can reduce the prevalence of gastric ulcers (Friman et al., 2023). For alternative housing systems, Werner et al. (2014) suggested that up to 25 % of silage could be included in the diet without having negative effects on the sows' performance. Furthermore, feeding strategies like TMR (Total-Mixed-Ration) as known for dairy cows may be also relevant for pregnant sows (Yang et al., 2014).

6 Methods to allocate enrichment materials

Objects most often are provided by hanging from the ceiling or from above the pen partition. As pigs are used to forage with the snout at the floor, objects should at least be offered at floor level enabling the sows to interact with the object without having to lift the head too much. Substrates can be presented on the floor or in dispensers, like racks or troughs. Substrates can either be provided manually or automatically. In any case, soiling of materials should be avoided, otherwise pigs will avoid them (Studnitz et al., 2007). In alternative housing systems outdoor runs can be used to provide roughages, which additionally encourages pigs to spend activity time in the outdoor area (reviewed by Wimpler et al., 2022). In Table 6.1, different methods for offering suitable enrichment materials are described.

Table 6.1: Methods to allocate suitable object- and substrates-based enrichment materials for pregnant sows.

Object-based enrichment



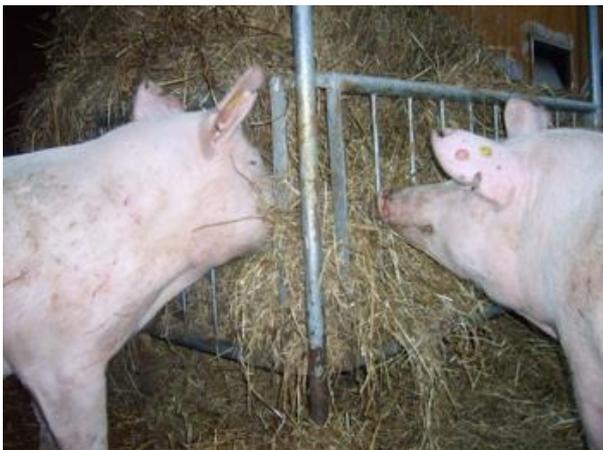
Objects hanging from the pen partition
(©FLI, K. Kauselmann)



Pig interacting with object-based enrichment
(© FLI)

- Objects are hanging from the ceiling or the pen partition.
- They should be low enough for sows to interact with the objects at floor level.
- Ropes can be clustered while hanging from the ceiling.
- Objects can be allocated in alternating order or combined with additional stimuli (e.g. bell, whistle).
- Allocation is possible in housing systems with slatted floors.
- Most objects are not rootable, this is why they should not be presented solely.

Substrate-based enrichment



Hay in a rack with sufficient axial dimensions
(©A. Schubbert)



Floor feeding of silage (in organic free range)
(©A. Schubbert)



Picture of roughage trough feeding
(©W. Hagmüller)



Automatic allocation of straw
(© L. J. Pedersen)

- Racks should provide sufficient axial dimensions, allowing the sow to put her snout into the rack.
- Allocation in racks is possible in housing systems with solid and slatted floors (in slatted floors, when slats are covered under the racks e.g. by slat coats).
- In housing systems with solid floors, outdoor runs or in free range systems allocation on the floor is possible (soiling with faeces should be avoided).
- Allocation in feeding troughs is possible in systems with solid floors.
- In general, roughages can be allocated manually or automatically.

7 Conclusions

Suitable enrichment material for sows should address the lack of satiety and the resulting foraging motivation. Scientifically knowledge on effective enrichment material for pregnant sows is scarce. However, enrichment material can either be object or substrate-based. In any case, sufficient enrichment material should be edible, chewable, investigable and manipulable. For feed-restricted sows, substrate-based enrichment (in the form of roughages) is recommended, since it not only provide exploration opportunities but also contribute to satiety and reduced prevalence of stomach ulcers. High amounts of roughages are best provided in housing systems with solid floors. For slatted floor systems, further investigations are needed to develop object-based enrichment materials that include characteristics such as the possibility to root.

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