

Scotland's Rural College

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Published in:
Animal Welfare

DOI:
[10.7120/09627286.25.3.309](https://doi.org/10.7120/09627286.25.3.309)

First published: 01/08/2016

Document Version
Peer reviewed version

[Link to publication](#)

Citation for published version (APA):
Ison, SH., Jarvis, S., & Rutherford, KMD. (2016). A survey of sow management at farrowing in the UK. *Animal Welfare*, 25(3), 309 - 319. Advance online publication. <https://doi.org/10.7120/09627286.25.3.309>

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1 **A survey of sow management at farrowing in the UK**

2 A survey of sow management at farrowing

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13

14 **Abstract**

15 Farrowing is an important period in pig production, with sow health and piglet
16 mortality representing a welfare issue and an economic loss. Sow health and welfare is
17 critical for piglet survival and good management can improve welfare and productivity. This
18 study investigated the management of sows around farrowing and attitudes of UK pig farmers
19 towards sow pain and difficulty farrowing. Farmers were asked how often they provided
20 night checks, used farrowing induction and administered pharmaceutical products during and
21 after farrowing. Farmers and veterinarians were asked if they used or prescribed anti-
22 inflammatories for farrowing-related health issues. Farmers were asked if pain at farrowing
23 was a problem for gilts and sows and what percentage they considered to have difficulty
24 farrowing. Convenience sampling using a number of distribution methods was used. Sixty-
25 one farmers and 52 veterinarians responded. Of the farmer respondents, 10 worked on
26 outdoor and 51 on indoor farms. Night checks were reported as frequently provided and
27 farrowing induction was rare. Many respondents reported using oxytocin substitutes at least
28 sometimes during (74%) or after (54%) farrowing. Azaperone was reported to be used at least
29 sometimes by 45% of respondents during and 33% after farrowing. Farmers indicated that
30 pain at farrowing was more often a problem for gilts than sows and 5% of gilts and 4% of
31 sows were considered to have farrowing difficulty. The high level of supervision around
32 farrowing, with the use of night checks is encouraging and could improve welfare. Frequent
33 use of oxytocin substitutes, which promote farrowing and milk let down may negatively
34 impact sow and piglet welfare and could be masking poor mothers that don't perform well
35 without intervention. This study provides interesting information regarding the management
36 of sows around farrowing, which could inform future research and education to improve sow
37 and piglet welfare in the periparturient period.

38 **Keywords:** Animal welfare; farrowing; pain; pig; sow management; survey.

39 **Introduction**

40 In the UK, pre-weaning piglet mortality represents a significant loss to the pig
41 industry and is a welfare issue, with an average live born mortality of 12.3 % indoors and
42 14.0 % outdoors and an average of 0.72 and 0.44 piglets per litter being born dead (BPEX
43 2014). Management practices, which rely on supervision by farm staff in the early post-
44 parturient period, can significantly improve piglet survival (for literature reviews see: Baxter
45 *et al* 2013; Kirkden *et al* 2013a). Farrowing supervision can be facilitated through the use of
46 farrowing induction, causing sows to farrow at a convenient time, when farm staff can be
47 available to supervise. Alternatively, farmers can check on sows at night during farrowing
48 times to deal with any issues that could occur outside of the normal working day.

49 A number of pharmaceutical products are available to use around farrowing. These
50 include oxytocin and carbetocin (a synthetic analogue of oxytocin), which can be used to
51 increase the frequency and intensity of uterine contractions, to aid the progress of farrowing
52 and initiate milk ejection, to aid in the treatment of mastitis-metritis-agalactia (MMA) or
53 post-partum dysgalactia syndrome (PPDS) (VMD 2011). Azaperone is a sedative that can be
54 used during farrowing to treat aggression towards piglets (savaging), excitation and to enable
55 obstetric assistance. Non-steroidal anti-inflammatory drugs (NSAIDs) are licenced to treat
56 conditions involving pain and inflammation in pigs, which could be experienced around
57 farrowing (Mainau & Manteca 2011). These products can be useful tools in the periparturient
58 period, but the inappropriate use of these products has the potential to be detrimental to sow
59 welfare. All these products are classified as POM-V, which means they should be prescribed
60 to an animal or group of animals by a veterinary surgeon following a clinical assessment
61 (NOAH 2014). However, repeated veterinary visits for individual pigs is not economically
62 sustainable, so once a condition has been diagnosed and a method of treatment prescribed,

63 further cases, which are recorded by the farmer and checked by the veterinarian on quarterly
64 visits, can be treated by farm staff.

65 A survey study was recently conducted, focusing on pain and the use of pain relief in
66 breeding pigs (Ison & Rutherford 2014). The aim of the current study was to investigate
67 aspects of management that could have implications for welfare (including pain) and
68 productivity around farrowing and lactation. In addition to the already published parts of the
69 questionnaire (Ison & Rutherford 2014), in the present study farmers were asked questions
70 regarding the management of sows around farrowing, including their thoughts on pain and
71 difficulty farrowing and farmers and veterinarians were asked about the use of anti-
72 inflammatories to treat post-farrowing conditions involving inflammation and pain.
73 Farrowing is a critical time for the welfare of the sow and her piglets, but also the farmer as
74 good performance at this stage of production provides the basis for all other stages of the
75 system. Information gained from this survey could help inform future research and education
76 regarding sow management around farrowing to improve welfare at this critical time.

77 **Methodology**

78 *Questionnaire design*

79 A questionnaire entitled: 'Pain and the use of pain relief in pigs' was designed using
80 Snap software (Snap surveys, UK) and distributed to UK farmers and veterinarians between
81 September 2012 and June 2013. Questionnaires were sent to farmers and veterinarians (both
82 on-line and on paper). Details of the design and distribution have been described previously
83 (Ison & Rutherford 2014). Questionnaires included a section on the respondents work, for
84 veterinarians, this included questions about their veterinary practice and for farmers, about
85 the farm on which they worked. Anti-inflammatory drugs were listed by active ingredient,
86 asking respondents to tick which ones they used on farm (for farmer respondents) or used or

87 prescribed (for veterinarians). All respondents were asked to tick how often ('almost always',
88 'frequently', 'sometimes', 'rarely' or 'never') they used or prescribed these drugs for
89 lameness. Veterinarians were given the option to tick if they have never advised on the
90 condition and farmers if they had never seen the condition on their farm. Respondents were
91 asked to score eight conditions for the pain they thought pigs experienced and to indicate
92 their agreement with statements about pain and the use of pain relief in pigs. All these results
93 are presented in the previous publication (Ison & Rutherford 2014).

94 In addition, the questionnaire sent to farmers included a section on farrowing
95 procedures. Firstly, farmers were asked the average number of total born and still born
96 piglets, and the percentage live born mortality (if known). They were then asked how often
97 (almost always, frequently, sometimes, rarely or never) they induced farrowing in gilts and
98 sows and how often they provided night-time checks for gilts and sows around farrowing.
99 They were also asked how often they used pharmaceutical products (oxytocin, carbetocin,
100 azaperone and anti-inflammatories) both during and after farrowing. Finally, they were asked
101 how often they thought pain at farrowing was a problem for gilts and sows (almost always,
102 frequently, sometimes, rarely or never) and what percentage of gilts and sows they thought
103 had difficulty farrowing. The questionnaire to both farmers and veterinarians, also asked
104 respondents to indicate how often then provided anti-inflammatories to treat post-farrowing
105 conditions: mastitis-metritis-agalactia (MMA) and post-farrowing lethargy, where sows are
106 off their feed. In summary, this paper presents the results of the section of the questionnaire
107 given to farmers focusing on farrowing procedures, and the frequency of which anti-
108 inflammatory drugs were used (or prescribed) to treat MMA and post-farrowing lethargy by
109 farmers and veterinarians.

110 ***Questionnaire distribution***

111 Before the questionnaire was sent out on a larger scale, it was piloted on five
112 veterinarians and five farmers who worked at University pig units. A convenience sampling
113 technique was used to reach as many farmers and veterinarians as possible. One hundred and
114 twenty-nine veterinarians were sent an email containing a link to the online version of the
115 questionnaire and an invitation to participate in the study, followed by a one week reminder
116 (contact information provided by Zoetis). In addition, paper copies of the questionnaire,
117 along with pre-paid envelopes were sent to 10 veterinary practices. The veterinary practices
118 were identified through an internet search where the practice website indicated that they
119 worked with pigs and contact information was available. The twenty-nine members of the
120 Scottish professional pig managers group were also sent an email invitation to participate in
121 the study, also with one week reminders. Paper copies of the farmer questionnaire were also
122 inserted into the December 2012 issue of *Pig World* magazine, with 4200 subscribers, 3000
123 of which were pig farmers, including farm owners, managers and employed stockpersons.
124 Some additional paper copies were distributed to pig farmers at BPEX meetings and a small
125 number were offered to pig farmers during veterinary visits to farms by one veterinary
126 practice. In addition, pig farmers visiting the SRUC building at the Royal Highland Show
127 were invited to fill in a questionnaire.

128 ***Data Analysis***

129 Data from on-line responses were exported into Excel and postal responses were
130 entered manually. Data analyses were conducted using Genstat (14th Edition; VSN
131 International Ltd., Hemel Hempstead, UK). Differences in the frequency of farrowing
132 induction, night-time checks and pain at farrowing between gilts and sows, along with
133 differences between the use of oxytocin and carbetocin and the frequency of treatment with
134 anti-inflammatories for MMA and post-farrowing lethargy between farmers and veterinarians
135 were all analysed using chi-square tests. Differences in the percentage of gilts and sows

136 having difficulty farrowing were analysed using a Mann-Whitney U tests. In all statistical
137 tests, no replies were treated as missing values.

138 **Results**

139 *Respondents and farms represented*

140 Sixty-one farmers with breeding sow herds and 52 veterinarians filled in
141 questionnaires. The number of veterinarians working with pigs in the UK, taken from our
142 database was 129, so the estimated response rate is approximately 40%. It is estimated that
143 the farmer questionnaire reached approximately 3000 farmers with the distribution methods
144 used, leading to an approximate response rate of 2%. Of the veterinarian respondents, 20
145 worked in a mixed practice, 17 in a large animal practice, nine in a pig only practice, two for
146 a pig production company, one in a small animal practice, and two were classified as 'other'.
147 The veterinary respondents worked with pigs between 1% and 100% of their time (mean =
148 $60.2 \pm 41.3\%$) and had between one and 45 years of pig experience (mean = 18.6 ± 12.4
149 years). Of the farmer respondents, 37 were farm owners, 17 were farm managers, one was an
150 employed stockperson, four were classified as 'other' and two did not say. Farmer
151 respondents spent between 5 and 100% of their time working directly with pigs (mean = 66.2
152 $\pm 30.8\%$), of this time, between 1 and 100% of their time was with breeding pigs (mean =
153 $51.7 \pm 29.61\%$) and had between 3 to 62 years of pig farming experience (mean = 30.8 ± 12.5
154 years).

155 Fifty of the farmer respondents worked on breeder-grower-finisher farms, eight on
156 breeder-weaner, two on breeder-grower farms and one did not say, but did have breeding
157 sows. Table 1 shows the breakdown of accommodation types for farrowing and lactating
158 sows and numbers of sows on the farms on which the farmer respondents worked. The
159 numbers of sows represented were 55 % (20875) indoor housed and 45 % (16813) outdoor

160 housed, with a mean (\pm STD) breeding herd size of 635 ± 1482 (indoor mean = 409 ± 617 ;
161 outdoor mean = 1868 ± 3395). This is similar in distribution to the whole UK breeding herd
162 (now thought to be over 40 % outdoor farrowing: BPEX 2014). The farm sizes represented
163 by respondents included 45 farms with more than 100 breeding pigs, seven with 25 to 99, five
164 with five to 24, one had less than five breeding pigs and three did not say. Production
165 information on the farms represented is shown in Table 2, along with UK averages. The total
166 born figures were similar to the UK average for outdoor, but slightly below average for
167 indoor housed sows. Still births per litter were similar for indoor and above average for
168 outdoor housed sows. Both indoor and outdoor farms had below average live-born mortality.

169 *Insert Table 1 here*

170 *Insert Table 2 here*

171 ***Farrowing induction and night-time checks***

172 Table 3 presents the percentage and frequency of respondents who reported to induce
173 farrowing or provided night-time checks at farrowing for gilts and sows, with respondents
174 that work with indoor and outdoor housed sows shown separately. No significant differences
175 were found between gilts and sows for how often farmers reported to induce farrowing ($\chi^2 =$
176 $4.13, P = 0.53$) or provided night-time checks at farrowing ($\chi^2 = 1.88, P = 0.95$).

177 *Insert Table 3 here*

178 ***Use of pharmaceutical products during and after farrowing***

179 Table 4 shows how often farmers reported to use pharmaceutical products both during
180 and after farrowing. Oxytocin and carbetocin have similar indications for use, so the overall
181 frequency of the combined reported use of these drugs was calculated (Table 4). This showed
182 that 74 % of respondents reported using these drugs at least sometimes during farrowing and

183 54 % afterwards. Oxytocin was reported to be used more often than carbetocin both during
184 ($\chi^2 = 12.67, P = 0.013$) and after ($\chi^2 = 16.78, P = 0.002$) farrowing. Azaperone was reported
185 to be used at least sometimes by 45 % of respondents during farrowing and by 33 % after
186 farrowing.

187 *Insert Table 4 here*

188 The reported use of anti-inflammatory drugs to treat MMA and post-farrowing
189 lethargy by farmers and veterinarians is shown in Figure 1. Post-farrowing lethargy was
190 indicated as being treated at least sometimes by 87.7 % of veterinarians and 47.6 % of
191 farmers, and MMA was reported to be almost always treated by 72.5 % of veterinarians and
192 30.4 % of farmers. MMA was reported to be more frequently treated with anti-
193 inflammatories than post-farrowing lethargy ($\chi^2 = 26.00, P < 0.001$) and veterinarians
194 reported to using or prescribing these drugs more often than farmers reported using these
195 drugs for both conditions (Post-farrowing lethargy: $\chi^2 = 19.80, P = 0.001$ (sample sizes = 42
196 farmers, 49 veterinarians); MMA: $\chi^2 = 21.61, P < 0.001$ (n = 46 farmers, 51 veterinarians)).

197 *Insert Figure 1 here*

198 ***Pain and difficulty farrowing***

199 Figure 2 shows how often farmers thought pain at farrowing was a problem for gilts
200 and sows. Respondents indicated that they thought pain at farrowing was more often a
201 problem for gilts than for sows ($\chi^2 = 11.04, P = 0.012$) and that a similar percentage (\pm SEM)
202 of gilts ($5.29 \pm 1.15\%$, minimum: 0, maximum: 50, median: 2) and sows ($3.73 \pm 0.54\%$,
203 minimum: 0, maximum: 16, median: 2) were reported to have difficulty farrowing (U = 1144,
204 $P = 0.69$).

205 *Insert Figure 2 here*

206 **Discussion**

207 This survey study aimed to provide information regarding the use of practices with
208 the potential to impact on sow and piglet welfare and productivity and presents data regarding
209 the management of sows around farrowing in the UK. The information on the farms
210 represented indicates how representative the data are of the UK as a whole and shows that the
211 results should be treated with some caution given the response rate and sampling method.
212 The average herd size for the farms represented in this study was 635, which is larger than the
213 UK as a whole, as in 2012, average pig herd size (for farms with more than five sows) was
214 153 breeding pigs (DEFRA 2014). In June 2013, the total UK herd was 421,000 breeding
215 pigs, on 6,000 pig holdings, with 370,000 of these breeding pigs on 800 holdings with
216 breeding herds of over 100 pigs (DEFRA 2014). Thus the results of this study represents
217 larger pig farms, with approximately 9% (37,493 breeding pigs) of the total UK herd and
218 5.6% of the largest farms (>100 breeding pigs) are represented. There is the possibility of
219 respondent bias, due to the use of convenience sampling, with a range of different distribution
220 methods. Therefore, those more interested in management methods and pain in pigs being
221 more likely to respond. This could be the case as live born mortality is below average and a
222 previous study has shown lower piglet mortality on farms where farmers had a more positive
223 attitude to animal welfare (Jääskeläinen *et al* 2014). It is also possible that many of the
224 respondents were not directly involved in day-to-day husbandry tasks. This is demonstrated
225 by the range of time spent working directly with pigs, with some farmer respondents only
226 spending 5% of their time with pigs and the majority of the respondents were farm owners,
227 who may not be directly responsible for decisions regarding sow management at farrowing.
228 This could account for the lack of reply from some respondents to certain questions.

229 ***Farrowing induction and night-time checks***

230 The majority of farmer respondents indicated that night-time checks were provided
231 during farrowing periods for both gilts and sows and more so for indoor compared with
232 outdoor farrowing animals. This is an encouraging result as farrowing supervision can
233 produce significant benefits, such as increased piglet survival, because it allows for the
234 implementation of proactive management techniques (for reviews see: Kirkden *et al* 2013a;
235 Vanderhaeghe *et al* 2013). Another tool which can be used to facilitate farrowing supervision
236 is the induction of farrowing by administering prostaglandins or prostaglandins along with
237 oxytocin or carbetocin to synchronise sows to farrow during working hours. By enabling
238 supervision, farrowing induction can increase piglet survival, but there can be risks including
239 an increase in low viability piglets if sows are induced too early and an increased risk of
240 farrowing difficulty (dystocia) and PPDS (Kirkden *et al* 2013b; Papadopoulos *et al* 2010). In
241 this study, few respondents reported that they induced farrowing in gilts and sows, indicating
242 that this practice is not considered beneficial in the farms on which the respondents work.
243 Further information on the nature of supervision given, including the frequency and duration
244 of day- and night-time checks and a larger sample size, would be useful information to
245 indicate any improvements in productivity with the use of supervision.

246 *Use of pharmaceutical products*

247 The current study showed that oxytocin and carbetocin were widely used, with 74 %
248 of farmers reporting the use of these drugs at least sometimes during and 54 % after
249 farrowing. Oxytocin was reported to be used more often than carbetocin, which is not
250 surprising given that oxytocin has been available for longer (since 1994 compared with 2004)
251 (VMD 2011) and is cheaper than carbetocin. However, carbetocin has a longer duration of
252 effect, and is considered safer than oxytocin as it has no effect on the frequency of stillbirths
253 when administered in order to induce parturition (Kirkden *et al* 2013b). In addition, in
254 comparison to oxytocin, the administration of carbetocin showed a tendency to reduce

255 stillbirth and significantly reduced farrowing duration when administered to sows with
256 inadequate contractions during parturition (Hühn *et al* 2004), so could be a better option. A
257 survey of French pig producers showed that farrowing intervention including frequent
258 manual assistance, use of pharmaceuticals and cross-fostering techniques positively
259 correlated with sow productivity (Martel *et al* 2008). However, the use of oxytocin
260 substitutes could also be a cause for concern. Extensive research into the use of oxytocin in
261 sows demonstrates that inappropriate use of this drug can be detrimental, with a surge in
262 uterine pressure having negative impacts on the piglets, increasing the risk of still-birth
263 (Mota-Rojas *et al* 2002, 2005, 2006, 2007; Alonso-Spilsbury *et al* 2004; González-Lozano *et*
264 *al* 2010 Baxter *et al* 2013), as well as being potentially more painful for the sow. In a survey
265 study of injectable medication given to periparturient sows by pork producers in the United
266 States, oxytocin was estimated to be given to 13.8 % of farrowing sows and was used on
267 82.8 % of the 301 farms surveyed (Straw *et al* 2000). This study also showed that only 38.9
268 % of the sows treated received the correct dose (Straw *et al* 2000). An interesting follow up
269 to this study would be to investigate why these pharmaceutical drugs are being administered
270 and whether they are they being used correctly.

271 Another surprising result from this study was that 45 % of respondents reported using
272 azaperone at least sometimes during and over 33 % after farrowing, which indicated that this
273 drug is perceived as a useful management tool in certain cases. Azaperone has been shown to
274 be effective when administered as a single dose post-farrowing, by promoting piglet survival
275 (Miquet & Viana 2010) and increasing piglet weight gain resulting in a larger weaning
276 weight, especially for primiparous sows (Miquet & Viana 2010; Ruediger & Schulze 2012).
277 When administered to primiparous sows housed in conventional crates or outdoor huts at the
278 point of placental expulsion, azaperone reduced piglet mortality in the outdoor system, more
279 specifically, death by crushing and savaging were reduced, resulting in more weaned piglets

280 (Miquet & Viana 2010). Litter weaning weights were significantly higher in farrowing crates
281 and outdoor huts (Miquet & Viana 2010) and a second study showed higher daily weight gain
282 and weaning weight for piglets from sows given azaperone post-farrowing, which was most
283 obvious for primiparous sows but no difference in mortality or piglet serum immunoglobulin-
284 G concentrations were found (Ruediger & Schulze 2012). However, azaperone, as with
285 oxytocin has the potential for misuse if given at an incorrect dose or time in relation to
286 farrowing and an ethical appraisal of the use of sedative drugs to improve productivity is
287 warranted (Baxter *et al* 2013). Therefore, the reasons for the high reported use of oxytocin
288 substitutes and azaperone warrants further investigation, including what proportion of sows
289 receive these drugs and their use on farms producing the next generation of breeding sows. It
290 would be preferable to select breeding animals that demonstrate good farrowing progress and
291 maternal behaviour without the need for intervention with the use of pharmaceutical
292 products.

293 There is growing societal concern over the use of farrowing crates in pig production,
294 with an increasing need for alternative indoor systems (Baxter *et al* 2012). Nine of the 51
295 indoor farms represented in this survey had some form of alternative to the conventional
296 farrowing crate. Alongside the need for alternative farrowing systems is the need for a sow
297 that can perform well in such systems, where maternal care is of greater importance (Arey
298 1997; Baxter *et al* 2012). Good maternal care in sows is characterised by passivity; lying in a
299 lateral position, with the udder exposed, allowing piglets' access to milk and warmth (Jarvis
300 *et al* 1999). It has been suggested that restricting sows in a farrowing crate could mask the
301 impact of poor maternal care (Baxter *et al* 2008). The frequent use of the sedative azaperone
302 shown in this study could also be 'masking' poor mothers and pain, by increasing passivity
303 and thereby reducing negative maternal responses. In addition, by increasing passivity, the
304 risk of sows developing decubital shoulder ulcers could also be increased (Herskin *et al*

2010). Likewise, the even more frequent use of oxytocin and carbetocin could be masking poor farrowing progression and nursing behaviour and increasing pain, as the increase in frequency and intensity uterine contractions is reported to be painful in women during labour (Lowe 2002). The increasing uptake of alternative crate-free farrowing systems relies on achieving production figures comparable to the farrowing crate and good maternal behaviour plays a crucial role in achieving this (Baxter *et al* 2011, 2012). Sows able to perform well, with little intervention would be beneficial in crate-free systems. Additional data on the management practices of farms with loose-housed farrowing systems and research on techniques that could improve productivity in these systems would be an important area of future research.

Anti-inflammatories were reported to be widely used by farmers and used or prescribed by veterinarians for the post-farrowing condition MMA (or PPDS) and for post-farrowing lethargy, where sows are off their feed. This is encouraging, but not surprising as farmers and veterinarians showed high agreement that pigs recover better with the use of pain relief (Ison & Rutherford 2014). Thirty per-cent of farmers and 73 % of veterinarians almost always used anti-inflammatories to treat MMA. This was similar to anti-inflammatory use reported by Finnish veterinarians in 2003, where around 70 % always treated farrowing fever (Raekallio *et al* 2003), although practices may have changed since this survey was conducted. Veterinarians reported using or prescribing anti-inflammatories more often than farmers used them for both MMA and post-farrowing lethargy, possibly as they are more likely to see the most severe cases; whereas farmers are more likely to see a range of severity and are involved in the routine administration of these drugs (Ison & Rutherford 2014). However, it could also be that farmers are not following veterinary instruction on the use of NSAIDs or are not aware of the benefits of using these drugs. Given that only a third of farmers considered that they were discussing pain and pain relief options with their veterinarian,

330 whereas two thirds of veterinarians thought they were discussing pain and pain relief options
331 with pig farmers (Ison & Rutherford 2014), there could be barriers to the increased use of
332 these drugs by farmers. Post-farrowing administration of non-steroidal anti-inflammatory
333 drugs compared with a placebo is beneficial to sow welfare and sow and piglet productivity
334 (Mainau *et al* 2012; Viitasaari *et al* 2013, 2014; Homedes *et al* 2014; Tenbergen *et al* 2014),
335 especially at farms with a high incidence of PPDS (or MMA) (Sabaté *et al* 2012). Better
336 communication between farmers and veterinarians regarding the use and benefits of using
337 anti-inflammatory drugs to treat pain could be needed (Cipolla & Zeconi 2015). In addition,
338 further research investigating the welfare and production benefits of using these drugs to treat
339 post-farrowing conditions involving inflammation and pain is warranted.

340 ***Pain and difficulty farrowing***

341 Farmer respondents indicated that pain at farrowing was more often a problem for
342 gilts than for sows, with the majority indicating ‘sometimes’ for gilts and ‘rarely’ for sows.
343 This fits with the general perception that primiparous dams experience more pain during
344 labour compared with multiparous ones (Mainau & Manteca 2011). When asked to score (on
345 a scale from 0 to 10) the painfulness of a variety of conditions, a normal farrowing was given
346 the lowest score (3.8) by farmers, however, a difficult farrowing requiring manual assistance
347 was scored 6.7, with only a broken leg and infectious mastitis scoring higher (Ison &
348 Rutherford 2014). When asked what percentage of gilts and sows respondents considered to
349 have difficulty farrowing, the numbers were fairly low, with no significant difference
350 between gilts and sows. The fact that farmers’ perceptions of pain at farrowing differed
351 between gilts and sows, but that the percentage of each considered to have difficulty
352 farrowing did not is interesting and indicates that pain and farrowing difficulty mean different
353 things to the farmer. A study investigating ease of farrowing in sows showed a subjective
354 score of farrowing ease given by the farmer correlated with objective behavioural measures,

355 indicating that farmers are familiar with their animals and have a good sense of how difficult
356 a farrowing is (Mainau *et al* 2010). A useful topic for a future survey study would be to
357 discover what features farmers consider when deciding the level of farrowing difficulty. In
358 addition, future research into pain and pain management around farrowing should focus on
359 cases of difficult farrowing, which farmers consider highly painful and investigating the
360 reasons why farmers reported that pain at farrowing was more of a problem for gilts than for
361 sows.

362 **Conclusions and Animal Welfare Implications**

363 Although data presented in this survey study are based on a limited number of
364 respondents and with the use of convenience sampling that may have introduced sampling
365 bias, this study has revealed some interesting information about the current management of
366 periparturient sows in the UK. The high frequency of night-time checks reported to be given
367 to gilts and sows during farrowing times is encouraging as supervision can improve welfare.
368 However, the frequent reported use of oxytocin substitutes and the sedative azaperone could
369 be a cause for concern. These products could be masking poor mothers and could be
370 detrimental to sow and piglet welfare, currently and in the future where the uptake of higher
371 welfare systems is likely to be implemented. Individuals that may not perform well without
372 intervention may not be suitable for free-farrowing systems, where poor mothers could have a
373 greater impact on piglet mortality. It is also encouraging that farmers are considering
374 farrowing as a painful and sometimes difficult process, as it demonstrates a concern for their
375 welfare, which is also indicated by the use, for example, of anti-inflammatories to treat post-
376 farrowing conditions. This survey study provides important information regarding the
377 management of farrowing sows, which could inform future experimental research and
378 training in order to improve management practices to increase welfare and productivity.

379 **Acknowledgements**

380 The authors would like to thank BBSRC and Zoetis for funding this study. The
381 authors are grateful to all those who helped with the questionnaire design and distribution.
382 Finally, the authors would like to thanks all respondents to the questionnaire.

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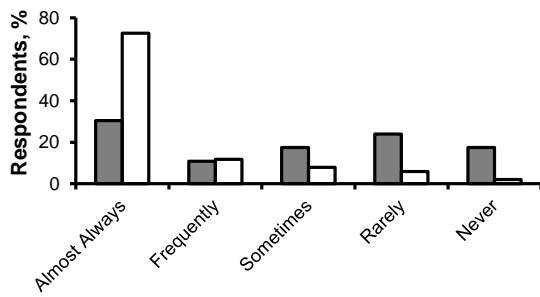
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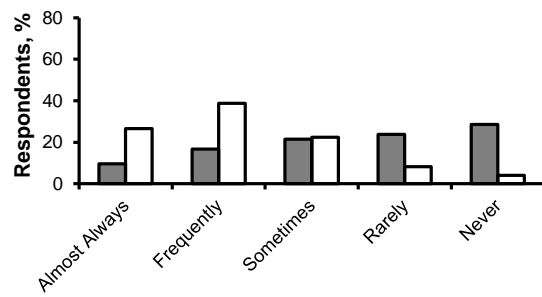
495 **Figure 1**

496 How often (almost always, frequently, sometimes, rarely, never) anti-inflammatory drugs
497 were used and/or prescribed by farmers (in grey) and veterinarians (in white) for A) Mastitis-
498 metritis-agalactia and B) Post-farrowing lethargy in sows/gilts. Veterinarians reported to
499 using or prescribing these drugs more often than farmers reported using these drugs for Post-
500 farrowing lethargy: $\chi^2 = 19.80$, $P = 0.001$ and mastitis-metritis-agalactia MMA: $\chi^2 = 21.61$, P
501 < 0.001

A) Mastitis-metritis-agalactia



B) Post-farrowing lethargy

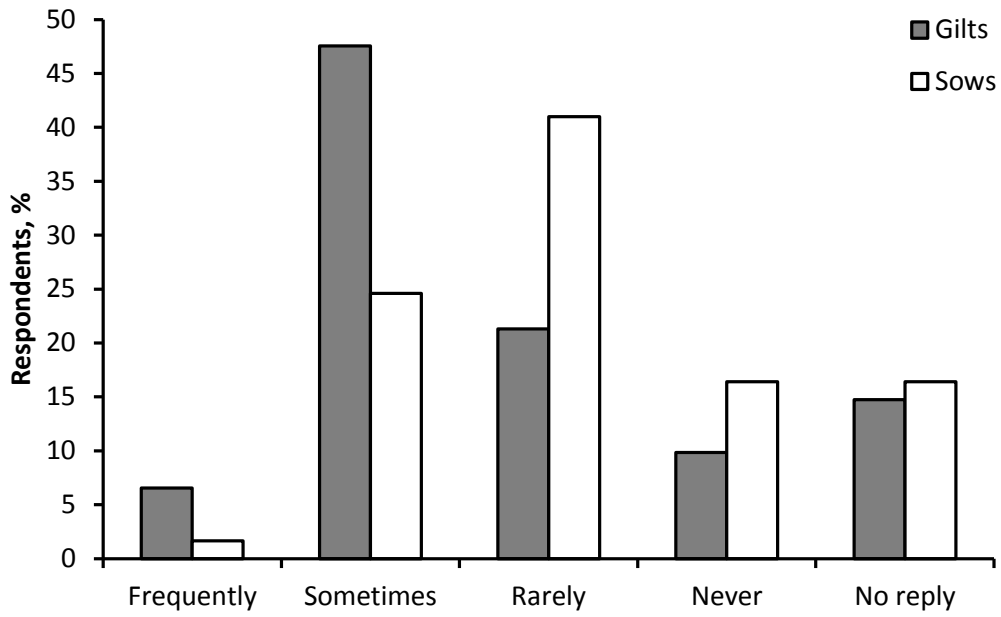


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503

504 **Figure 2**

505 The percentage of farmer respondents who thought that pain at farrowing is a problem for
506 gilts (in grey) and sows (in white) either frequently, sometimes, rarely, never or did not reply,
507 with farmers indicating that they thought pain at farrowing was more often a problem for gilts
508 than for sows ($\chi^2 = 11.04, P = 0.012$)



509

510

511 **Table 1**
 512 **Types of accommodation for farrowing and lactating sows on farms represented by**
 513 **survey respondents**

Accommodation type	Indoor	Outdoor	
Conventional crates only	42		
Conventional and swing-side crates	3		
Conventional crates and loose pens	2		
Loose pens only	4		
Outdoor huts and indoor loose pens		2	
Outdoor huts only		8	Total
Total	51	10	61
Total breeding pigs	20875	16813	37688

514

515

516 **Table 2**

517 **Production information on farms represented by survey respondents (mean \pm SEM),**

518 **and equivalent UK average figures**

Production information	UK average		UK average	
	Indoor	Indoor*	Outdoor	Outdoor*
Total born	12.95 \pm 0.20	13.16	11.53 \pm 0.18	11.58
Stillborn	0.78 \pm 0.06	0.72	0.84 \pm 0.21	0.44
Live born mortality, %	10.36 \pm 0.53	12.33	10.00 \pm 1.40	14.00

519 *(BPEX 2014)

520

521 **Table 3**

522 **The percentage (and frequency) of farmer respondents who reported how often (almost**
 523 **always, frequently, sometimes, rarely or never) farrowing induction and night-time**
 524 **checks at farrowing were provided for gilts and sows on indoor or outdoor farms.**

Frequency	Induce farrowing				Night-time checks at farrowing			
	Indoor		Outdoor		Indoor		Outdoor	
	Gilts	Sows	Gilts	Sows	Gilts	Sows	Gilts	Sows
Almost always	8.0 (4)	14.3 (7)	0.0 (0)	0.0 (0)	48.0 (24)	46.9 (23)	20.0 (2)	11.1 (1)
Frequently	2.0 (1)	6.1 (3)	0.0 (0)	0.0 (0)	16.0 (8)	12.2 (6)	0.0 (0)	11.1 (1)
Sometimes	10.0 (5)	14.3 (7)	0.0 (0)	0.0 (0)	22.0 (11)	24.5 (12)	10.0 (1)	11.1 (1)
Rarely	20.0 (10)	16.3 (8)	10.0 (1)	0.0 (0)	4.0 (2)	4.1 (2)	30.0 (3)	33.3 (3)
Never	60.0 (30)	49.0 (24)	90.0 (9)	100 (9)	10.0 (5)	12.2 (6)	40.0 (4)	33.3 (3)
No reply	1	2	0	1	1	2	0	1
Gilts vs. sows	Effect size (χ^2)		<i>P</i> value		Effect size (χ^2)		<i>P</i> value	
	4.13		0.53		1.88		0.95	

525

526

527 **Table 4**

528 **The percentage (and frequency) of farmer respondents who reported how often (almost**
 529 **always, frequently, sometimes, rarely or never) oxytocin, carbetocin, azaperone and**
 530 **anti-inflammatories were used during and after farrowing**

	Drug	Almost always	Frequently	Sometimes	Rarely	Never	No reply
During	Oxytocin	1.9 (1)	18.5 (10)	50.0 (27)	9.3 (5)	20.4 (11)	7
	Carbetocin	2.2 (1)	20.0 (9)	22.2 (10)	4.4 (2)	51.1 (23)	16
	Oxytocin and/or carbetocin	3.5 (2)	25.9 (15)	44.8 (26)	10.3 (6)	15.5 (9)	3
	Azaperone	0.0 (0)	3.6 (2)	41.8 (23)	34.5 (19)	20.0 (11)	6
	Anti-inflammatory	0.0 (0)	2.2 (1)	28.9 (13)	24.4 (11)	44.4 (20)	16
After	Oxytocin	0.0 (0)	13.0 (6)	41.3 (19)	15.2 (7)	30.4 (14)	15
	Carbetocin	2.4 (1)	2.4 (1)	11.9 (5)	19.0 (8)	64.3 (27)	19
	Oxytocin and/or carbetocin	2.0 (1)	14.0 (7)	38.0 (19)	20.0 (10)	26.0 (13)	11
	Azaperone	0.0 (0)	2.2 (1)	30.4 (14)	30.4 (14)	37.0 (17)	15
	Anti-inflammatory	0.0 (0)	4.4 (2)	42.2 (19)	24.4 (11)	28.9 (13)	16

531

532