Pain Recognition and Treatment in Farm Animals

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definitions
what is pain?

IASP (1986) An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

IASP (2011) The inability to communicate verbally does not negate the possibility that an individual is experiencing pain and is in need of appropriate pain-relieving treatment.

- “stress” hyperalgesia
- biological purpose
- unreliable (!)
what is pain?

- “sensitization”
- biological purpose?
- explains
  - alldynia
  - post-traumatic (surgical) pain
  - neuropathic states, e.g., PLS
- informs logical treatment
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Field vs Laboratory

- castration
- disbudding
- dystocia
- trauma
- mastitis
- arthritis

production • transport • slaughter

- pain recognition
- pain quantification
- prophylaxis
- treatment
- legislation

welfare

not well described

basis?

publishable data

experimental surgery, eg…
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Why bother?

- ethical
- justice
- legal
- practical
- production
- medical

Papers and Articles

Guidelines on the recognition of pain, distress and discomfort in experimental animals and an hypothesis for assessment

Special Article

PAIN AND ITS EFFECTS IN THE HUMAN NEONATE AND FETUS

K.J.S. Anand, M.B.B.S., D.Phil., and P.R. Hickey, M.D.

The evaluation of pain in the human fetus and neonate is difficult because pain is generally defined as a subjective phenomenon. Early studies of neurologic development concluded that neonatal responses to stimuli were mediated by reflexes and not by pain perception. Some authors have obscured the mounting evidence that noception is important in the biology of the neonate. This is true regardless of any philosophical view on consciousness and "pain perception" in newborns. In the literature,
Why bother?

- ethical
- justice
- legal
- practical
- production
- medical
- scientific

- effective pain treatment mandatory
- requires recognition
- cardiovascular hyperdynamism
- oliguria
- reduced appetite
- \(-ve\) E and N\(_2\) balance
- immunosuppression
- catabolism & cachexia
- inadequate sleep
- adverse memory
- behavioural changes
- retarded convalescence
post-operative pain recognition: species effects
“conservation – withdrawal” (trophotropic) responses
“fight-or-flight” (ergotropic) responses
post-operative pain recognition: species effects

- complicates pain assessment
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post-operative pain recognition: food animals

Canadian Council on Animal Care 1993
Flecknell & Waterman-Pearson 2000
Australian Government; National Health and Medical Research Council 2008
National Academy of Sciences; Institute for Laboratory Animal Research 2009

- changes in normal, appearance, spontaneous & provoked behaviour
post-operative pain recognition

spontaneous behaviour & appearance (sheep)

- ears: hanging close to head
- eyes: bright, open, normal pupil size
- expression: normal
- mentation: BAR, food searching
- position: standing (head down for food), sternal (head up, ruminating)
- social behaviour: flock engagement, food arguments
- appetite: eating, ruminating or searching
- vocalisation: normal (food-seeking) bleats

- promotes “pigeon-holing”

- easily applied
- inaccurate
- insensitive

- directed backwards
- sunken, partially closed, mydriasis
- grimacing, flemen
- depressed, lethargic, stare, wound inspection

- sternal (head down, 0 activity)
- lateral recumbency (worst)
- self-imposed (corner) separation

- uninterested
- bruxism, depressed bleats, groaning
post-operative pain recognition

changes in spontaneous behaviour & appearance (sheep)

ears: hanging close to head, directed backwards

eyes: bright, open, normal pupil size, sunken, partially closed, mydriasis

expression: normal, grimacing, flemen

mentation: BAR, food searching, grimacing, flemen, depressed, lethargic, stare, wound inspection

position: standing (head down for food), sternal (head up, ruminating), sternal (head down, 0 activity), lateral recumbency (worst), self-imposed (corner) separation

social behaviour: flock engagement, food arguments, self-imposed (corner) separation

appetite: eating, ruminating or searching, uninterested

vocalisation: normal (food-seeking) bleats, bruxism, “depressed” bleats, groaning
post-operative pain recognition: sheep

changes in provoked behaviour (sheep)

Pain Recognition and Management in Small Ruminants
Involved in Musculoskeletal Research
AVA questionnaire study 2005

“….start bleating, walk or run to the door and are looking at the person who is approaching the pen; even more active if the person has a feeding bucket or hay in his hand “

“….smell the hand, try to chew the fingers, looking for food in the hand”

“…….escape away from the door (not familiar with the person) “

“…….do not respond (remain recumbent)”
post-operative pain recognition

changes in provoked behaviour (sheep)

• interaction assessment
• more sensitive
• more informative
• time consuming (2 – 4 weeks) interaction
• do-able in pigs
• beware
post-operative pain recognition

some breeds do not allow familiarization
Variation in the analgesic effects of xylazine in different breeds of sheep.
Ley, S.; Waterman, A.; Livingston, A.
Veterinary Record 1990 Vol. 126 No. 20 pp. 508

Welsh mountain > Swaledales > Cluns
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post-operative pain recognition

pain behaviours change with age
post-operative pain recognition: food animals

- difficulty $\alpha^{-1}$ degree of familiarisation
- age-dependent
- breed – dependent
- “production pain” of little value
- does it matter?
post-operative pain treatment: principles

- surgeon control
- body position
- opioids
- NSAIDs
- local anaesthetics
- NMDA antagonists
- $\alpha_2$ agonists
- antispasmodics
- general anaesthetics
- SAIDs
- benzodiazepines
- anticonvulsants
- antidepressants
- new knowledge

PREVENT post-operative pain 😄
familiarisation (2 - 4 weeks)
feeding
watering
bedding
grooming
attention
exercise
Dr Green
physiotherapy
dressings & wound inspection
monitoring pain behaviours
reporting
1) Pre-emptive analgesia: peripheral

Giving analgesics before needed

cm phospholipids
\[ \downarrow \]
phospholipase A\(_2\)
\[ \downarrow \]
arachidonic acid
\[ \downarrow \]
LOX
\[ \downarrow \]
COX2
\[ \downarrow \]
\[ \downarrow \]
LTB\(_4\)
\[ \downarrow \]
PGE\(_2\)
\[ \downarrow \]
TXA\(_2\)
\[ \downarrow \]
PGI\(_2\)
\[ \downarrow \]
TXB\(_2\)

“sensitizing soup”
1) Pre-emptive analgesia: peripheral

- cm phospholipids
  - phospholipase A₂
  - arachidonic acid
  - LOX
  - COX2
  - LTB₄
  - PGE₂
  - TXA₂
  - PGI₂
  - TXB₂

- SAIDs
- NSAIDs
- local anaesthetics

“sensitizing soup”
1) Pre-emptive analgesia: central

- adrenoreceptor induction
- NMDA activation
- axonal sprouting
- δ gene expression

seconds, minutes, hours, days

“wind-up”
1) Pre-emptive analgesia: central

- adrenoreceptor induction
- NMDA activation
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- δ gene expression

seconds, minutes, hours, days

“wind-up”
1) Pre-emptive analgesia: central

- Adrenoreceptor induction
- NMDA activation
- NMDA antagonists e.g. ketamine
- $\alpha_2$ agonists
- Some NSAIDs
- Opioids
- Local anaesthetics

Physiological time:
- Seconds
- Minutes
- Hours
- Days

“Wind-up”

Local anaesthetics
2) Partial intravenous anaesthesia

- reduce vaporizer setting
- analgesic infusion
3) Prolonged postoperative analgesia

- pre-surgery
- pre-emptive analgesics
- 5 – 30 days NSAIDs
But.......

- effective analgesia theoretically devisable
- analgesics cause behavioural changes
  - e.g., δ appetite
- analgesics cause physiological effects
  - e.g., ileus
- δ (or un-δ ) postoperative behaviours
  - drugs ◈ pain ◈ both
- drugs may affect studied variables........
4) **Local anaesthetics**

- profound prolonged analgesia
- (at low cost)
Conclusion

• analgesics
• pain behaviours
• pain scoring system
• encourage (?) familiarisation
  • motivate staff
  • adequate staff
  • adequate time
• veterinary (anaesthetist) on moderate – severe band procedures
• moratorium on food animal use for experimental surgery
Conclusion

- traditional, not demonstrable “good models”
- medically – driven (inherent specism)
- inexpensive - widely available
- ostentatious pain behaviours
- < noble
- < cuddleble
- < politically contentious
Conclusion

“The question is not, can they reason? Nor can they talk?

But can they suffer?”

 ..........possibly more