Guidelines for anaesthesia and analgesia in fish

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Fish

- Tropical
  - Zebra fish
  - Guppies
- Temperate
  - Salmon
  - Trout

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Anaesthesia or no anaesthesia

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Anaesthesia and sedation

- Difficult to handle
- Struggle
- Restraint required (sampling, weighing, measuring)
- Large number of fish to be handled

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Stress signs

- Ataxia (erratic swimming)
- Tachypnoea (increased operculum rate)
- Colour change
- Posture
- Use of water column

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Pre anaesthetic considerations

- Starve 12-24 hours or
- Fish should not be fed on the day they are to be anaesthetised
- Weight
- Prepare equipment and anaesthetic solution

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Frequency of Anaesthesia

- Fish should not be anaesthetised more than 4 times weekly.
- Fish should be allowed to fully recover prior to the next anaesthetic/sedation

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The ideal anaesthetic agent

- Rapid induction and recovery time
- The anaesthetic agent should provide adequate immobilisation and analgesia for the duration of the procedure
- Have a wide safety margin.
- An anaesthetic agent that is easy to administer and water soluble
- harmless to the environment and operator is preferred.

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Anaesthesia

- Adding the anaesthetic agent to the water ‘inhalation anaesthetic’
- inhaled through the water, enters the arterial blood and the remainder or metabolites excreted via the gills, kidney and skin.
- Agents have a mechanism of action similar to local anaesthetics.

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MS222 Tricaine methane sulphonate (TMS)

- ***MS222*** at present this is the only anaesthetic agent licensed* for use in fish and has the added advantage of being water soluble.

* In the UK

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MS222 Tricaine methane sulphonate (TMS)

- **MS222** Tricaine methane sulphonate (TMS)
  - 50-200mg/l Anaesthesia
  - 15-50mg/l Sedation
  - 1g/l Euthanasia

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- It is important to ensure that the anaesthetic is buffered

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Inhalation anaesthesia

- Holding bath
- Anaesthetic bath
- Recovery bath

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Anaesthesia protocol

- Use water originating from the aquatic system
  - water parameters are within acceptable range
  - all at the same temperature.
  - Oxygenated water

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Anaesthesia protocol

- The fish are placed in a pre-prepared bath with the required anaesthetic concentration.
- Fish should be anaesthetised in small batches (3-4 at a time)
- Remain no longer than 10 minutes in the anaesthetic solution (usually less time is required).
- If longer anaesthetic is required a second anaesthetic bath with a lower maintenance concentration of anaesthetic agent is used.

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Maintaining anaesthesia

- Artificial ventilation
  - Non-recirculating
  - Recirculating

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Anaesthetic assessment

- Depth of anaesthesia can be assessed by
  - ataxia
  - loss of righting reflex and response to stimuli (squeezing the base of the tail).

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Anaesthetic monitoring

- Heart rate (Doppler/ECG)
- Respiratory rate

  observe the movement of the operculum.

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Anaesthetic monitoring

- The gills should be pink to light red
- Pale gills are suggestive of
  - hypoxia
  - hypotension
  - anaemia

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Anaesthetic monitoring

Respiratory arrest:

- concentration of anaesthetic should be decreased or the fish placed in the recovery bath.

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Anaesthesia protocol

- Signs of recovery are seen within minutes of placement in the recovery bath.
- Recovery times of longer than a couple of minutes are considered prolonged.
- Recovery can be aided by manually moving the fish forward in the recovery bath.

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- Once the fish are placed in the recovery bath the analgesic and immobilising effects of the anaesthetic drugs diminish quickly.

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Analgesia

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Recognising pain

- **Subjective**
- **Requires knowledge of the species-wide variation**
- **Requires experience**
- **Stress ⟷ Pain**

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Changes in appearance or behaviour

- Ataxia (erratic swimming)
- Rubbing
- Increased respiratory rate
- Colour change
- Posture
- Use of water column

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Guidelines

- When is anaesthesia required?
- How frequently should we allow a particular fish to be anaesthetised?
- Should we create a set rules or code of best practice? e.g.
  - Use buffers
  - Choice of anaesthetic agent
  - Number of fish per anaesthetic bath
- Should analgesia be mandatory?

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