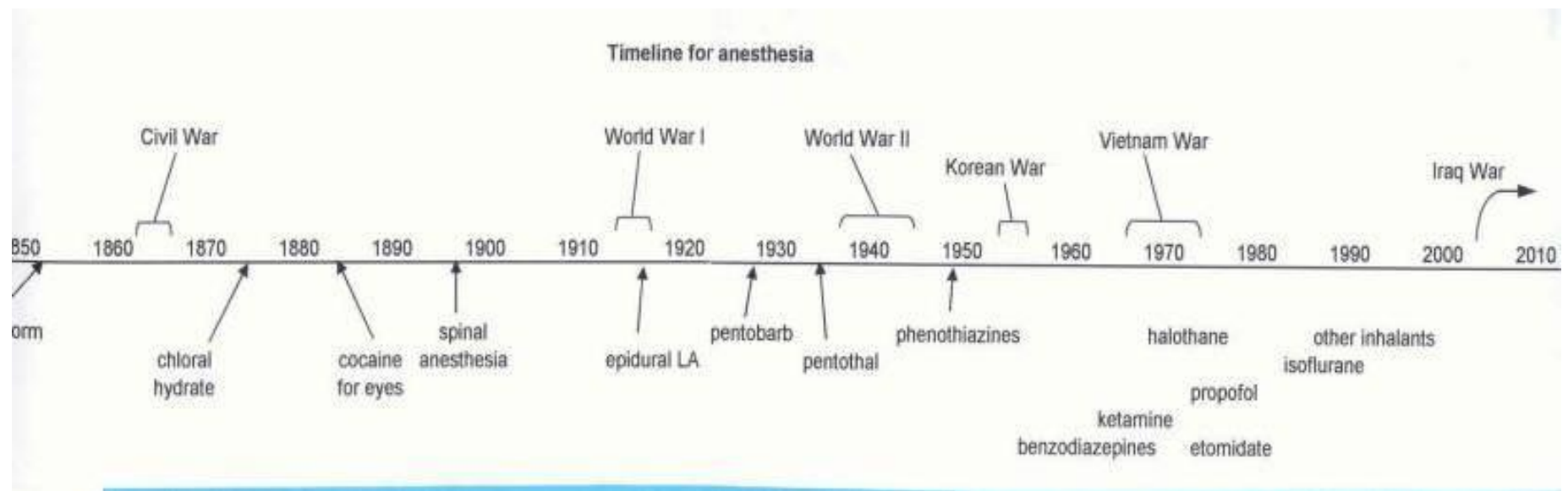




Pre-anesthesia

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History of Anesthesia



Classification of Anesthetic Agents

❖ Route of administration

- ❖ Inhalant
- ❖ Injectable
- ❖ Oral
- ❖ Topical

❖ Time of administration

- ❖ Preanesthetic
- ❖ Induction
- ❖ Maintenance



❖ Principal effect


- ❖ Local vs. general

- ❖ Sedatives and tranquilizers vs. analgesics

- ❖ Neuromuscular blockers


- ❖ Anticholinergic agents

- ❖ Reversal agents

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- ❖ Chemistry
 - ❖ Pharmacokinetics
 - ❖ Pharmacodynamics
 - ❖ Drug distribution
 - ❖ Target tissues and stimulation
 - ❖ CNS—depression or stimulation

Preanesthetic Medications


- ❖ Calm or sedate excited animal
- ❖ Minimize adverse drug effects
- ❖ Reduce dose of concurrent drugs
- ❖ Smoother anesthetic induction and recovery
- ❖ Analgesia
- ❖ Muscle relaxation

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- ❖ Route of administration affects onset of action and duration of effects
 - ❖ SC—slowest onset, longest duration
 - ❖ IM—faster onset, shorter duration
 - ❖ IV—fastest onset, shortest duration



Preanesthetic Anticholinergics

- ❖ Parasympatholytic drugs—block acetylcholine
 - ❖ Prevent and treat bradycardia
 - ❖ Decrease salivary secretions

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- ❖ Atropine and glycopyrrolate (dogs and cats)
 - ❖ IV, IM, SC, or IT
 - ❖ Atropine—faster onset, shorter peak, shorter duration
 - ❖ Glycopyrrolate—slower onset, longer peak, longer duration



Anticholinergic Effects

- ❖ CNS—limited effect
- ❖ Cardiovascular—prevent bradycardia
- ❖ Secretions—decrease
- ❖ Eye—mydriasis and corneal drying
- ❖ Bronchodilation

Anticholinergic Adverse Effects


- ❖ Cardiac arrhythmia
 - ❖ Contraindicated in animals with elevated heart rates or cardiac diseases
- ❖ Temporary bradycardia—atropine
- ❖ Thickened respiratory and salivary secretions
 - ❖ May lead to airway blockage—cats and ruminants
- ❖ Intestinal peristalsis inhibition
 - ❖ May lead to colic (horses) or bloat (ruminants)

Tranquilizers and Sedatives

- ❖ Phenothiazines
- ❖ Benzodiazepines
- ❖ Alpha₂-adrenoceptor agonists
- ❖ Alpha₂-antagonists

Phenothiazines—Acepromazine Maleate

- ❖ Also known as acepromazine or “ace”
 - ❖ Preanesthetic sedation
 - ❖ Decrease dose of general anesthetic
 - ❖ Ease induction and recovery
 - ❖ May be used with opioids for minor procedures

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- ❖ Approved for horses, dogs, and cats
 - ❖ Administered IV or IM
 - ❖ No reversal agent
 - ❖ Metabolized by liver
 - ❖ Will slowly cross the placenta



Effects of Acepromazine

❖ CNS

- ❖ Calming, reluctance to move, decreased interest in surroundings
- ❖ Sedation less pronounced in cats
- ❖ Not an analgesic



❖ Cardiovascular System

- ❖ Peripheral vasodilation that leads to hypotension, increased heart rate, and hypothermia
- ❖ Protects against arrhythmias and decreases cardiac output



- ❖ Respiratory system

- ❖ Worsens depressive effect of other drugs

- ❖ Gastrointestinal system

- ❖ Antiemetic

- ❖ Prevents histamine release and decreases allergic response

Adverse Effects of Acepromazine

❖ CNS

- ❖ Reduced seizure threshold
- ❖ May produce aggression or excitement

❖ Cardiovascular system

- ❖ Hypotension—dose dependent



❖ Penile prolapse

- ❖ Seen in horses and other large animals
- ❖ May lead to permanent injury

❖ Decreased PCV

- ❖ Possibly due to splenic engorgement



Use of Acepromazine

- ❖ Dose and needle placement
- ❖ Increased potency and duration
 - ❖ Geriatrics, neonates, debilitated animals
- ❖ Breed considerations
 - ❖ Australian shepherds
 - ❖ Giant breeds, Boxers, Greyhounds
 - ❖ Terriers and cats



Benzodiazepines

- ❖ Tranquilizers—controlled substances
 - ❖ Diazepam
 - ❖ Zolazepam
 - ❖ Midazolam
- ❖ Rapid onset of action
- ❖ Short duration of action




Effects of Benzodiazepines

❖ CNS

- ❖ Calming and antianxiety only in old or ill patients
- ❖ Not an effective sedative or analgesic
- ❖ Anticonvulsant—use with animals having seizures

❖ Cardiovascular and respiratory systems

- ❖ Minimal effect with a high margin of safety

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- ❖ Skeletal muscle relaxation
 - ❖ Potentiate general anesthetics
 - ❖ Appetite stimulation (cats and ruminants)

Adverse Effects of Benzodiazepines

❖ CNS

- ❖ Disorientation and excitement—young, healthy dogs
 - ❖ Dysphoria and aggression—cats
 - ❖ Muscle fasciculations—horses
 - ❖ Ataxia and recumbency—any large animal
- ## ❖ Diazepam must be given by IV slowly
- ❖ Oral diazepam in cats can cause liver failure



Use of Benzodiazepines

- ❖ Diazepam
 - ❖ Not water soluble
 - ❖ Don't mix with water-soluble drugs
 - ❖ Don't store in plastic
 - ❖ Commonly used with ketamine to induce anesthesia in small animals and horses
 - ❖ Administer IV slowly



❖ Midazolam

- ❖ Water soluble
- ❖ Can be administered IM or SC
- ❖ Excellent sedative for swine, ferrets, rabbits, and birds
- ❖ Used in combination with ketamine to induce anesthesia in dogs, small mammals, and birds



❖ Zolazepam


- ❖ Available only as a component of Telazol[®]
- ❖ A powdered product
- ❖ Reconstituted with sterile water

Alpha₂-Adrenoceptor Agonists

- ❖ Also written alpha₂-agonists or α₂-agonists
- ❖ Noncontrolled agents
- ❖ Sedation, analgesia, and muscle relaxation
- ❖ Large and small animals—IM or IV
- ❖ Administered prior to minor procedures
- ❖ Readily reversed with alpha₂-antagonist

Alpha₂-Agonists

- ❖ Xylazine (Rompun, Anased)
- ❖ Detomidine (Dormosedan)
- ❖ Romifidine (Sedivet)
- ❖ Dexmedetomidine (Dexdomitor)

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- ❖ Stimulates alpha₂ receptors of the sympathetic nervous system (SNS)
 - ❖ Decrease release of norepinephrine
 - ❖ No “fight-or-flight” response
 - ❖ Sedation, analgesia, bradycardia, hypotension, and hypothermia
 - ❖ Metabolized in liver; excreted in urine
 - ❖ Rapid sedation; 1-2 hour duration


Effects of Alpha₂-Agonists

❖ CNS

- ❖ Dose-dependent sedation
- ❖ Analgesia—short-acting

❖ Cardiovascular system—early phase

- ❖ Dose-dependent vasoconstriction and hypertension
- ❖ Bradycardia
- ❖ Cardiac arrhythmias

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- ❖ Cardiovascular system—late phase
 - ❖ Decreased cardiac output
 - ❖ Hypotension and further bradycardia



❖ Respiratory system

- ❖ Dose-dependent depression

❖ Other effects

- ❖ Muscle relaxation
- ❖ Increased effect of other anesthetic agents
- ❖ Vomiting—immediate response (dogs and cats)
- ❖ Hyperglycemia—transient
- ❖ Hypothermia

Adverse Effects of Alpha₂-Agonists

❖ CNS


- ❖ Change in behavior—varies with species


❖ Cardiovascular system

- ❖ Bradycardia, hypotension, decreased output

❖ Respiratory system

- ❖ Depression—varies from animal to animal
- ❖ More severe if given with other drugs

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- ❖ Increased urination
 - ❖ Gastrointestinal effects
 - ❖ Bloat—dogs, cattle, and horses
 - ❖ Salivation and regurgitation—cattle
 - ❖ Premature parturition—cattle (last trimester)

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- ❖ Sweating—horses
 - ❖ Absorbed through skin abrasions and mucous membranes
 - ❖ Wash off immediately



Use of Alpha₂-Agonists

- ❖ Use with caution; monitor patients closely
- ❖ Avoid use in geriatric, diabetic, pregnant, pediatric, or ill patients
- ❖ Administer anticholinergics 10-20 minutes prior

Alpha₂-Agonist—Xylazine

- ❖ 2% solution (small animals)
- ❖ 10% solution (horses)
- ❖ Use 1/10 horse dose in cattle
- ❖ Used mostly in large animals

Alpha₂-Agonist—Dexmedetomidine

- ❖ Dexdomitor[®]
- ❖ Most commonly used in dogs and cats
- ❖ Produces sedation and analgesia
- ❖ More potent and safer than xylazine
- ❖ Antagonist—atipamazole (Antisedan[®])
- ❖ Preanesthetic in low doses
- ❖ Can be mixed with other drugs

Alpha₂-Agonists—Detomidine and Romifidine

❖ Detomidine

- ❖ Used in horses
- ❖ Sedation, analgesia, muscle relaxation
- ❖ Two times the duration of xylazine
- ❖ Standing sedation with butorphanol

❖ Romifidine

- ❖ Produces less ataxia


Alpha₂-Antagonists

- ❖ Reverse all effects of alpha₂-agonists
 - ❖ Beneficial effects—for example, analgesia and sedation
 - ❖ Detrimental effects—for example, bradycardia
- ❖ Wide margin of safety



❖ Effects of overdose

- ❖ Neurological—excitement and muscle tremors
- ❖ Cardiovascular—hypotension and tachycardia
- ❖ Gastrointestinal—salivation and diarrhea

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- ❖ Dose is expressed as a ratio
 - ❖ Agonist to antagonist
 - ❖ 10:1 means the dose of the antagonist is 1/10 of the dose of the agonist
 - ❖ Administer slowly by IV
 - ❖ Reduce dose if more than 30 minutes has elapsed since the agonist was administered

Alpha₂-Antagonist—Tolazoline

- ❖ Nonspecific alpha₂-antagonist
- ❖ Used in ruminants at a 1:10 dose ratio with xylazine
- ❖ Reverses cardiovascular and sedative effects

Alpha₂-Antagonist—Yohimbine

- ❖ Used in dogs, cats, horses, and exotic species
- ❖ Reverses cardiovascular and sedative effects of xylazine
- ❖ Dose ratio is species dependent
 - ❖ Dogs and horses—10:1
 - ❖ Cats—2:1

Alpha₂-Antagonist—Atipamezole

- ❖ Antisedan[®]
- ❖ Specific antagonist for dexmedetomidine
- ❖ IM injection (IV in emergencies)
- ❖ Use ½ the dose in cats compared to dogs
- ❖ Reversal—5-10 minutes after IM injection

Opioids

- ❖ Derivatives of opium
- ❖ Opiates—naturally derived compounds
- ❖ Produce analgesia and sedation
- ❖ Anesthetic induction when combined with other drugs
- ❖ Classified as agonists, partial agonists, agonist-antagonists, or antagonists



Used of Opioids

- ❖ Agonists

- ❖ Morphine, hydromorphone, oxymorphone, fentanyl, and meperidine

- ❖ Partial agonist

- ❖ Buprenorphine



- ❖ Agonist-antagonists

- ❖ Butorphanol and nalbuphine

- ❖ Antagonists

- ❖ Naloxone, etorphine, and carfentenil



- ❖ Preanesthetic

- ❖ Agonists, partial agonists, or agonist-antagonist

- ❖ May be used alone or in combination with

- ❖ Tranquilizers

- ❖ Anticholinergics

- ❖ Analgesia

- ❖ Prevent and treat postoperative pain

- ❖ Used with tranquilizer to produce neuroleptanalgesia

Effects of Opioids

❖ CNS

- ❖ Effect depends on many factors

- ❖ Dogs

 - ❖ Causes sedation

 - ❖ Narcosis

- ❖ Cats, horses, and ruminants

 - ❖ Causes CNS stimulation

 - ❖ Bizarre behavior patterns or dysphoria



- ❖ Use lower dose

- ❖ Analgesia

- ❖ Pure agonists are most effective against severe pain
- ❖ Used as a premedication for painful surgery



- ❖ Cardiovascular system

- ❖ Bradycardia

- ❖ Respiratory system

- ❖ Minimal decreased rate and tidal volume

Other Effects of Opioids

- ❖ Miosis in dogs
- ❖ Mydriasis in cats, horses, and ruminants
- ❖ Hypothermia in dogs
- ❖ Hyperthermia in cats
- ❖ Increased responsiveness to noise
- ❖ Sweating in horses
- ❖ Decreased urine production with urine retention

Adverse Effects of Opioids

- ❖ CNS
 - ❖ Anxiety, disorientation, excitement, dysphoria
- ❖ Cardiovascular system
 - ❖ Pronounced bradycardia
- ❖ Respiratory system
 - ❖ Decreased respiration and tidal volume
 - ❖ Decreased PaO₂ and PaCO₂
 - ❖ Dose dependent with some agents
 - ❖ Ceiling effect with some agents



❖ Gastrointestinal system

- ❖ Salivation and vomiting—small animals
- ❖ Initial diarrhea, vomiting, and flatulence
- ❖ Pretreat with atropine or acepromazine
- ❖ GI stasis follows initial GI stimulation
 - ❖ May predispose to colic in horses
 - ❖ Avoid administration to any animal with a GI obstruction