**Drugs**

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| Drug | Doses/Calculations | Class of drug | MOA | Effects | Contraindications | Withdrawal times |
| 2% Lidocaine | **Locally into spermatic cord and subcutaneous tissue dorsal to surgical site.**  ***Toxic Dose****:* 10mg/kg  ***Volume***= D x W / C             = 10 x 250 / 20             = 125 mL lidocaine  **½TD = 62.5mL**. It is safe to give up to this volume.  Therefore 5 mL per side = **10mL given**  62.5 mL – 10 mL = 52.5 mL  **In this procedure we used less 52.5 mL less than half the toxic dose.** | Class-1b antiarrhythmic drug | Lidocaine enters the nerve cells by diffusion through membranes. It works by stopping sodium (Na) ions from passing through the voltage-gated channels of pain receptors in the body, by binding to the Na channels. An amide on lidocaine allows it to act like an amino acid, and interact with the active sites in the Na channel domains, causing a conformational change. When the active site has something else interacting with it, then it cannot transfer the Na ions, and therefore cannot send signals of pain to the brain. | Lidocaine is a moderately long-acting local anaesthetic. It blocks initiation and transmission of nerve impulses at the site of application by stabilizing the neuronal membrane. | Lidocaine is contraindicated in animals with a known hypersensitivity to the drug. | **Epidural:**  Meat- 1 day  Milk- 24 hours  **Infiltration:**  Meat- 4 days  Milk- 72 hours |
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| 10% Ketamine | **IM Sedative:**  ***Dose***: 0.1 mg/Kg  ***Weight***: 250 Kg  ***Conc.***: 100mg/mL  ***Vol.*:** D x W / C          =(0.1mg/Kg x 250Kg)/ (100mg/mL)  = 0.25 mL  **However, for the procedure 0.5 mL Ketamine was administered.**  During the procedure, once sedation began to wear off, an IV dose at half the previous volume was administered🡪  0.5mL/2  = 0.25 mL | N-methyl-D-aspartate (NMDA) antagonist | Ketamine acts as an antagonist for NMDA receptors which are involved in processing CNS input, therefore blocking this input. It also acts on opioid receptors and voltage gated Ca channels which aid in its analgesic effect. The full mechanism of action is not completely understood. | Ketamine is a rapid-acting general anaesthetic. It produces anaesthesia characterised by profound analgesia with normal ocular, pharyngeal and laryngeal reflexes, normal or increased muscle tone, cardiovascular stimulation, a minimal respiratory depression (which can become severe in some cases of IV administration). There may also be hyper-salivation, increased CSF pressure and, during recovery animals may be hyper-responsive and ataxic, so exposure to handling or loud noises should be kept at a minimum during recovery. Co-administration with alpha-2-agonists (such as xylazine used in this lab) or benzodiazepines can control the increased muscle tone. | Contraindicated in hypertensive animals, those at risk of heart failure, those with hepatic or renal insufficiency, head trauma, pre-existing seizure disorders. | Meat: 3 days  Milk: 48 hours |
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| 2% Xylazine | ***Dose***: 0.05 mg/kg  ***Weight***: 250kg  ***Conc.***: 20 mg/mL  ***Volume:*** D x W/ C=(0.05\*250)/20  = 0.625 mL  = **0.6 mL**  During the procedure, once sedation began to wear off, an IV dose at 0.025mg/kg was administered🡪  (0.025\*250)/20  = **0.3 mL** | Potent Alpha 2 adrenergic agonist | Xylazine has a highly lipophilic nature, it directly stimulates central α2 receptors as well as peripheral α-adrenoceptors in a variety of tissues.As an agonist, xylazine leads to a decrease in neurotransmission of norepinephrine and dopamine in the central nervous system. It does so by mimicking norepinephrine in binding to presynaptic surface receptors, which leads to feedback inhibition of norepinephrine.  Xylazine also serves as a transport inhibitor by suppressing norepinephrine transport function through competitive inhibition of substrate transport. | Causes sedation, anaethesia, muscle relaxation and analgesia in many animals. It is 10–20 times more potent in ruminants than other species and is therefore used as a very useful sedative and analgesic in cattle, goats, and sheep. | Induces uterine contractions and therefore should not be used in pregnant cows. Detomidine is regarded as a better alternative. If animal is very excited, anxious or unruly, xylazine may not produce reliable sedation.  Side effects in animals include transient hypertension, hypotension, gastrointestinal upset and respiratory depression. | Meat: 4 days  Milk: 24 hours |
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| Tolazoline | ***Conc***: 10% = 100mg/mL  ***ED***: 4x xylazine dose  4 x .05 = .2mg/kg  ***Vol***: (250kg x .2mg/kg) / 100mg/mL  **= .5 mL of Tolazoline to be given IV if required** | Alpha 1 and 2 adrenergic competitive antagonist | Reverses the effects of Alpha 2 agonists ,eg. Xylazine, by competitively binding to Alpha 2 adrenergic receptors. | A direct peripheral vasodilator. It has direct actions on blood vessels; decreasing the pulmonary arterial pressure and peripheral resistance, and increasing venous capacity and cardiac output and can cause tachycardia, hypotension, and increased  GI motility | It should not be administered to animals  exhibiting signs of stress, debilitation, cardiac disease, sympathetic blockage,  hypovolemia, or shock | Meat: 8 days  Milk: 48 hours |
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| Flunixin | ***Conc***.: 5% = 50mg/mL  ***Dose***: 1.1mg/kg  ***Weight*:** 250kg  ***Vol***.: (250kg x 1.1mg/kg) / 50mg/mL  **= 5.5 mL given IV 10 mins post sedative** | Nicotinic acid derivative non steroidal anti-inflammatory (NSAID) | Flunixin meglumine is a non selective COX inhibitor. | It has potent  anti-inflammatory and analgesic effects and is indicated for the treatment of acute and surgical pain. Flunixin is an exception among the NSAIDs as it relieves visceral pain and not only integument pain as most NSAIDs do. | Flunixin is not given rapidly via IV as some anaphylactic reactions have been observed. Treatment for longer than 3 days can result in hematochezia and hematuria. | Meat: 4 days  Milk: 72 hours |
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| Penicillin | ***Conc***.: 200,000 IU/mL  ***Dose***: 20,000 IU/kg  ***Weight:*** 250kg  ***Vol***.: (250kg x 10,000 IU/kg) / 200,000 IU/mL = **25 mL given IM**  Not more than 10-15ml per site in young cattle.  Not more than 20ml per site in adult cattle. | Penicillin G (benzylpenicillin) – Natural penicillin | The structure of penicillins includes a β-lactam ring and a thiazolidone ring. Cleavage of the β-lactam ring destroys antibiotic activity. Penicillins bind to and inhibit the transpeptidase involved in the cross-linking of the bacterial cell wall, the third and final step in cell-wall synthesis. The weakened cell wall ruptures, resulting in lysis and cell death. Penicillins also inhibit other peptidases (penicillin-binding proteins) involved in cell wall synthesis and block the inhibition of autolysins. Rapidly growing bacteria are most susceptible  to the bactericidal effect of penicillin. | Penicillin G is used in all species for the treatment of infections caused by Gram(+), nonpenicillinase producing pathogens. | Allergic reactions to penicillin may occur in animals, especially cattle | Meat: 10 days  Milk: 48 hours |
| Streptomycin |  | Aminoglycoside antibiotic | Streptomycin binds to the 30S ribosomal fragment and inhibits the rate of protein synthesis and the fidelity of mRNA translation which results in the synthesis of abnormal proteins. It is bactericidal against Gram(–) aerobes and is synergistic with β-lactams against many Gram(+) pathogens. | Streptomycin is used to treat and prevent Gram(-) infections. | The aminoglycosides are relatively more toxic than other classes of antimicrobials. Hence, dosage regimens must  be adjusted in animals with decreased renal function and they should not be used with other ototoxic or nephrotoxic drugs. | Meat: 2 days |
| Epinephrine | May be administered IV in emergency cases. In such a case, 0.01% (0.1 mg/mL) soln is required.  If epinephrine HCl @ 1 mg/mL is the only concentration available, dilute 1mL in 9mL normal saline.  Dose: 1.5 to 5.0 mL of 0.01% epinephrine HCl per 45Kg body weight (repeat after 15 minutes if necessary.  ***Conc.:*** 0.1mg/mL  ***Weight:*** 250Kg  (lower dose)  1.5\*(250/45)  =8.3 mL 0.1% Epinephrine  (higher dose)  5.0mL\*(250/45)  =27.8 mL 0.1% Epinephrine | Alpha and beta adrenergic agonist | Epinephrine acts on alpha and beta-adrenergic receptors. Through its action on alpha-adrenergic receptors, epinephrine minimizes the vasodilation and inhibits the increased vascular permeability that occurs during anaphylaxis. Through its action on beta-adrenergic receptors, epinephrine leads to bronchial smooth muscle relaxation. | It’s actions on alpha adrenergic receptors reduce loss of intravascular fluid volume and possible risk of hypotension. Bronchial smooth muscle relaxation associated with action on beta adrenergic receptors helps to relieve bronchospasms, wheezing, and dyspnea that may occur during anaphylaxis. | IVs administration is not recommended for routine clinical cases. Epinephrine is contraindicated in patients with narrow-angle glaucoma, hypersensitivity to epinephrine, non-anaphylactic shock, during general anesthesia with halogenated hydrocarbons or cyclopropane, during labour and in cardiac dilatation or coronary insufficiency. Epinephrine should not be used in cases where vasopressor drugs are contraindicated. It should not be injected with local anaesthetics into small appendages of the body due to risk of necrosis. |  |
| Tetanus Antitoxin | Dose: 1500 units  A 5mL vial contains 1500 units. | Systemic passive immunizing agent. | Neutralizes the toxin produced by *Clostridium tetani* before it is transported to the nervous system via the circulation. It can also neutralize toxin locally and prevent its systemic absorption. Thus, antitoxin can be given locally, at the site of toxin production, intravenously (in severe cases), and intramuscularly (in less severe cases) |  | Risk of anaphylactic reaction | Meat: 21 days |
| Atropine |  | Antimuscarinic agent | Competitively inhibits acetylcholine (and other cholinergic stimulants) at postganglionic parasympathetic neuroeffector sites. Additionally, with high doses, nicotinic receptors may be blocked at neuromuscular junctions and autonomic ganglia. |  |  | Antimuscarinic use  Meat: 14 days  Milk: 3 days  When used as an antidote🡪  Meat:28 days  Milk: 6 days |