NOW AVAILABLE FROM DECHRA VETERINARY PRODUCTS:

VETIVEX™ Hartmann’s Solution
For Injection in 1000mL and 5000mL Bags

What is VETIVEX Hartmann’s?
VETIVEX Hartmann’s Solution for Injection is a sterile, nonpyrogenic, isotonic crystalloid solution for fluid and electrolyte replenishment. VETIVEX Hartmann’s has an electrolyte profile similar to Lactated Ringer’s Solution. Lactated Ringer’s Solution (LRS) is a modification of Hartmann’s Solution and many references discuss their clinical use and clinical effects as if they are the same, including DiBartola’s textbook on fluid therapy. Both VETIVEX Hartmann’s Solution and LRS are balanced electrolyte solutions, with electrolyte profiles similar to plasma, that also contain lactate.

How does VETIVEX Hartmann’s compare to LRS commonly sold in the United States?
VETIVEX Hartmann’s has a slightly higher concentration of sodium, potassium, calcium, chloride and lactate. The osmolarity is very similar.

<table>
<thead>
<tr>
<th></th>
<th>Vetivex Hartmann’s Solution (mEq/L)</th>
<th>Lactated Ringer’s (mEq/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>131</td>
<td>130</td>
</tr>
<tr>
<td>Potassium</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Calcium</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Chloride</td>
<td>111</td>
<td>109</td>
</tr>
<tr>
<td>Lactate</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>Osmolarity</td>
<td>278 mOsmol/Liter</td>
<td>273 mOsmol/Liter</td>
</tr>
</tbody>
</table>

Why does VETIVEX Hartmann’s contain lactate?
The addition of lactate helps address conditions of metabolic acidosis by mimicking the body’s normal level of bicarbonate ion and providing the body with a readily available source of bicarbonate. Metabolism of lactate by the liver consumes hydrogen ions and generates bicarbonate, and thus has an alkalinizing effect.
Are the contraindications and precautions the same with VETIVEX Hartmann’s as for LRS?
Yes, the same contraindications and precautions exist with VETIVEX Hartmann’s as for LRS, due to their similar electrolyte profile and osmolality.

What infusion rate and volume should be used when administering VETIVEX Hartmann’s to a patient?
Practitioners should use the same infusion rate and volume for each individual patient as they would for LRS, based on the individual patient’s hydration, cardiovascular state, and concurrent disease states. Patients should be closely monitored during IV infusion with any fluid and the patient’s needs should be reassessed regularly.

What drugs or other fluids should not be administered through the same infusion set as VETIVEX Hartmann’s?
Just like LRS, VETIVEX Hartmann’s should not be run through the same infusion set as blood products. The calcium in both LRS and VETIVEX Hartmann’s can cause clotting and the possible development of microthrombi.

Based on experience from human medicine, some drugs should not be mixed with Hartmann’s Solution. These include drugs containing oxalate, phosphate or carbonate/bicarbonate. Veterinarians should only add drugs to VETIVEX Hartmann’s if they are sure they are safe to mix. Incompatibility has been reported with novobiocin sodium, oxytetracycline hydrochloride, sodium bicarbonate, sodium calcium edetate, and sulphadiazine sodium when mixed with Hartmann’s Solution.

Dechra Veterinary Technical Services
24 hr. support available at (866) 933-2472 or contact us at support@dechra.com for non-urgent questions or concerns.

VETIVEX™ Hartmann’s Solution
For Injection in 1000mL and 5000mL Bags
1. Prior to opening the protective outer bag, check for leaks and damage. Make sure the fluid is clear and the expiration date hasn’t passed already. Double check it is the correct fluid to be administered.

2. Warm the fluid bag to body temp, if desired.

3. Remove the outer protective sleeve from the bag.

4. If any medication is to be added to the bag:
   - Check that medication is compatible.
   - Clean injection port with alcohol. Insert needle and syringe (with medication) and inject into fluid.

5. Thoroughly mix the medication and fluid.

6. Insert the spike on administration set into the fluid bag.

7. Squeeze chamber on administration set until half full. Allow fluid to run through administration set to the end to remove air bubbles. Close control flow mechanism on administration set.

8. Vetivex fluid is now ready to be administered intravenously to the patient.

9. Infusion rate to be calculated as to patient’s requirements.
   - Make sure any unused fluid is discarded.
   - Vetivex is single use only.

10. Patients should be re-evaluated periodically to assess for any change in their fluid needs.
    - The faster the administration rate, the more often they must be evaluated.

11. Early signs of overhydration include:
    - Serous nasal discharge
    - Nausea and/or vomiting
    - Restlessness
    - Increased respiratory rate/effort
    - Increased heart rate
    - Polyuria (if kidney function is normal)

Calculating fluid requirements: Maintenance + Hydration deficit + Ongoing losses
1. Maintenance requirements: (40-60mL/kg/day)
   Note: this includes normal urine output (sensible losses) and insensible losses through respiration, skin, & feces.
2. Hydration deficit: Body weight (kg) x % of dehydration as a decimal = deficit in liters
3. Contemporary (ongoing) losses: e.g. vomiting, diuresis, polyuria

DRIP RATE
ADULT SET (10 drops/mL)  PEDIATRIC SET (60 drops/mL)

<table>
<thead>
<tr>
<th>mL/hr</th>
<th>drops/min</th>
<th>mL/hr</th>
<th>drops/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>60</td>
<td>600</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>120</td>
<td>1200</td>
</tr>
<tr>
<td>30</td>
<td>300</td>
<td>180</td>
<td>1800</td>
</tr>
</tbody>
</table>

PHYSICAL FINDINGS IN DEHYDRATION

<table>
<thead>
<tr>
<th>PERCENT DEHYDRATION</th>
<th>CLINICAL SIGNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>Not detectable</td>
</tr>
<tr>
<td>5-6</td>
<td>Subtle loss of skin elasticity</td>
</tr>
<tr>
<td>6-8</td>
<td>Definite delay in return of skin to normal position</td>
</tr>
<tr>
<td>10-12</td>
<td>Tented skin stands in place</td>
</tr>
<tr>
<td>12-15</td>
<td>As above, plus signs of shock (tachycardia, cool extremities, rapid and weak pulses, prolongation of CRT). Death may be imminent.</td>
</tr>
</tbody>
</table>

COMBINED INTERPRETATION OF PCV AND TS/TP

<table>
<thead>
<tr>
<th>PCV(%)</th>
<th>TS / TP</th>
<th>INTERPRETATION OF PCV AND TS/TP</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ ↑</td>
<td>↑</td>
<td>DEHYDRATION</td>
</tr>
<tr>
<td>↑</td>
<td>N or ↓</td>
<td>Splenic contraction; polychromatophasia; DEHYDRATION + hypoproteinemia</td>
</tr>
<tr>
<td>N ↑</td>
<td></td>
<td>Hyperglobulinemia; anemia + dehydration</td>
</tr>
<tr>
<td>N N</td>
<td></td>
<td>Normal; DEHYDRATION + anemia + hypoproteinemia; acute hemorrhage</td>
</tr>
<tr>
<td>↓ N</td>
<td></td>
<td>Anemia (nondiabetes) + normal hydration</td>
</tr>
<tr>
<td>↓ ↑</td>
<td></td>
<td>Anemia; DEHYDRATION; anemia + hypoproteinemia</td>
</tr>
<tr>
<td>↓ ↓</td>
<td></td>
<td>Blood loss; anemia + hypoproteinemia; overhydration</td>
</tr>
</tbody>
</table>

Setting up an administration set

1. Prior to opening the protective outer bag, check for leaks and damage. Make sure the fluid is clear and the expiration date hasn’t passed already. Double check it is the correct fluid to be administered.

8. Vetivex fluid is now ready to be administered intravenously to the patient.

9. Infusion rate to be calculated as to patient’s requirements.
   - Make sure any unused fluid is discarded.
   - Vetivex is single use only.

10. Patients should be re-evaluated periodically to assess for any change in their fluid needs. The faster the administration rate, the more often they must be evaluated.

11. Early signs of overhydration include:
    - Serous nasal discharge
    - Nausea and/or vomiting
    - Restlessness
    - Increased respiratory rate/effort
    - Increased heart rate
    - Polyuria (if kidney function is normal)

Courtesy of Dez Hughes BVSc, MRCVS, Dip AVECC
Hartmann’s Solution for Injection

For Animal Use Only

Description: Hartmann’s Solution is a sterile, nonpyrogenic solution for fluid and electrolyte replenishment in single dose containers for parenteral administration. It contains no antimicrobial agents.

Each 100 ml of solution contains:
- Sodium chloride 600 mg
- Sodium lactate 317 mg
- Potassium chloride 40 mg
- Calcium chloride dihydrate 27 mg

<table>
<thead>
<tr>
<th>Electrolyte concentrations</th>
<th>mmol/L</th>
<th>mEq/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>131</td>
<td>131</td>
</tr>
<tr>
<td>Potassium</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Calcium</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Chloride</td>
<td>111</td>
<td>111</td>
</tr>
<tr>
<td>Lactate</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

Clinical Pharmacology: Hartmann’s Solution has value as a source of water and electrolytes. It is capable of inducing diuresis depending on the clinical condition of the patient.

Hartmann’s Solution produces a metabolic alkalizing effect. Lactate ions are metabolized ultimately to carbon dioxide and water, which requires the consumption of hydrogen cations.

Indications and Usage: Hartmann’s Solution is indicated as a source of water and electrolytes or as an alkalinizing agent.

Warnings: Do not administer to horses by intraperitoneal injection.

Hartmann’s Solution should be used with great care, if at all, in patients with congestive heart failure, severe renal insufficiency, and in clinical states in which there exists edema with sodium retention.

Hartmann’s Solution should be used with great care, if at all, in patients with hyperkalemia, severe renal failure, and in conditions in which potassium retention is present.

Hartmann’s Solution should be used with great care in patients with metabolic or respiratory alkalosis. The administration of lactate ions should be done with great care in those conditions in which there is an increased level or an impaired utilization of these ions, such as severe hepatic insufficiency.

Hartmann’s Solution should not be administered simultaneously with blood through the same administration set because of the likelihood of coagulation.

The parenteral administration of Hartmann’s Solution can cause fluid and/or solute overloading resulting in dilution of serum electrolyte concentrations, overhydration, congested states, or pulmonary edema. The risk of dilutional states is inversely proportional to the electrolyte concentrations of the injections. The risk of solute overload causing congested states with peripheral and pulmonary edema is directly proportional to the electrolyte concentrations of the injections.

In patients with diminished renal function, administration of Hartmann’s Solution may result in sodium or potassium retention.

Hartmann’s Solution is not for use in the treatment of lactic acidosis.

Adverse Reactions: Reactions which may occur because of the solution or the technique of administration include febrile response, infection at the site of injection, venous thrombosis or phlebitis extending from the site of injection, extravasation, and hypervolemia. If an adverse reaction does occur, discontinue the infusion, evaluate the patient, institute appropriate therapeutic countermeasures, and save the remainder of the fluid for examination if deemed necessary.

Precautions: Clinical evaluation and periodic laboratory determinations are necessary to monitor changes in fluid balance, electrolyte concentrations, and acid base balance during prolonged parenteral therapy or whenever the condition of the patient warrants such evaluation.

Hartmann’s Solution must be used with caution. Excess administration may result in metabolic alkalosis.

Do not administer unless solution is clear and seal is intact.

Reactions which may occur because of the solution or the technique of administration include febrile response, infection at the site of injection, venous thrombosis or phlebitis extending from the site of injection, extravasation, and hypervolemia.

If an adverse reaction does occur, discontinue the infusion, evaluate the patient, institute appropriate therapeutic countermeasures, and save the remainder of the fluid for examination if deemed necessary.

Dosage and Administration: As directed by a veterinarian. Dosage is dependent upon the age, weight and clinical condition of the patient as well as laboratory determinations.

Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration whenever solution and container permit.

All solutions for injection contained in plastic containers are intended for administration using aseptic technique.

Additives may be incompatible. Complete information is not available. Those additives known to be incompatible should not be used. Consult with pharmacist, if available. If, in the informed judgment of the veterinarian, it is deemed advisable to introduce additives, use aseptic technique. Mix thoroughly when additives have been introduced.

Do not store solutions containing additives. Discard unused portion.

Overdosage: In an event of overhydration or solute overload, re-evaluate the patient and institute appropriate corrective measures. See Warnings, Adverse Reactions and Precautions.

How Supplied: Hartmann’s Solution is supplied as:

<table>
<thead>
<tr>
<th>NDC Code</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>17033-482-01</td>
<td>1000 ml</td>
</tr>
<tr>
<td>17033-482-05</td>
<td>5000 ml</td>
</tr>
</tbody>
</table>

STORAGE: Exposure of pharmaceutical products to heat should be minimized. Avoid excessive heat. It is recommended the product be stored at room temperature (25°C); brief exposure up to 40°C does not adversely affect the product.

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

DISTRIBUTED BY:
Dechra Veterinary Products
7015 College Boulevard, Suite 525
Overland Park, KS 66211

Made in Northern Ireland.

For a copy of the Material Safety Data Sheet (MSDS) or to report adverse reactions call Dechra Veterinary Products at (866) 933-2472.

© 2015 Dechra Ltd.