**Rehydration Strategies for Rodents**

Date Reviewed: December 13, 2023

**I. Purpose**

This standard operating procedure (SOP) outlines best practices for the rehydration of rodents diagnosed with dehydration and ensures consistent and uniform care.

**II. Policy**

It is a LAR policy to meet or exceed all federal, state, and local regulations and guidelines and to comply with all institutional policies and procedures as they apply to the use of animals in research. All personnel must pass online animal training modules and attend applicable training in animal care and use, occupational health and safety, and equipment operation before performing activities outlined in this SOP. Animal housing rooms should be entered using appropriate personal protective gear for the species and disease or hazard containment level.

**III. Dehydration**

Dehydration is the loss of water and minerals (salts) essential for normal bodily function. Dehydration occurs when the body loses more fluid than it takes in, either from:

1. Fluid loss due to diarrhea, in some species cases – vomiting, medications (such as diuretics that increase urine output), or
2. Reduced fluid intake – vaccines/medications that induce a profound inflammatory effect{immune stimuli} or illness that causes the animal to become too ill to reach water or the inadvertent lack of drinking water.
* Mild dehydration – 5% bodily fluid loss.
* Moderate dehydration – 5–10% bodily fluid loss.
* Severe dehydration – 10-15% bodily fluid loss is a life-threatening condition and requires immediate medical care.

**VI. Detecting Dehydration**

Detecting and precisely calculating the degree of dehydration on a physiologic level requires urine (increased urine specific gravity – how concentrated the urine is) and blood serum (measurement of blood electrolytes such as sodium, potassium, and bicarbonate, as well as urine biometabolites to determine kidney function).

For rodents, for the most part, we rely on physical signs to make an accurate presumptive diagnosis of dehydration. The degree of dehydration directly influences the disordered bodily response to internal and environmental stimuli. Signs of dehydration include:

* Dry bedding – no evidence of urination in the previous 12 hours
* Anorexia – a lack of appetite and body weight loss of 5 - 15% in < 48 hours (1.25 to 3.75 grams in a 25-gram mouse or 12.5 to 37.5 grams in a 250-gram rat)
* No fecal output
* The rodent may be cool to the touch
* Listlessness, lethargy, or refusal to move
* The eyes appear sunken and dry
* The rodent appears thin with a ruffled coat
* A positive “Pinch Test”, otherwise called a “Skin Turgor Test”

**Performing the Pinch Test**

Grab with your thumb and forefinger and pull the animal’s skin away from its body. A well-hydrated animal’s skin will return to a normal position within 1 second. An animal suffering from dehydration will lack elasticity and stay in a peaked position longer. A minimum of 5% dehydration must exist to elicit a positive pinch test and thus demonstrate clinical dehydration.

If the speed of return to normal position is delayed but the skin does not remain tented, the animal is moderately (5-8%) dehydrated. If the skin remains tented for more than 2-3 seconds, the animal is likely severely dehydrated (~10%) and in danger of dying.

**VII. Treatment of Dehydration**

Dehydration requires immediate fluid replacement, supportive care, and continued monitoring.

**Subcutaneous (SQ) Fluid Replacement:**

1. Calculate the fluid replacement volume for a fluid deficit using the following formula:

Body weight (grams) x % Dehydration (as a decimal value) = Fluid volume (ml)

1. Administration of SQ fluids. Replace 50% of the calculated volume immediately subcutaneously – warmed to approximately 100 degrees F - using a 25 gauge needle and an appropriately sized needle.

For a rapid approximation of the weight and volume of fluid replacement required, use the charts below. The larger the volume given SQ the slower the absorption rate of those fluids will be, therefore, divide the required volume in half and give the second volume 2 hours later.

**Mice: 5% dehydration fluid replacement calculated by the average weight of the rodent, by age.**

**Fluid Replacement For Approximately 5% Dehydration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Avg wt @ 21 Days | Avg wt @ 42 Days | Avg wt @ 56 Days | Avg wt @ > 84 Days |
| ♂ | 10 grams | 20 grams | 22 grams | ♀28 grams |
| Vol of fluids SQ | 0.5 ml | 1.0 ml | 1.1 ml | 1.4 ml |
| ♀ | 9 grams | 15 grams | 18 grams | 21 grams |
| Vol of fluids SQ | 0.45 ml | 0.75 ml | 0.9 ml | 1.05 ml |

**Fluid Replacement For Approximately 8% Dehydration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Avg wt @ 21 Days | Avg wt @ 42 Days | Avg wt @ 56 Days | Avg wt @ > 84 Days |
| ♂ | 10 grams | 20 grams | 22 grams | ♀28 grams |
| Vol of fluids SQ | 0.8 ml | 1.6 ml | 1.8 ml | 2.2 ml |
| ♀ | 9 grams | 15 grams | 18 grams | 21 grams |
| Vol of fluids SQ | 0.72 ml | 1.2 ml | 1.4 ml | 1.7 ml |

**Fluid Replacement For Approximately 10% Dehydration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Avg wt @ 21 Days | Avg wt @ 42 Days | Avg wt @ 56 Days | Avg wt @ > 84 Days |
| ♂ | 10 grams | 20 grams | 22 grams | ♀28 grams |
| Vol of fluids SQ | 1.0 ml | 2.0 ml | 2.2 ml | 2.8 ml |
| ♀ | 9 grams | 15 grams | 18 grams | 21 grams |
| Vol of fluids SQ | 0.9 ml | 1.5 ml | 1.8 ml | 2.1 ml |

*\*If giving more than 1.0 ml sq, give in 1 ml increments over several locations on the dorsum*

**Rats: 5% dehydration fluid replacement calculated by the average weight of the rat, by age.**

**Fluid Replacement For Approximately 5% Dehydration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Avg wt @ 21 Days | Avg wt @ 42 Days | Avg wt @ 56 Days | Avg wt @ > 84 Days |
| ♂ | 45 grams | 229 grams | 280 grams | 425 grams |
| Vol of fluids SQ | 2.25 ml | 11.45 ml | 14.0 ml | 21.2 ml |
| ♀ | 40 grams | 168 grams | 191 grams | 252 grams |
| Vol of fluids SQ | 2.0 ml | 8.4 ml | 9.5 ml | 12.6 ml |

**Fluid Replacement For Approximately 8% Dehydration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Avg wt @ 21 Days | Avg wt @ 42 Days | Avg wt @ 56 Days | Avg wt @ > 84 Days |
| ♂ | 45 grams | 229 grams | 280 grams | 425 grams |
| Vol of fluids SQ | 3.6 ml | 18.3 ml | 22.4 ml | 34 ml |
| ♀ | 40 grams | 168 grams | 191 grams | 252 grams |
| Vol of fluids SQ | 3.2 ml | 13.4 ml | 15.2 ml | 34 ml |

**Fluid Replacement For Approximately 10% Dehydration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sex | Avg wt @ 21 Days | Avg wt @ 42 Days | Avg wt @ 56 Days | Avg wt @ > 84 Days |
| ♂ | 45 grams | 229 grams | 280 grams | 425 grams |
| Vol of fluids SQ | 4.5 ml | 22.9 ml | 28.0 ml | 42.5 ml |
| ♀ | 40 grams | 168 grams | 191 grams | 252 grams |
| Vol of fluids SQ | 4.0 ml | 16.8 ml | 19.1 ml | 25.2 ml |

*\*If giving more than 5.0 ml sq, give in 5 ml increments over several locations on the dorsu.*

**Intraperitoneal (IP) Fluid Replacement:**

For animals experiencing 10% or greater dehydration, SQ fluids will likely not be absorbed well due to cardiovascular collapse due to shock. IP fluid administration is a better choice for rehydration provided there is no respiratory distress. It is imperative to warm fluids to normal body temperature (approximately 100° F) when IP administration is done. The following calculation must be performed with an accurate weight:

1. The volume of fluid administered IP at one time should not exceed 50% of the total blood volume of the animal. Total blood volume is estimated to be 6% of the total body weight.

[blood volume % 0.06 x body weight (grams)] x 0.50 = Fluid volume (ml)

1. Use a 25 gauge needle for mice and a 21 gauge needle for IP injection.

*\* Over-hydration may cause pulmonary edema and respiratory distress. This can be seen as rapid, labored breathing. If adverse signs are noticed, contact the AV immediately.*

**VIII. Supportive Care for Dehydrated Rodents**

After fluid therapy has been initiated:

* The rodent should be placed in a cage half on and half off a heating pad for heat support
* Heavily moistened dry food or BioServ wet food should be placed on the floor of the cage
* Ensure that readily available water is placed on the cage with an appropriate length sipper tube