

<b>CHAPTER 2</b>	<b>Thought Lab 2.1: Water Gains and Losses</b>	<b>BLM 2.1.6</b>
<b>HANDOUT</b>		

**Purpose:** Compare water consumption and loss in humans and small animals.

### Procedure

1. A water budget quantifies the amount of water an organism gains and loses through various activities. The data table below compares the daily water budget for a human and an Ord's kangaroo rat.

#### Water Budgets for a Human and an Ord's Kangaroo Rat

Water budget for a human				Water budget for an Ord's kangaroo rat			
Water gains (mL)		Water losses (mL)		Water gains (mL)		Water losses (mL)	
metabolic water	190	urine	900	metabolic water	54.0	urine	13.5
absorbed (drinking)	1045	feces	200	absorbed water total	6.0	feces	2.6
absorbed (eating)	665	evaporation (including 350 mL from breathing)	800			evaporation (including breathing)	43.9
Total water gain	1900	Total water loss	1900	Total water gain	60.0	Total water loss	60.0

Source: Bodil Schmidt-Nielsen and Knut Schmidt-Nielsen. 1951. A complete account of the water metabolism in kangaroo rats and an experimental verification. *Journal of Cellular and Comparative Physiology* Volume 38, Issue 2, Pages 165–181.

2. Calculate the percentage of the total water gain from (a) metabolic water and (b) absorbed water for a human and an Ord's kangaroo rat.
3. Calculate the percentage of the total water loss from (a) urine and (b) evaporation for each organism.



## Thought Lab 2.1: Water Gains and Losses (cont'd)

4. Compare the percentages of total water lost through evaporation for a human and an Ord's kangaroo rat. How might the Ord's kangaroo rat's nocturnal behaviour be related to its water budget?
  
  
  
  
  
  
  
  
  
  
5. The cellular respiration of different foods produces different amounts of water:
  - 1.0 g of glucose (carbohydrate) results in 0.6 g of water.
  - 1.0 g of fat results in 1.07 g of water.
  - 1.0 g of protein produces 0.4 g of water.
  - a) Assume that grain is two percent fat, 62 percent carbohydrate, 11 percent protein, and 10.4 percent free water. For how many days could the kangaroo rat's water needs be met by 1 kg of grain?
  
  
  
  
  
  
  
  
  
  
  - b) Assume that a cooked beef steak is seven percent fat, 27 percent protein, and 65.6 percent free water. For how many days could a human's water needs be met by 1 kg of beef?