A main reason that proper nutrition is so important in children is that bone growth is very sensitive to nutritional deficiencies. The most extreme form of deficiency affecting bone growth is the disease known as “rickets.” This disease is characterized by softening of bone, leading to deformity and fractures. The disease is most prevalent in “third world” countries, and the cause is a lack of calcium and vitamin D.

However, proper bone health requires more than just calcium and vitamin D. This lesson explains some of the other nutritional factors, such as magnesium and phosphorus. Students also learn that too many colas, which contain phosphoric acid, can upset the normal mineral balance and be bad for bones.
Activity for Students
1. Have students examine dietary formulations on Hill’s PetFit website.
2. Require students to compare and contrast a pet-food nutrition label with that of a human TV-dinner nutrition label.
3. If feasible, create student groups to perform a Web Quest on rickets. WebQuest instructions and a grading rubric are in the Word document file.

This exercise will help you to understand the plight of children in under-developed countries and how fortunate you are to live in this country. You should also have learned that there are solutions to problems such as this, but that the solutions are complex and involve a mixture of culture, human behavior, access to food resources, government and non-government organizations (NGOs), and food suppliers.

Summary of Lesson Content
The lesson begins with the general importance of major sources of energy for the body, and the general importance of different minerals (Calcium, Phosphorus, Magnesium) and vitamins (vitamin D) required from the diet for bone growth/development. The lesson describes how different dog-food formulations address different needs for different types of animals (young animals, aged animals, large-breed animals). Teachers can link to Hill’s Petfit website.

The lesson describes how deficiencies/excess of required vitamins/minerals or other malnutrition results in developmental orthopedic disease (specifically in large-breed dogs). Examples are given with radiographic images. It is not important at this point for the students to know exactly what the diseases are, but that they can see abnormalities in the bone and realize malnutrition is the cause.

Objectives
The students will learn:
1. How proper nutrition impacts bone development.
2. How nutritional imbalances can lead to bone disorders (developmental orthopedic disease in large-breed dogs and human rickets).