CASE TEACHING NOTES
for
"Osteoporosis: Marissa, Jeremy and Eleanor"

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INTRODUCTION
This case focuses on the physiology of bone homeostasis and methods of prevention and treatment of osteoporosis. One of the overall purposes of the case is to show students that osteoporosis is not simply a disease that afflicts elderly women. It affects men as well as women and carries both genetic and environmental risk factors. Although its prevalence increases with age and is more common in women than in men, anyone can develop this disease. This case works well in an introductory nutrition course, a bone physiology course, a pathophysiology course, or a general education course focusing on the human body and disease. It would be beneficial to precede this case by teaching your students some endocrinology so that they have some knowledge of parathyroid hormone (PTH), calcitonin, bone and calcium storage, and hormone replacement therapy.

Objectives
In working through this case study, students will learn that osteoporosis can affect anyone and that calcium is not the only factor in preventing it. It is a far more complex disease than most people realize. Students should be able to do the following upon completing the case study:

1. Accurately define osteoporosis.
2. List several risk factors for osteoporosis.
3. Describe the roles of osteoblasts and osteoclasts in bones.
4. Understand basic bone physiology and the concept of peak bone mass.
5. Explain how hormones, notably PTH, calcitonin, and estrogen, affect bone and blood calcium levels.
6. Understand that bones serve as calcium reservoirs.
7. Explain why calcium is vital to bone health.
8. Explain how vitamin D, sodium, caffeine, and alcohol affect calcium levels in the body.
9. List the best sources of calcium, in addition to dairy products and calcium supplements.
10. Explain how weight-bearing and/or resistance exercises protect and strengthen bones.
11. Understand how long-term use of glucocorticoids can increase the risk of developing osteoporosis.
12. Understand how hormone replacement therapy (HRT) can treat and/or prevent osteoporosis.
13. Know the pros and cons of HRT.
14. Know some options other than HRT available for osteoporosis.

Present the opening question to every student and allow approximately five minutes for individual brainstorming. This question was chosen because it may lead students to the assumption that only calcium affects bone health. Also, the student is unsure of who the speaker
is. The ambiguity is intentional; this way, the student does not associate the disease with a specific type of person. They soon learn from the case study that osteoporosis is an extraordinarily complex issue.

Using the blackboard, students share their questions and comments. Here are some examples of what they may come up with:

- What is osteoporosis?
- Why is calcium good for bones?
- What if a person can't have dairy products?
- Who gets osteoporosis?
- Are there any treatments?
- Is this disease genetic?
- What prevents osteoporosis?

Now that the case study is complete and critical information has been shared among the class and reinforced, each student is responsible for answering the question initially handed out at the beginning of the case study.

_I've always been told that calcium is important for strong, healthy bones. My mom says that as long as I drink milk, I won't develop osteoporosis. Is this correct? Is there anything else I can do to protect myself?_

Responses should be as detailed as possible, incorporating relevant information learned from the case. Tell the students that they should feel free to extend their research and add to their knowledge. Responses should be at least two pages in length.

**INTERNET REFERENCES**

1. Arthritis Foundation: Osteoporosis

2. Menopause Symptoms and Hormone Replacement Therapy

3. Merck Manual of Diagnosis and Therapy: Osteoporosis

4. NIH ORBD-NRC: Fast Facts on Osteoporosis
   [http://www.osteo.org/osteofastfact.html](http://www.osteo.org/osteofastfact.html)

5. NIH ORBD-NRC: Osteoporosis Overview
   [http://www.osteo.org/osteo.html](http://www.osteo.org/osteo.html)

6. Osteoporosis and Bone Physiology: Bone Physiology
   [http://uwcme.org/courses/bonephys/physiology.html](http://uwcme.org/courses/bonephys/physiology.html)
7. Osteoporosis and Bone Physiology: Clinical Features of Osteoporosis
http://uwcme.org/courses/bonephys/clinical.html

8. Osteoporosis and Bone Physiology: Estrogen
http://uwcme.org/courses/bonephys/opestrogen.html

9. Osteoporosis Society of Canada
http://www.osteoporosis.ca

10. Women's Health Initiative
http://www.nhlbi.nih.gov/whi/

Acknowledgements: This case study was developed with support from The Pew Charitable Trusts.

Image Credit: Trabecular bone architecture of a lumber spine bone biopsy of a 42-year-old male (left) vs. that of an 84-year-old woman having clinically manifested osteoporosis (right). Images used with permission, courtesy of Ralph Mueller, Ph.D., ETH Zuerich and Harvard Medical School, Boston.

Date Posted: 12/05/01 nas. Revised 03/10/03.