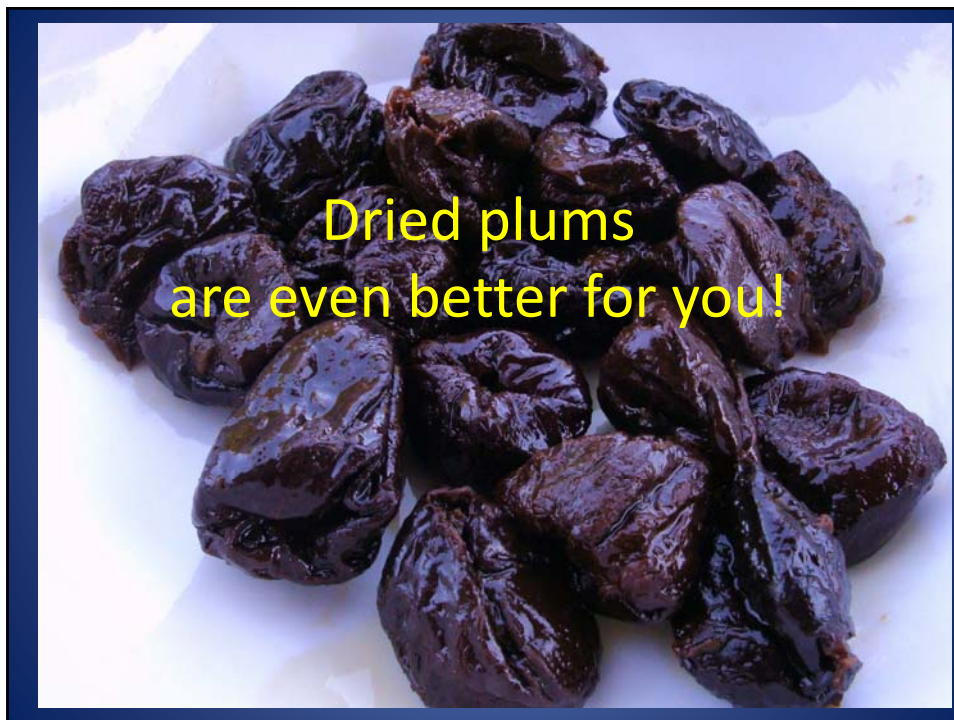


**Dried Plum:  
An Emerging Therapy for Osteoporosis**

International Prune Association Conference  
May 25-28, 2015 Sirmione, Italy

Bernard Halloran, Ph.D.  
Veterans Affairs and the  
University of California, San Francisco

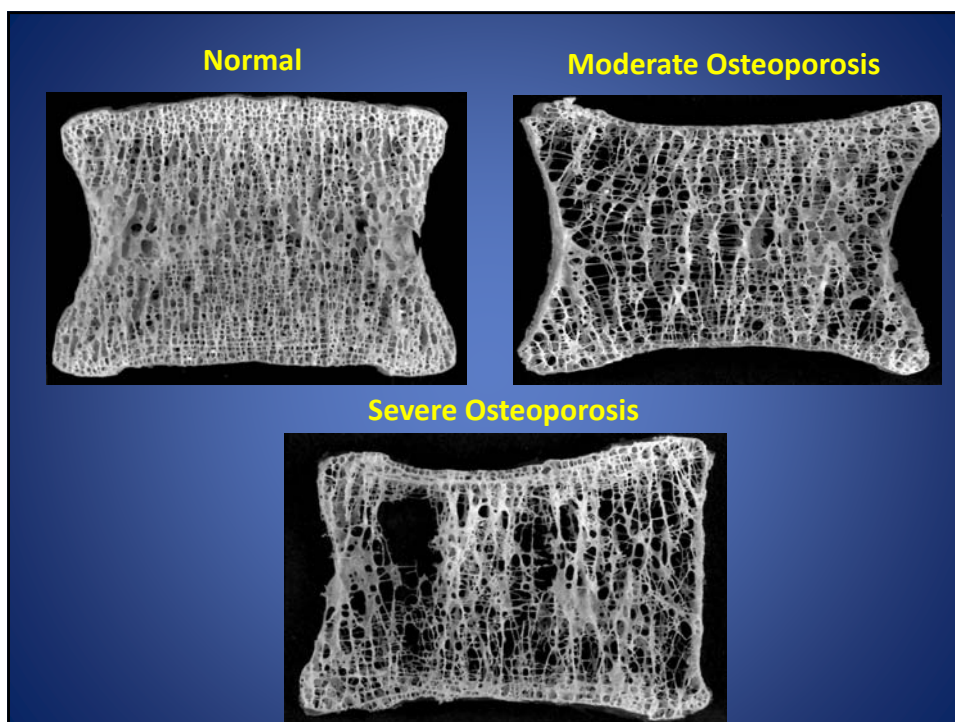




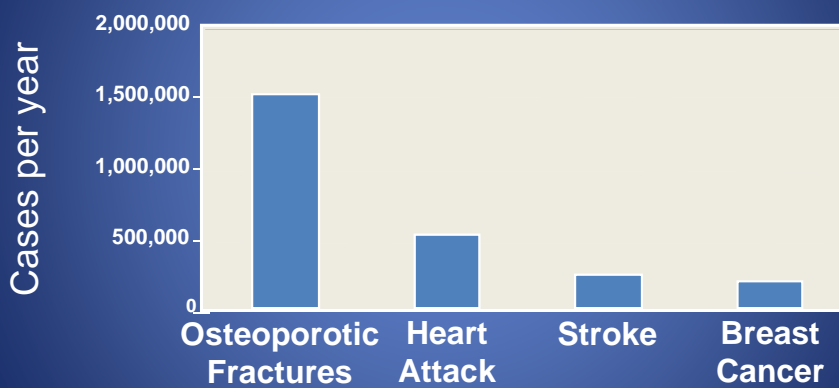
**Osteoporosis:** “A skeletal disorder characterized by decreased bone volume and increased risk of fracture”.

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Everyone, beginning around age 30, loses bone and everyone if they live long enough will experience an osteoporotic fracture.



## Annual Incidence of Common Diseases in Women



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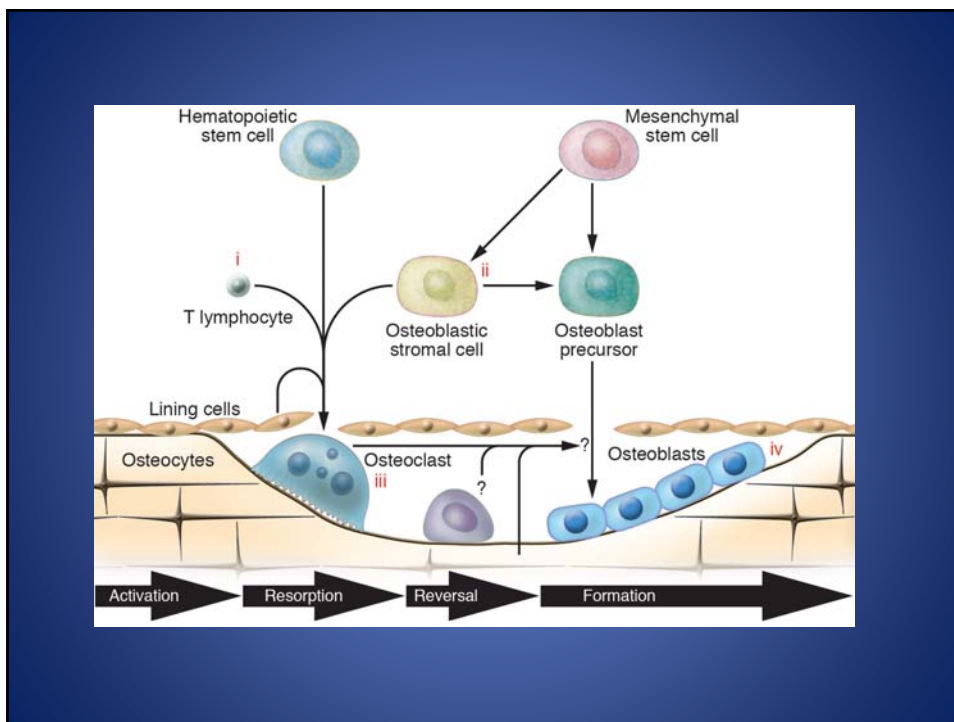
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- Two populations of stem cells in bone: MSC and HSC
- Osteoblasts (bone forming cells) arise from the MSCs
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- Osteoblasts and osteoclasts work in concert to control bone volume



## Prevalence and Costs

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- 1-2 million fractures occur each year. Annual costs exceed \$18,000,000/yr

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Only ½ of hip fracture survivors recover half their pre-fracture functional capacity. Many are confined to a wheel chair and require long term care.

## Causes of osteoporosis:

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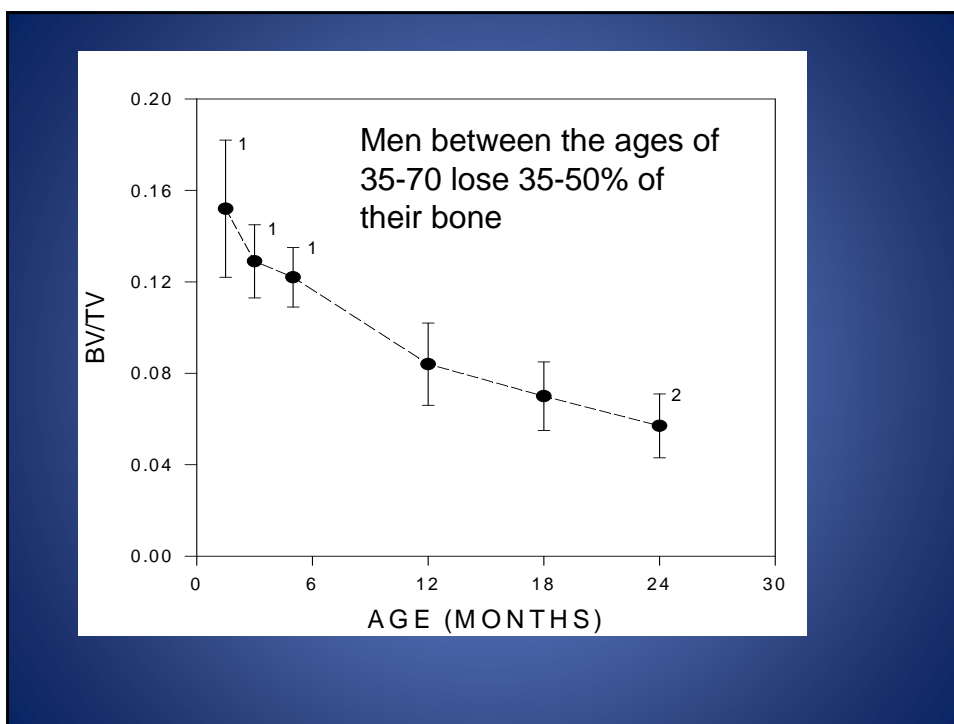
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## Causes of osteoporosis:

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- Age-related
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- Drug induced

## Therapies for osteoporosis

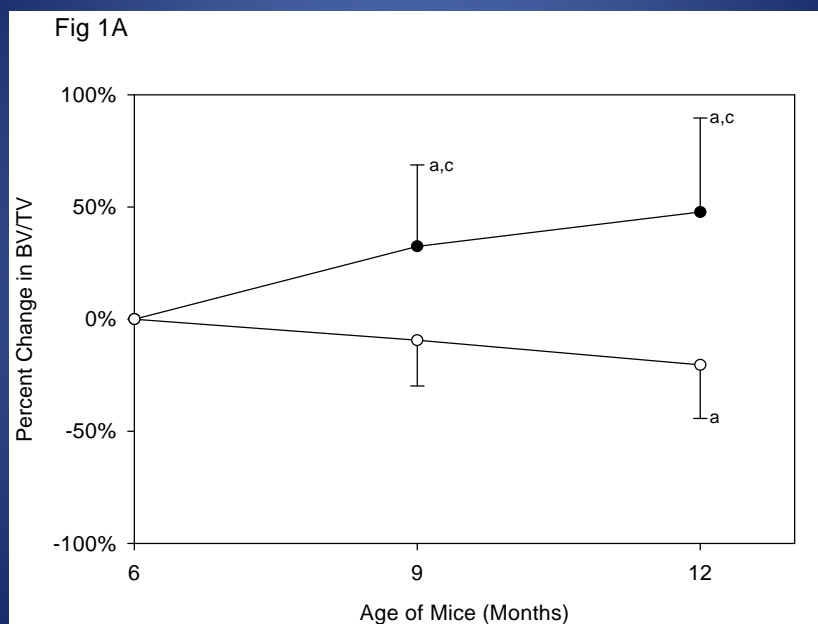
- Calcium
- Vitamin D
- Bisphosphonates (Fosamax, Alendronate, Residronate)
- Estrogen
- Prolia
- Rolaxifene
- Teriparatide



## What are the effects of plum on Age-related bone loss?

- Male mice, 6 months old (30 yr old human).
- Mice fed diets containing no plum or 25% dried plum for 6 months.
- Bone volume expressed as a percent change from baseline (6 months).

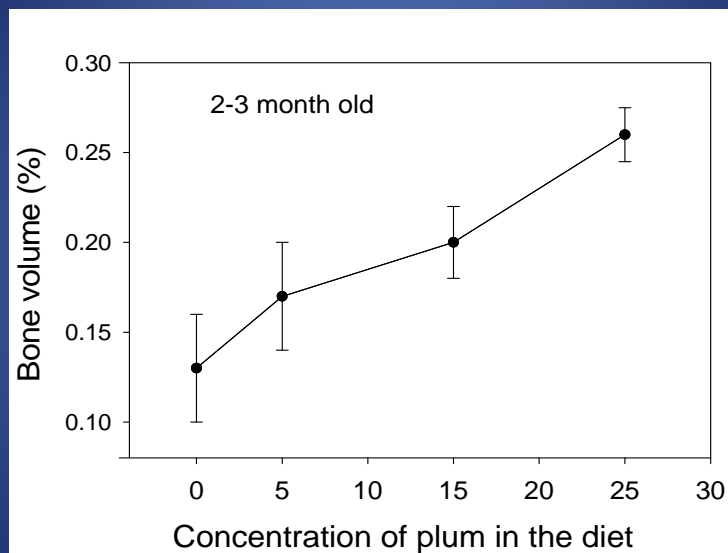
## Dietary Plum increases bone in aged mice

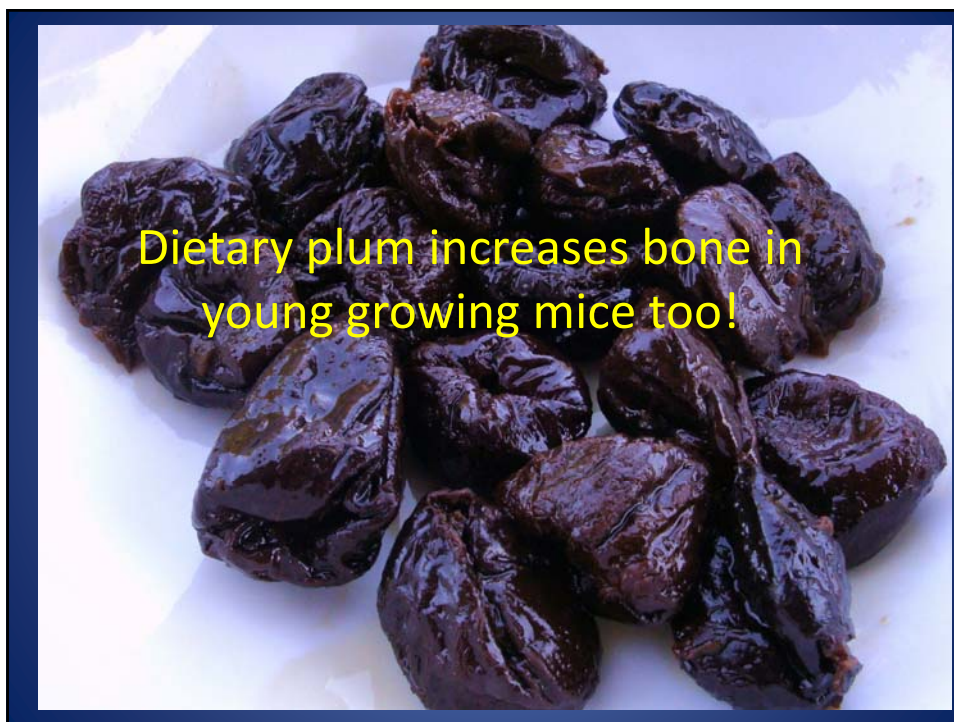


## What are the effects of plum on bone during growth?

- Male mice, 2-3 months old (15-18 yr old human).
- Mice fed diets containing no plum or diets containing 5%, 15% or 25% dried plum for 1 month.
- Measure bone volume.

### Dietary Plum increases bone in young growing mice





### Per cent increase in bone volume as a function of age in plum fed mice

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<u>Age (months)</u>	<u>% increase</u>
• 1	64%
• 2	94%
• 3	64%
• 12	78%
• 24	33%

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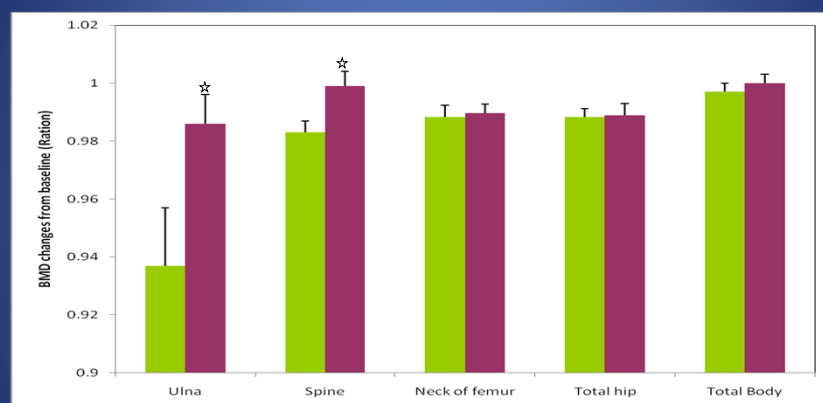
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## Effects of dietary plum on bone:

- Reduces bone loss in steroid hormone deficiency.
- Prevents bone loss with aging and can restore bone that has already been lost
- Promotes bone accrual during growth.

### BMD Changes from Baseline after One Year Consumption of Dried Apple or Dried Plum



Arjmandi and Hooshmand, Florida State University.



## How does plum work?

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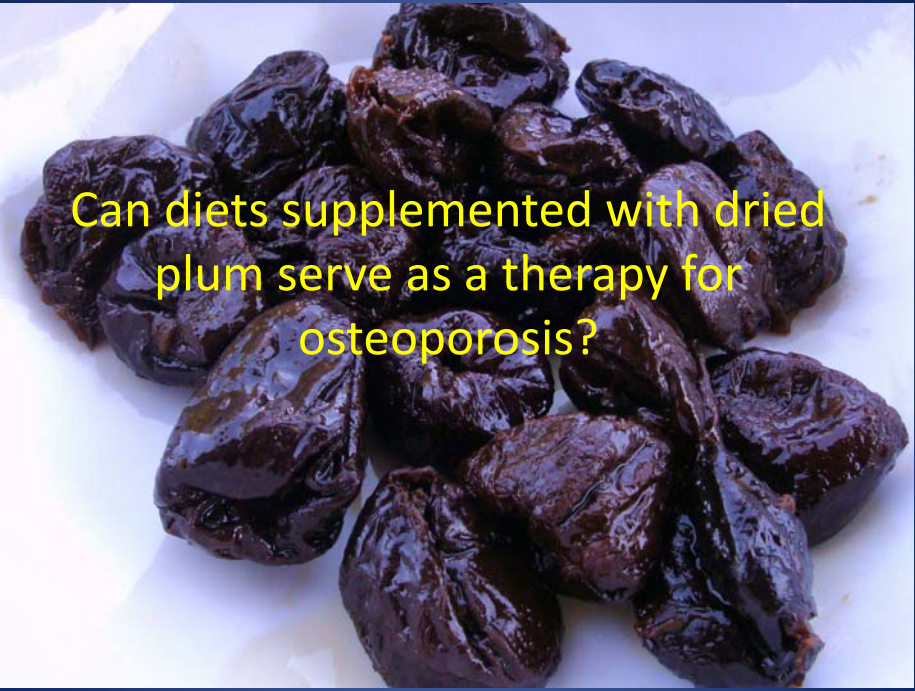
But what causes these changes in bone cells?

What's in plum? .....Polyphenols?

## Planned studies

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- Identify the active compounds in plum
- Determine how they work
- Determine whether they work in humans.



Can diets supplemented with dried plum serve as a therapy for osteoporosis?

Funding for these studies was provided by:

- The California Dried Plum Board
- Veterans Affairs Merit Review Program
- NIH

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- Mary Nakamura UCSF
- Russell Turner, OSU
- Mario Ferruzzi, Purdue
- Urszula Iwaniec, OSU

Dried plums are good for everybody!!  
So says Sadie!

