

Bone Mineral Accumulation: Preventing Stress Fractures in Adolescent Runners

An evidence-based deep dive into calcium, Vitamin D3, and energy availability to maximize bone density and prevent stress fractures during adolescence.

ACCESS

Free resource

AUDIENCE

coach / parent / athlete

READ TIME

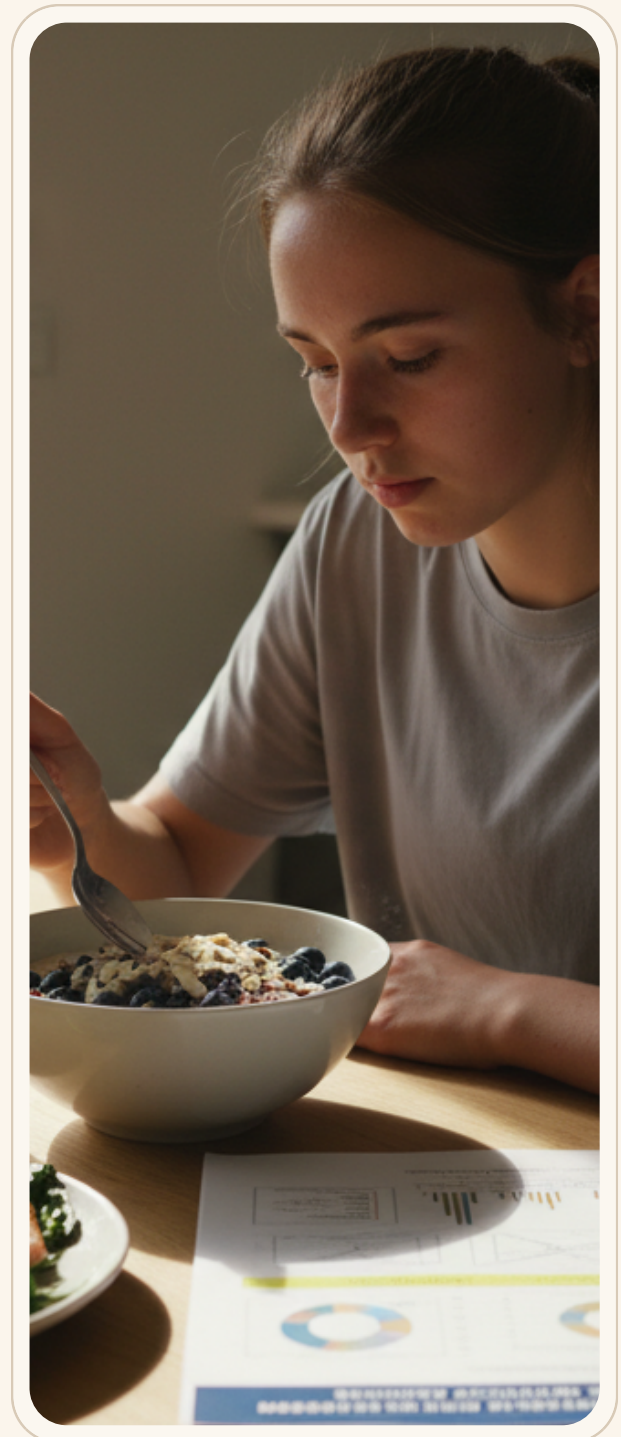
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AUDIENCE

Coach + Parent + Athlete

WHY THIS MATTERS

An evidence-based deep dive into calcium, Vitamin D3, and energy availability to maximize bone density and prevent stress fractures during adolescence.

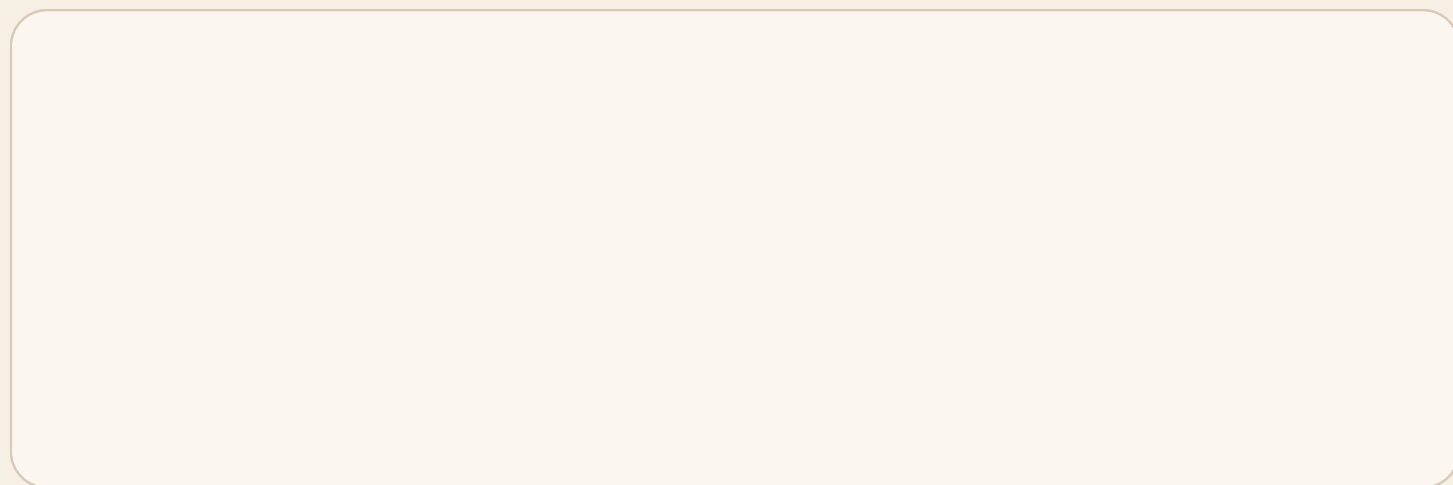


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QUICK START

Start here

An evidence-based deep dive into calcium, Vitamin D3, and energy availability to maximize bone density and prevent stress fractures during adolescence.



PEAK WINDOW

Bone is still being built during the years many runners start training hard

- Adolescence is not just a time to avoid injury. It is a time to build future resilience.
- The body needs energy, calcium, vitamin D, and hormone support to use impact well.

FUEL FIRST

Not eating enough for the training is usually the real bone problem

- Chronically low intake reduces hormone function and lowers the resources available for bone formation.
- An athlete can be committed, high-mileage, and still be eating less than the training asks for.

DAILY NUTRIENTS

Calcium is a grocery number, and vitamin D is the physician's call

- The Dietary Reference Intakes put ages 9-18 at 1,300 mg per day of calcium from food — the highest of any life stage, with a ceiling of 3,000 mg per day.
- That is three or four servings, not a heroic effort: yogurt, plain, low fat (8 ounces) carries 415 mg, milk, nonfat (1 cup) carries 299 mg, mozzarella, part skim (1.5 ounces) carries 333 mg.

What Coaches and Parents Need To Know

- Peak bone mass is still being built during the teen years.
- Running can strengthen bone, but only when energy intake keeps up with training.

- Missed periods, repeated shin pain, or another stress fracture are not "normal runner stuff."

WATCH FOR

What to watch before it becomes a crisis

Performance drop-offs, stress injuries, menstrual disruption, and persistent fatigue rarely show up as isolated issues.

- Under-fueling is often quieter than coaches expect.
- The best first move is usually a food-plus-screening conversation, not a supplement guess.
- Parents and coaches should hear the same short message.

What Actually Protects Bone

[!WARNING]

Recurrent stress fractures are a red flag for low energy availability and RED-S. Treat the reason the bone failed, not just the bone itself.

- Eat enough every day, not just on hard training days.
- Include calcium-rich foods at least 3 times daily.
- Raise vitamin D with the physician if the athlete has a stress-injury history, limited sun exposure, or a...

COACH LINE

[!WARNING]

Coach and Parent Checklist

Track 3 days of calcium intake.

Ask about menstrual regularity and recent fatigue.

Review any sudden mileage jumps, doubles, or extra workouts.

Make sure the athlete is eating after practice, not waiting until dinner.

When To Escalate

Pain that is pinpointed to one bone

Pain that worsens with running or hopping

A second stress fracture

Missed periods plus injury history

A runner who is getting "smaller" while training load increases

References

Institute of Medicine. Dietary Reference Intakes for Calcium and Vitamin D. Washington, DC: The...

National Institutes of Health, Office of Dietary Supplements. Calcium, and Vitamin D, Fact Sheets...

Holick MF, Binkley NC, Bischoff-Ferrari HA, et al. Evaluation, treatment, and prevention of...

Demay MB, Pittas AG, Bikle DD, et al. Vitamin D for the Prevention of Disease: An Endocrine...

Mountjoy M, Ackerman KE, Bailey DM, et al. IOC consensus statement on Relative Energy Deficiency...

QUICK REFERENCE

Key targets to keep in view

Use these as planning anchors when you turn the manual into weekly actions.

CALCIUM

Daily, from food first

Treat this as a decision anchor, not a trivia stat.

VITAMIN D

A physician tests and treats

Treat this as a decision anchor, not a trivia stat.

BIGGEST THREAT

Low energy availability

Treat this as a decision anchor, not a trivia stat.

COACH TAKEAWAYS

Use this with athletes

These are the cues worth repeating before the week gets busy.

- ☐ Build now: Adolescent bone gets built once. Enough food across these years is most of the strategy.
- ☐ Food beats fear: Enough total intake protects bone better than tiny perfect meals.
- ☐ No weigh-ins, no body-composition talk, and no calorie cutting for a growing runner.

- ☐ Refer, do not diagnose: Second bone stress injury: refer. Hip, groin, front of shin, top of foot, pelvis or low back: same-day care.
- ☐ Bone pain alongside cycle changes or a shrinking plate goes to a physician the same week — say all three at the visit.

WHAT TO DO NEXT

Use it this week

Who on your roster is on their second bone injury, and has anyone actually sent them to a physician?

BOTTOM LINE

Bone protection is enough food now, and a fast handoff the first time a bone complains.

RELATED TOOL

Iron protocol

Turn warning signs into action.

Source topics: Institute of Medicine. Dietary Reference Intakes for Calcium and Vitamin D. Washington, DC: The National Academies Press; 2011. • National Institutes of Health, Office of Dietary Supplements. Calcium, and Vitamin D, Fact Sheets for Health Professionals. • Holick MF, Binkley NC, Bischoff-Ferrari HA, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2011;96(7):1911-1930. • Demay MB, Pittas AG, Bikle DD, et al. Vitamin D for the Prevention of Disease: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab. 2024;109(8):1907-1947. • Mountjoy M, Ackerman KE, Bailey DM, et al. IOC consensus statement on Relative Energy Deficiency in Sport (REDs): 2023 update. Br J Sports Med. 2023;57(17):1073-1097.