

Hydration before, during, and after activity remains the cornerstone to approaching cramping in athletes

3. Diener HC, Dethlefsen U, Dethlefsen-Gruber S, Verbeek P. Effectiveness of quinine in treating muscle cramps: a double-blind, placebo-controlled, parallel-group, multicentre trial. *Int J Clin Pract* 2002; 56:243–246.
4. Jansen PH, Veenhuizen KC, Wesseling AI, de Boo T, Verbeek AL. Randomised controlled trial of hydroquinine in muscle cramps. *Lancet* 1997; 349:528–532.
5. Drug products for the treatment and/or prevention of nocturnal leg muscle cramps for over-the-counter human use; final rule. *Federal Registrar* 1994; 59:43234–43252. Available at www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcr/CFRSearch.cfm?fr=310.546. Accessed on December 9, 2004.
6. *Drug Facts and Comparisons* [book on CD-ROM]. St. Louis, Mo: Wolters Kluwer Health; 2004.
7. Joy E. Heat Illness. Sports Medicine Tip Sheet. American Medical Society for Sports Medicine. Last modified November 8, 2002. Available at www.amssm.org/Handouts/HeatIllness.pdf. Accessed on December 9, 2004.
8. Watts K, Mulder G. Heat illness. In: Richmond JC, Shahady EJ, eds: *Sports Medicine for Primary Care*. Ann Arbor, Mich: Braun-Brumfield, 1966:525–540.
9. Eicher ER. Chronic fatigue and staleness. In: Strauss RH, ed: *Sports Medicine*, 2nd ed. Philadelphia: W.B. Saunders, 1991:207–220.
10. Lisle D and Kernan M. The athlete and the outdoors: Environmental influences on sports. In: Birrer RB and O'Connor FG, eds: *Sports Medicine for the Primary Care Physician*, 3rd ed. Boca Raton, Fla: CRC Press, 2004:99–112.

CLINICAL COMMENTARY

Hydration and salt intake best approach for cramping in athletes

The use of quinine for the treatment or prevention of leg cramps in young adult athletes is not well studied. Safety and efficacy issues make it an unappealing option in the treatment of cramps and consequently it is not recommended for use in athletes. Hydration before, during, and after activity remains the cornerstone to approaching cramping in athletes. Appropriate salt intake for those who lose high concentrations of salt in their sweat may also

be useful in prophylaxis. Once cramps occur, rehydration, stretching, massage, and rest work best.

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Can type 2 diabetes be prevented through diet and exercise?

EVIDENCE-BASED ANSWER

Diets that result in long-term weight loss of 5% to 7%, along with moderate-intensity exercise for more than 150 minutes per week, reduce the incidence of type 2 diabetes for patients with impaired glucose tolerance (IGT) (strength of recommendation [SOR]: **A**, based on multiple randomized controlled trials [RCTs]). Each of the trials demonstrating this finding included fairly intensive counseling as part of the successful intervention. Diet and exercise reduce the incidence of diabetes in both lean (body mass index [BMI] <25) and overweight patients with IGT (SOR: **B**, based on a single, large RCT).

EVIDENCE SUMMARY

Three large prospective RCTs evaluated the effect of dietary and exercise interventions in populations at risk for developing diabetes.

The **Diabetes Prevention Program Research Group**¹ randomized 3234 patients age >24 years without diabetes but with IGT and a BMI >24 to 1 of 3 groups: intensive lifestyle modification, metformin, or control; they then compared the incidence of diabetes over 3 years. Patients were men and women from primary care populations and represented diverse ethnic backgrounds. Investigators defined IGT as plasma glucose of 140 to 200 mg/dL 2 hours after a 75-g glucose bolus when the fasting glucose was <140 mg/dL. Intensive lifestyle intervention comprised individual training sessions on a

TABLE

Incidence of diabetes among patients with impaired glucose tolerance participating in diet and exercise programs

Study population	Mean BMI	Intervention	Diabetes incidence*	RRR	NNT
Diabetes Prevention Program ¹ (3234 primary care patients, men and women, mixed ethnic backgrounds, various ages)	34	Control	11.0	Baseline	Baseline
		Metformin	7.8	31%	14 (over 7 years)
		Intensive lifestyle modification	4.8	58%	7 (over 7 years)
Finnish Diabetes Prevention Study ² (522 patients)	31	Control	23	Baseline	Baseline
		Intensive lifestyle modification	11	58%	5 (over 5 years)
Da Qing IGT and Diabetes Study ³ (577 primary care patients, men and women aged >25 years)	25.8	Control	15	Baseline	Baseline (all over 6 years)
		Diet	10	31%	17
		Exercise	8	46%	14
		Diet and exercise	9.5	42%	16

*Incidence of diabetes per 100 person-years.
IGT, intensive glucose control; BMI, body mass index; RRR, relative risk reduction; NNT, number needed to treat.

low-calorie, low-fat diet, aerobic exercise (such as brisk walking), and behavior modification. Case managers met with each participant for at least 16 sessions during the first 24 weeks and at least monthly thereafter. The control group received lifestyle change recommendations without individualized attention.

After 24 weeks, 50% of the lifestyle group met the 7% weight loss goal and 74% were exercising at least 150 minutes per week. At the final visit, 38% maintained their target weight and 58% met their exercise goal. Lifestyle intervention produced greater weight reduction and increased activity compared with the metformin and control groups, with a corresponding decreased incidence of diabetes (**Table**). Subgroup analysis found that lifestyle intervention produced the greatest reduction in diabetes (71%) for patients aged >60 years.

The **Finnish Diabetes Prevention Study**² similarly randomized 522 patients, aged 40 to 65 years, with IGT and obesity (mean BMI=31) to either intensive lifestyle intervention or con-

trol and followed them for 3.2 years. The lifestyle intervention included moderate exercise for at least 150 minutes per week and weight loss of at least 5%. Patients were offered an individualized exercise plan with supervised aerobic exercise plus circuit-type resistance sessions 3 times a week. Nutritionists met with patients 7 times in the first year and every 3 months after that. Patients were counseled to increase fiber intake, reduce total fat below 30% of total calories, and reduce saturated fat below 10%. The control group was given general information on diet and exercise without individualized programs. Most patients (86%) in the intervention group met their exercise goal, and 25% met the fiber requirement.

Compared with the control group, the intervention group had greater success rate for each category. Intensive lifestyle intervention reduced the incidence of diabetes by 58% (number needed to treat=5 for 5 years; see **Table**).

The **Da Qing IGT and Diabetes Study**³ divided

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Exercise was more effective in reducing diabetes in lean patients, but overweight patients also benefited

577 patients with IGT into 1 control and 3 intervention groups: diet, aerobic exercise, and combined diet plus aerobic exercise. Patients in this study had the lowest average BMI (25.8) of the 3 studies. The intervention group received individual and group counseling sessions at weekly intervals for 1 month, then monthly for 3 months, and then every 3 months. The control group received generalized information on IGT and diabetes but individual or group instruction was not included.

At the 6-year follow-up, the quantity of exercise was significantly higher in the exercise intervention groups, but no significant difference in caloric intake was seen among all 4 groups. The incidence of diabetes in the exercise intervention group was approximately half that in the control group overall (**Table 1**). Exercise was more effective in reducing diabetes in lean patients (BMI <25), but both lean and overweight patients benefited. The combination of diet plus exercise and diet changes also significantly reduced diabetes, although to a lesser degree.

RECOMMENDATIONS FROM OTHERS

The American Diabetes Association recommends structured programs that emphasize lifestyle changes, including education, reduced fat and energy intake, regular physical activity, and regular participant contact. These changes can produce long-term weight loss of 5% to 7% of starting weight and reduce the risk for developing diabetes.⁴ They also stress the importance of promoting exercise as a vital component of the prevention as well as management of type 2 diabetes. The benefit of exercise in improving the metabolic abnormalities of type 2 diabetes is probably greatest when it is used early in its progression from insulin resistance to impaired glucose tolerance to overt hyperglycemia.⁵ The

World Health Organization states that increased physical activity and maintaining a healthy weight play critical roles in the prevention and treatment of diabetes.⁶

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REFERENCES

1. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002; 346:393–403.
2. Tuomilehto J, Lindstrom J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med* 2001; 344:1343–1350.
3. Pan XR, Li GW, Hu YH, et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. *Diabetes Care* 1997; 20:537–544.
4. American Diabetes Association. Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications. *Diabetes Care* 2002; 25(Suppl 1):S50–S60.
5. American Diabetes Association. Diabetes mellitus and exercise. *Diabetes Care* 2002; 25(Suppl 1):S64–S68.
6. World Health Organization. Diet, nutrition and the prevention of chronic diseases: report of the joint WHO/FAO expert consultation. WHO Technical Report Series No. 916 (TRS 916), 2002.

CLINICAL COMMENTARY

Encourage patients to exercise and eat well, and see a dietician if they are willing

Diet and exercise are important components in the management of patients at risk for diabetes; the challenge revolves around the time and money commitment necessary for these interventions. A physician in a typical office setting has limited time to implement the interventions used in these trials. Referral to other health professionals (dietician, exercise