Which lifestyle interventions effectively lower LDL cholesterol?

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EVIDENCE-BASED ANSWER

Counseling, weight loss, exercise, and drinking alcohol all effectively lower low-density lipoprotein cholesterol (LDL-C). Specifically, one to 2 daily drinks of alcohol lowers LDL-C, if consumed regularly for more than 4 weeks (strength of recommendation [SOR]: A, based on consistent results of multiple randomized controlled trials [RCTs]).

Counseling by physicians, dieticians, or pharmacists is effective at increasing patient compliance with medications, thereby lowering LDL-C (SOR: C, good evidence that intervention lowers LDL-C, insufficient to prove that it reduces mortality/morbidity).

Weight loss has been associated with reductions in LDL-C. However, other factors – including degree of caloric restriction, drug intervention, and diet composition – may play a more significant role than weight loss alone (SOR: A, based on a meta-analysis and consistent results of RCTs).

Exercise significantly lowers LDL-C (SOR: A, based on meta-analyses and consistent results of RCTs). Smoking cessation may have a beneficial effect (SOR: B, based on inconsistent results from RCTs that it lowers LDL-C). Exercise-based alternative practices (yoga and tai chi) lower LDL, and meditation may have a beneficial effect (SOR: C, moderate evidence that intervention lowers LDL, insufficient evidence to prove that it reduces mortality/morbidity).

EVIDENCE SUMMARY

Elevated LDL-C is an independent risk factor for coronary heart disease (CHD), the leading cause of death in the US (4). Lowering LDL-C by 60 mg/dL reduces CHD events by 50% after 2 years (5). Although medications successfully lower LDL-C and decrease CHD risk, therapeutic lifestyle changes remain the initial therapy for most adult patients (3,6).

FAST TRACK
Weight loss lowers LDL-C, although some studies suggest it may be short-term.

Our search located evidence about alcohol consumption, counseling, exercise, weight loss, alternative lifestyle measures, and smoking
WHICH LIFESTYLE INTERVENTIONS EFFECTIVELY LOWER LDL CHOLESTEROL?

<table>
<thead>
<tr>
<th>LIFESTYLE INTERVENTION</th>
<th>MAGNITUDE OF EFFECT ON LDL-C</th>
<th>% REDUCTION DATA LDL-C</th>
<th>DATA SOURCES</th>
<th>SOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>4-10 mg/dL</td>
<td>4%-8%</td>
<td>4 RCTs</td>
<td>A</td>
</tr>
<tr>
<td>Counseling</td>
<td>0-58 mg/dL</td>
<td>0%-33%</td>
<td>15 RCTs, 8 CTs</td>
<td>A</td>
</tr>
<tr>
<td>Exercise</td>
<td>3-16 mg/dL</td>
<td>2.5%-4%</td>
<td>5 meta-analysis</td>
<td>A</td>
</tr>
<tr>
<td>Meditation</td>
<td>0-28 mg/dL</td>
<td>0%-19%</td>
<td>3 RCTs</td>
<td>B</td>
</tr>
<tr>
<td>Smoking</td>
<td>0-5 mg/dL</td>
<td>0%-4%</td>
<td>2 RCTs</td>
<td>B</td>
</tr>
<tr>
<td>Weight loss:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– diet, exercise, supplements</td>
<td>0-42 mg/dL</td>
<td>0%-22%</td>
<td>28 RCTs, 14 CTs, 1 meta-analysis</td>
<td>A</td>
</tr>
<tr>
<td>– drug therapy</td>
<td>10-31 mg/dL</td>
<td>11%-32%</td>
<td>4 RCTs, 2 CTs</td>
<td></td>
</tr>
<tr>
<td>Yoga/tai chi</td>
<td>20-26 mg/dL</td>
<td>15%-20%</td>
<td>2 RCTs, 1 CT</td>
<td></td>
</tr>
</tbody>
</table>

LDL-C, low-density lipoprotein cholesterol; SOR, strength of recommendation; RCT, randomized controlled trial; CT, clinical trials.

Table. A- and B-level evidence points to effectiveness of lifestyle interventions

cessation. The TABLE summarizes the evidence for each.

1 TO 2 DRINKS DAILY REDUCED LDL-C

One 5-year-long cohort study (N=933) showed that alcohol was associated with LDL-C reduction in a dose-dependent manner (7). Two crossover trials (4-6 weeks in duration) conducted among heavy drinkers showed that LDL-C increased when alcohol intake decreased. Two randomized crossover trials (8-12 weeks in duration) found a statistically significant decrease in LDL-C with consumption of 1 to 2 drinks daily.

COUNSELING IMPROVES MEDICATION ADHERENCE

An RCT (N=167) with 8 years of follow-up found that patient education and counseling effectively improved medication adherence (8). Another RCT (N=1162) lasting 1 year, however, found that nutrition counseling by primary care physicians resulted in no significant change in LDL-C compared with usual care (9).

FAST TRACK

2 clinical trials found that LDL decreased significantly with 1 to 2 alcohol drinks per day.

Studies focused on enhancing dietary compliance did not find consistent post-intervention improvement. Greater medication adherence or improved dietary compliance did result in consistent significant improvements in LDL-C.

EXERCISE LOWERS LDL; WEIGHT LOSS A FACTOR

Aerobic exercise effectively lowers LDL-C. This reduction is enhanced by weight loss and diet and mitigated by weight gain (10). An analysis of 4 RCTs showed that LDL-C also decreased with resistance training.

A higher body-mass index is associated with higher LDL-C. However, the effect of weight loss per se on LDL-C remains unclear. Multiple short-term studies have found that a modest amount of weight loss (5%-10%) is associated with a significant reduction in LDL-C (11). A meta-analysis found a 0.8 mg/dL LDL-C decrease for every kg of weight lost. Long-term follow-up, however, showed that LDL-C returned to baseline even when weight loss was maintained. Eight clinical trials failed to demonstrate a reduction in LDL-C postintervention with up to 10 kg of weight loss. Studies using weight-loss drugs (Sibutramine, Orlistat) found more significant weight loss during treatment, along with greater decrease in LDL-C, when compared with studies using only lifestyle modifications.

OTHER MEASURES HAVE MIXED RESULTS

High-quality RCTs (N=267) with yoga or tai chi as the exercise intervention showed a statistically significant decrease in LDL-C over 12 to 14 weeks (12). Two RCTs investigated the effect of meditation on LDL-C with mixed results. One (N=16) showed a significant decrease in LDL-C over 8 weeks, while a second (N=60) showed no difference in LDL-C. A high-quality RCT (N=91) with a combined intervention (counseling, exercise, and meditation over 1 year) showed a significant decrease in LDL-C.

In cross-sectional surveys, LDL-C does not appear to differ between smokers and non-smokers. One meta-analysis found a dose-dependent relationship between smoking and LDL-C, with overall LDL-C 1.7% higher for...
smokers compared with nonsmokers (13). Two RCTs investigated the effect of smoking cessation on LDL-C with mixed results. One (N=935) showed a decrease in non-fasting LDL-C while a second (N=140) showed no difference in LDL-C.

**Recommendations from Others**

According to ATP III guidelines, (3) all adults with LDL-C above goal should be treated with therapeutic lifestyle changes for primary and secondary prevention of CHD. These include a diet intervention, increased physical activity, and weight loss. Physicians are encouraged to refer patients to a nutritionist. If LDL-C is not at goal after 6 weeks, changes are intensified; physicians should consider pharmacologic therapy if a patient is still unable to attain his or her goal. ACP III guidelines recommend an office visit every 4 to 6 months to monitor adherence.

American Heart Association guidelines recommend that physicians counsel smokers at every office visit to stop smoking. The American College of Cardiology recommends abstinence from alcohol for patients with suspected alcoholic cardiomyopathy. For patients with heart failure from any other cause, alcohol consumption is usually limited to 1 drink per day.

**References**


**Additional References**

**Practices**


**Alcohol**


3. Chrysohoou C, et al. – Effects of chronic alcohol consumption on lipid levels, inflammatory and
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COUNSELING

8. Lichtman JM, et al. – Clinical trial of an educational intervention to achieve recommended cholesterol levels in patients with coronary artery disease. Am Heart J 2004; 147:522-528

EXERCISE

1. Kelley GA, Kelley KS, Tran ZV – Exercise, lipids, and lipoproteins in...
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SMOKEING


WEIGHT LOSS


11. Lucas CP, Boldrin MN, Reaven GM – Effect of orlistat added to diet (30% calories from fat) on plasma lipids, glucose, and insulin in obese patients with hypercholesterolemia. Am J Cardiol 2003; 91:961-964


19. Manley SE, et al. – Effects of three months’ diet after diagnosis of Type


34. Wadden TA, Anderson DA, Foster GD – Two-year changes in lipids and lipoproteins associated with the maintenance of a 5% to 10% reduction in initial weight: some findings and some questions. *Obes Res* 1999; 7:170-178


45. Wing RR, Jeffery RW – Effect of modest weight loss on changes in cardiovascular risk factors; are there differences between men and women or between weight loss and maintenance? *Int J Obs Relat Metab Disord* 1995; 19:67-73


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