Red Yeast Rice:

A Scientific & Regulatory Review

By Gene Bruno, MS, MHS

As a dietary supplement, red yeast rice has an impressive, but troubled history.

Impressive, because it made a big splash in the marketplace when it was first introduced as a natural cholesterol-lowering agent that really seemed to work, and troubled, because it's very effectiveness ultimately resulted in an FDA (U.S. Food and Drug Administration) action and its ultimate "neutering." This article will review the human clinical research and regulatory status of red yeast rice.

Historical Use

The first recorded use of red yeast rice (*Monascus purpureus*, Went yeast fermented on rice) was during the Tang Dynasty in 800 A.D. In a later text from the Ming Dynasty (1368-1644), red yeast rice is suggested as a mild aid for gastric problems, blood circulation, and spleen and stomach health.[1] In fact, red yeast rice has a traditional history of use as a Chinese medicinal as well as a culinary product (e.g., used in Peking duck)[2] with pigments it produces used traditionally as colorants in Asian food.[3,4] However, the claim to fame for red yeast rice is its use as an HMG-CoA reductase inhibitor.

HMG-CoA Reductase

Humans and all other mammals produce the enzyme 3-hydroxy-3-methyl-glutaryl coenzyme A reductase (HMG-CoA reductase). This enzyme is involved in the production of thousands of molecules, including cholesterol. HMG-CoA reductase inhibitors are substances that can interfere with the action of HMG-CoA reductase, including cholesterol production.[5] This is the basis for statin drugs, such as Lipitor, Torvast, Lescol, Mevacor, Crestor, Zocor, etc., which lower cholesterol levels. Studies involving yeast indicate that certain species also provide HMG-CoA reductase inhibitors[5], and modulate cholesterol biosynthesis.[6]

Human Clinical Research Review

Red yeast rice products naturally contain substances called monacolins. One of those monacolins, monacolin K, was found to be chemically identical to the statin lovastatin (Mevacor).[2] Therefore, it was not surprising that red yeast rice was found to reduce serum cholesterol levels in human research.

In an early Chinese study[7], red yeast rice was compared to simvastatin (Zocor) in 108 patients with blood fat levels. The patients were divided into two groups, with one group given 1,200 mg of red yeast rice daily, and the other group given 10 mg of Zocor daily for eight weeks. The results were that both groups experienced very similar and significant reductions in total cholesterol (23-23.3 percent), LDL cholesterol (28-29.5 percent) and triglycerides (28.1-29.5 percent). Both groups also experienced an increase in HDL (the 'good cholesterol'). In addition, the side effects of red yeast rice were less than those of Zocor. It is suggested that Xuezhikang made in China is a safe, effective and tolerable lipid modulator.

In another Chinese study[8] (multicenter, single-blind) conducted at the Beijing University of Traditional Chinese Medicine, 446 patients with high blood fats were divided into two groups, with 324 patients receiving red yeast rice and 122 patients receiving another Chinese herbal medicine, Jiaogulan (*Gynostemma pentaphylla*). After eight weeks, there were significant decreases in total cholesterol (22.7 percent) LDL cholesterol (30.9 percent) in the red yeast rice group, with only 7.0 percent and 8.3 percent reductions, respectively, in the other group. Furthermore, the red yeast rice group also had significant increases in HDL cholesterol (19.9 percent), compared to 8.4 percent in the other group. Also, red yeast rice significantly lowered serum triglycerides by 34.1 percent, compared to 12.8 percent in the other positive control group. Researchers concluded that, in conjunction with a proper diet, red yeast rice produced a favorable lipid-lowering effect.

In 1999, the first American study was conducted at the UCLA School of Medicine. It was a 12-week, double-blind, placebo-controlled study comparing the cholesterol-regulating effects of a red yeast rice (2,400 mg/day) to a placebo in 83 patients with high blood

fats. All patients consumed a diet similar to the American Heart Association Step I diet (i.e., 30 percent of calories from fat, <10 percent from saturated fat, and <300 mg cholesterol daily). The results were that total cholesterol decreased significantly in the red yeast rice group compared with the placebo group, and red yeast rice also decreased LDL cholesterol and triglycerides. The UCLA researchers concluded that red yeast rice "provides a new, novel, food-based approach to lowering cholesterol in the general population." Clearly, this study generated a lot of excitement in U.S.

There were other studies on red yeast rice, and then in 2006 a meta-analysis[9] (i.e. review and analysis of similar clinical studies) was conducted on red yeast rice research. Ninety-three randomized trials with 9,625 participants were included. Although the methodological quality of many of the studies was often low, the combined results showed significant reduction of serum total cholesterol levels, triglycerides levels and LDL-cholesterol, with an increase in HDL-cholesterol levels compared with placebo. The researchers indicated that the cholesterol-lowering effect of red yeast rice appeared to be similar to pravastatin, simvastatin, lovastatin, atorvastatin, or fluvastatin. They also indicated that more rigorous studies were needed.

After that, several other studies were conducted both domestically and internationally.[10-13] The result of all of these studies was that red yeast rice was found to effectively help lower cholesterol levels. In short, it could certainly be argued that red yeast rice was a nutraceutical with a significant body of research behind it demonstrating efficacy as a natural cholesterol-lowering agent, when providing 6-10 mg of monacolin K daily.

Regulatory Status

Given the fact that the monacolin K in red yeast rice was found to be chemically identical to lovastatin[2], there has been ongoing legal dispute between the dietary supplement industry, the pharmaceutical industry and the FDA as to whether red yeast rice should be considered a drug or dietary supplement.[14,15] Finally, in March of 2001, the United States District Court in Utah ruled that red yeast rice contains lovastatin (monacolin K) and is an unapproved drug. Consquently, any red yeast rice supplement currently on the market is only allowed to provide trace amounts of monacolin K in a daily dose, rather than the 6-10 mg shown to be efficacious. The FDA has taken measures to enforce this, on one occasion issuing a warning letter telling consumers not to buy or consume specific red yeast rice products since they may contain an unauthorized drug (lovastatin) that could be harmful to health.[16]

So does this mean that any red yeast rice product currently on the market is ineffective? Not necessarily. Despite FDA actions, some red yeast rice products tested as recently as 2011 have been found to contain substantial amounts of monacolin K; although others contained little or none of this component. The two problems with this are that: 1) there is no way of knowing which products actually contain efficacious amounts of monacolin K (for the most part, the labels on red yeast rice products indicate the amount of red yeast rice, not the amount of monacolin K), and 2) those that do contain efficacious amounts are walking a legal tightrope.

Adverse Reactions/Drug Interactions

According to some research, red yeast rice may cause some abdominal discomfort, heartburn, flatulence, headache and dizziness in certain individuals.[10,17] There are no specific studies showing drug interactions with red yeast rice. Since this nutraceutical has the same mechanism of action as lovastatin, it is possible that it may have a similar lowering effect on coenzyme Q10 as the drug.[18] Consequently, it would probably make sense to supplement with coenzyme Q10 when using red yeast rice. **VR**

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