THE FRENCH PARADOX

Wine and heart health: learning from the French paradox

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ABSTRACT

Wine with good food (albeit fatty) is an integral part of the French dietary pattern which is often called the French paradox. We note that among the inherent compounds in wine, especially red, that could confer cardioprotection, are resveratrol and melatonin. However, we do not think that drinking red wine is the sole explanation for the French paradox, whereby a rich high fat diet is associated with a lower than expected incidence of coronary heart disease. Rather, we note differences in French social behaviour – French eating is for refined pleasure and conviviality. "Food is bought, cooked, and celebrated." Gardening with the availability and love of fresh vegetables is common. This lifestyle may be the key to the French paradox which, however, seems to be a passing phenomenon as dietary patterns and passion for gardening change even in France. Recent data suggest that, after all, the French are susceptible to the same rules as are other nations. The true Mediterranean diet pattern, found only in the relatively small geographic part of the South of France, is by contrast low in fat, with little red meat and rich in fish and olive oil. Like the French diet, it emphasises fresh fruit and vegetables and includes modest wine with the meals. SAHeart 2011; 8:172-177

"Ce qu'on appelle actuellement exception est simplement un phénomène dont une ou plusieurs condition sont inconnues" (Claude Bernard: That which one calls an exception is simply a phenomenon for which one or several facts are still unknown).

The "French Paradox" is usually thought of as the apparent incompatibility of their high fat diet with a low incidence of coronary heart disease. This catchy term was appropriately invented by the wine-loving French, much as the concept of "extra virgin" olive oil was invented by the Italians.[1] Note the closely related term, "l'exception française" still part of French thinking, seemingly to justify the apparently different and possibly thought-provoking approach that the French might claim to have in attempting to solve insoluble problems.

In 1992 Renaud and de Lorgeril wrote in The Lancet and eternalised the unforgettable phrase, the "French Paradox": "In most countries, high intake of saturated fat is positively related to high mortality from coronary heart disease (CHD)." However, the situation in France is paradoxical in that there is high intake of saturated fat but low mortality from coronary heart disease (CHD). This paradox may be attributable in part to the protective effects of regular wine consumption.[1] Thus by adding wine (French wine, and note that in France wine is regarded as food and strongly linked to food) to the protection afforded by high fresh vegetables and olive oil,[2] a hypothesis with wider implication emerges: prediction of CHD involves dietary factors extending beyond the established risk factors embodied in the Framingham score.

In the popular mind, the French paradox is often interpreted as the inexplicable but legendary capacity of the French to eat all the foie gras and cheese they want, provided that fatty items are swished down with much red wine. As attractive as this concept might seem, the hypothesis that drinking red wine as the sole protective factor against a diet with apparently excess fat consumption remains to be fully proven. That alcohol consumption can be related to an overall J-shaped mortality curve is no longer in doubt, thus establishing the benefits of moderate alcohol consumption. From this is follows that teetotallers, of whom there must be at least some even in France, are actually harming themselves.

MEDITERRANEAN DIET DOES NOT EXPLAIN THE FRENCH PARADOX

It is now generally accepted that the Mediterranean diet confers health benefits and that wine with meals is part of that diet.[3] However, France is a country with major differences in the climatic areas so that where olives grow in the Mediterranean climate zone in the South is only a small part of the whole (Figure 1). From the climatic point of view, the larger part of France is simply not Mediterranean.[4]

Rather, there are three important points regarding the French food pattern. First, the diet is very varied. Diets with low diversity scores of are associated with increased coronary heart disease (CHD) mortality.[5] Secondly, the pattern of drinking is very different, in that in France wine is drunk daily and during meals and rarely alone.[4] Thirdly, devotion to food is a major part of the French culture, and choice of food is pleasure, and is not health orientated as in the USA. Who can dispute that the French are masters of the food, energetically visiting restaurants throughout the world and bestowing stringent Michelin stars? Thus the wide diversity the patterns of French food, and the French reverence for good food and wine with meals could be very important in explaining the French paradox.

FIGURE 1: Simplified presentation of the main climatic and biogeographic areas in France. Only a small part of France is Mediterranean. From de Lorgeril, et al,[4] with permission.

FRENCH CHEESES

Red wine and cheese are often together as an integral part of the French menu. The typical French cheese plate has a majority of soft white cheeses, with different fatty acid contents from the hard yellow cheeses such as the Dutch Edam cheese. An example of protective cheeses is the Swiss Alpine cheese that has a high content both of alpha-linolenic acid, the omega-3 long chain fatty acid eicosapentaenoic acid (EPA), both held to be cardioprotective. Whether the soft French cheeses such as camembert have a protective probiotic influence that in turn decreases cholesterol absorption from the gut[7] is still under investigation.

EUROPEAN COUNTRIES IN WHICH MORTALITY IS LESS THAN PREDICTED

France is among the countries bordering the Mediterranean such as Spain, Portugal, Italy and Greece, to which are added Switzerland and Belgium, in which overall cardiovascular mortality is lower than in the rest of Europe. The European Society of Cardiology states for all these countries a given severity of the major cardiovascular risk factors (age, blood pressure, total cholesterol, smoking habits, and presence or absence of diabetes) is less severe than for non-Mediterranean countries such as Germany. In reality France as a whole is certainly not Mediterranean in its dietary pattern except for the small area at its base that actually borders on the Mediterranean Ocean.[4]

Of these other countries besides France that have lower risks, only Portugal still fully adheres to the traditional Mediterranean diet[4] and keeps its mortality relatively low, with Italy and then Spain being the next best adherers with somewhat higher mortalities. Greece has slipped behind in adherence to the diet and so has mortality increased.[4] Switzerland has an extraordinary high standard of medical care to explain its lower CHD mortality. Furthermore, Swiss Alpine cheeses have a high content both of alpha-linolenic acid, thought to be cardioprotective, and the omega-3 long chain fatty acid EPA, which could help to explain the Swiss Alpine paradox.[6] Belgium and by far the larger part of France have non-Mediterranean diets rich in fatty foods but also in wine and vegetables. Thus overall, the few countries still adhering to the Mediterranean diet have explanations for their low CHD mortality, while others such as Belgium are further examples of the French paradox and Switzerland has its own Swiss Alpine paradox.

THE PASSING OF THE FRENCH PARADOX?

Even in France habits change with the times. Meals are becoming shorter and less elaborate. The famed restaurant guide, Michelin, now lists simpler restaurants offering good food and smaller menus at lower prices. Less exercise is another current trend. Traditionally, the French enjoy growing their own vegetables in their own gardens. Eating fresh vegetables plus the exercise associated with gardening may both contribute to protection against the adverse effects of the traditional high fat diet, and may help to explain the French paradox. Thus as gardening disappears, so does the French paradox weaken. And the most recent prospective population study shows that the French (or, at least, those studied) have similar cardiovascular outcomes to those calculated from traditional Framingham-based risk factor scores that are regarded as valid throughout the rest of the Western world.[10]

THE MORE MEDITERRANEAN, THE BETTER?

Although the definitions of the Mediterranean diet differ, there is now consensus that the Mediterranean-style diet is cardioprotective.[3] In France, French geography matters (Figure 1). The geographic position of living in Europe on the north-south latitude might be very important. Some data suggest that the southern part of France has a specifically low cardiovascular mortality in keeping with the Mediterranean concept. Indeed the protective effect of living in Toulouse is as strong as living in Barcelona.

ALCOHOL VS WINE

Most large scale epidemiological data on alcohol come from North America, where data seem most accurate, suggesting that there are no cardiovascular protective differences between drinking white or red wine nor between alcohol taken as wine and other sources of alcohol.[8] This viewpoint is confirmed in a large and current meta-analysis.[9] However, such analyses do not dispose of the concept of wine as part of a healthy lifestyle.[11,12]

FISH-LIKE EFFECT OF WINE

The latest development by the French group of de Lorgeril, is the concept that wine, but not specifically red wine, has a "fish-like" effect by increasing blood omega-3 fatty acid levels.[13] They found that in patients with CHD, moderate wine drinking was associated with higher blood marine omega-3 concentrations than was no alcohol use. This effect of wine comparable to that of eating fatty fish may partly explain the protective effects of wine drinking against CHD.

RED VS WHITE WINE

The red wine hypothesis argues for the specific benefits of red as opposed to white wine.[14] Red wine taken during a meal has a beneficial effect on the markers of postprandial oxidative damage resulting from fat-rich food.[15] Drinking of procyanidin-rich red wine has been linked to the longevity in the small Gers area of France.[16] However, still lacking are strict epidemiological data with mortality data and life style assessment, while taking into account the classical risk factors including blood pressure, blood lipid profiles and blood glucose values. Thus this component of the red wine story is only hypothesis-generating in the absence of good data.

The hard data suggesting that red wine has specific protective qualities are two studies on the haemodynamic effects of red wine in which de-alcoholised red wine had cardiovascular protective effects in short term studies on humans with coronary disease. Thus, 250ml of de-alcoholised Greek red wine decreased arterial stiffness and improved the augmentation index which reflects aortic stiffness.[17] In another study, healthy men drunk either red wine or de-alcoholised red wine which equally reduced circulating endothelin levels.[18] Additive data comes from dogs with stenosed coronary arteries, in whom administration of French blended red wine, apparently an almost vintage Rhone wine, Chateaux Neuf du Pape, eliminated cyclic flow reductions caused by periodic acute platelet mediated thrombus formation,[19] thus supporting the original suggestion of the inhibitory effects of wine on platelets.[1]

PATTERNS OF DRINKING. WINE VS BEER OR SPIRITS

What matters is not only what you drink but how you drink: sipping or bingeing.[20] Comparing France with Northern Ireland, the typical drinking pattern in middle aged men in France of regular and moderate alcohol intake throughout the week, was associated with a low risk of ischaemic heart disease, whereas the binge drinking pattern more prevalent in Belfast conferred a higher risk. Only wine drinking and not that of beer or spirits was associated with a lower risk of hard coronary events, irrespective of the country.

Thus the French study suggests that wine has better health qualities than beer or spirits, as supported by a Danish studies.

Gronbaek et al.[11,12] found a lower comparative mortality of wine drinkers compared with that of beer or spirits drinkers.

Looking at the relative mortality risk of subjects with all causes of deaths (cardiovascular disease, cancer, all other causes of death) and in those consuming wine, beer or spirits, moderate wine drinking (up to 21 drinks per week) decreased mortality risk. With beer drinkers there was no mortality effect though a small decrease in coronary heart disease associated with 1 to 21 drinks per week that was offset by a corresponding increase in cancer deaths.[12] With spirits, lives were lost when more than 21 drinks were consumed weekly mostly due to increased cancer.[12] Thus wine, specifically, was beneficial.

WINE AND SOCIAL CLASS

Could the difference between drinks lie in the different social class of wine drinkers, with beer drinkers being "lower" in class than wine drinkers? However, the educational level made no difference to the results.[12] More difficult to exclude was that part of the explanation for the superiority of wine might lie not so much in the benefits of the wine but in the associated diet. In a clever Danish study, the food patterns of wine versus beer drinkers were analysed.[21] Data from 98 outlets of two large Danish supermarket chains were taken from approximately 3.5 million transactions. All data were collected for inventory control, thereby providing details of which items were bought, the number and price of the items, and the total charge for each transaction. Of note those who bought wine also chose a more healthy type of food to go with their wine than did the beer drinkers. Those who in any case preferred to buy components of a good diet also chose wine rather than beer. Bearing in mind that regular modest wine with meals is an important part of the Mediterranean diet,[3] there may well be a positive interaction between wine and a healthy diet. Thus olive oil and wine are common in the Mediterranean diet, and when given together have a synergistic postprandial haemodynamic response.[22]

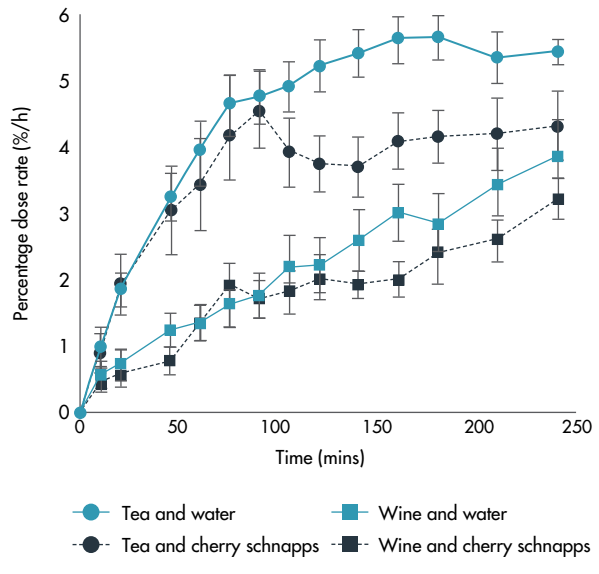

FIGURE 2: Gastric emptying measured as average percentage dose recovery of carbon 13 (standard error bars) after ingestion of cheese fondue taken with white wine or black tea followed by a shot of cherry schnapps. From Heinrich, et al. [23] (open access).

WINE AND GASTRIC EMPTYING

An interesting new concept is that wine delays gastric emptying and hence, indirectly, helps to keep the GI (Glycaemic Index) low. The wine tested was a Swiss white (Fendant du Valais) which accompanied a Swiss fondue.[23] The white wine delayed gastric emptying more than did spirits in the form of schnapps and both were more effective than black tea (Figure 2).

IN DEFENCE OF WHITE WINES

Besides delaying gastric emptying, basic experimental data raise the possibility of some specific benefits of white wine. Mukherjee, et al. (2009) worked on the concept that there are different signalling paths in small animals for infarct size reduction and for prolonged survival.[24] Experimentally, rats fed white wine had increased levels of the survival factor SirT-1, whereas those fed red wine had reduced cardiomyocyte apoptosis and infarct size. In human studies, Pinzani, et al.[25] found that both white and red wines had similar effects in increasing the total antioxidant capacity levels in blood after 2h of ingestion red or white wine blood antioxidant capacity in humans. They comment that the white wine they tested was produced by an ancient Tuscany procedure (similar to that used for red wines) which includes fermentation of the grape juice together with peels and seeds. Thus they argue that it is not only the colour of the wine that matters but the winemaking procedure that is used.

PROTECTIVE WINE COMPONENTS: RESVERATROL, MELATONIN

There are groups of organic compounds found in red wine that are thought to be cardioprotective such as the phenolic compounds.[14]

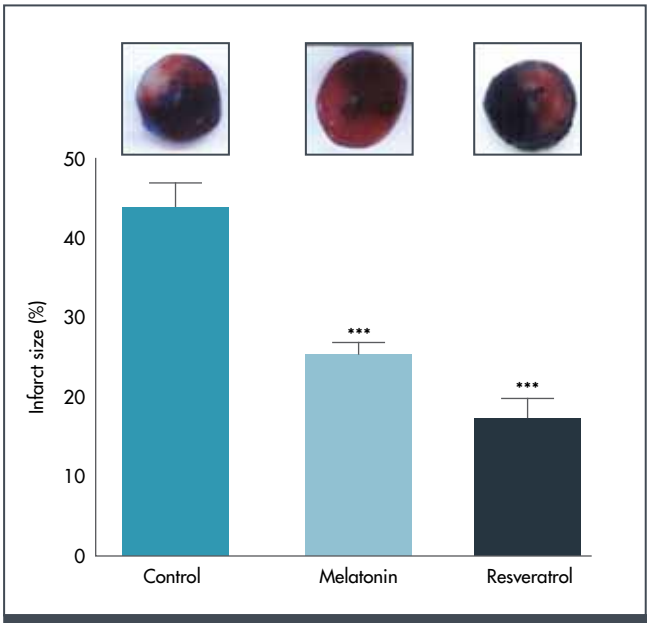

FIGURE 3: Cardioprotective agents in red wine. Acute pre-treatment with melatonin or resveratrol in concentrations found in red wine reduces infarct size in mouse model after lethal ischaemia-reperfusion injury. Slices through mouse hearts after control and or pre-treatment by melatonin or resveratrol followed ischaemia and reperfusion. Adapted from Lamont, et al.[36] with permission.

Experimentally, alcohol-free red wine limits arterial thrombosis[25] and decreases atherosclerosis.[26] Resveratrol is a well known polyphenol predominantly found in red wine that experimentally offers cardiovascular benefit (Figure 3).[14] At concentrations varying from 0.5 to 13.5mg/L in red wine, resveratrol confers anti-ischaemic effects via its antioxidant properties that act by promoting nitric oxide production, inhibiting platelet aggregation and increasing HDL levels.[28,29,30] Recently, another component that we have identified in red wine is melatonin, ranging in concentrations from 50ng/L to 200ng/L.[31] This natural compound regulates the circadian sleep rhythm in mammals and is also synthesised in various plants such as rice, soya bean and grapes.[32,33] Experimental data suggest that a high concentration of melatonin (40mg/L) confers anti-ischemic effects via its powerful antioxidant properties.[34,35]

Our studies have shown that a low concentration of melatonin (corresponding to the concentration found in red wine), protects the heart against a lethal ischaemia-reperfusion injury in a rat model (Figure 3).[36] Both melatonin and resveratrol confer cardioprotection via the activation of the recently discovered Survivor Activating Factor Enhancement (SAFE) pathway.[36] This is a prosurvival pathway involving the intrinsic activation of the innate immune system and the transcription factor, signal transducer and activator of transcription (STAT3).[37,38] Thus, we postulate that there are cardioprotective properties of complex compounds found in red wine including melatonin and resveratrol.

CONCLUSION

The French lifestyle may be the key to the French paradox which, however, seems to be a passing phenomenon as dietary patterns and passion for gardening change even in France. Recent data suggest that, after all, the French are susceptible to the same rules as are other nations. The true Mediterranean diet pattern, found only in the relatively small geographic part of the South of France, is by contrast low in fat, with little red meat and rich in fish and olive oil. Like the French diet, it emphasises fresh fruit and vegetables and includes modest wine with the meals.

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