Guest et al. [1] were pioneers in the field of blood coagulation and fibrinolysis who participated in the discovery of factor V and urokinase [1,3]. In fact, many scientists attribute the discovery of urokinase to these workers. The present author studied the effects of exercise on blood coagulation and fibrinolysis with Dr Guest. Using volunteers conditioned to a treadmill exercise regimen over a period of 1 month, we determined each subject’s maximum heart rate during exercise and then had each run for 30 min at 80% of that rate every day for 1 week. On the first day of the study, samples were taken from the subjects before and during exercise to determine clotting and fibrinolytic activities. These variables were evaluated on a weekly basis. For the duration of the study, the amount of work performed was adjusted so that volunteers continued to exercise at 80% of their maximum heart rate.

As in the study by Wallén et al. [2] in this issue of Clinical Science, we saw a dramatic increase in blood coagulation following exercise. However, at the same time we noticed an even greater increase in fibrinolytic activity. As the individuals increased their daily exercise performance and became conditioned, baseline coagulation activity (increased Lee–White clotting times, increased partial thromboplastin time) only increased slightly, while fibrinolytic activity rose markedly. Other research [4,5] has since confirmed that exercise increases fibrinolytic activity. The study by Wallén et al. [2] importantly points out the danger of thrombosis in individuals performing severe exercise. However, these findings should not discourage individuals from exercising moderately. Considering the probability that fibrinolytic activity is elevated in individuals who exercise and that the increased fibrinolytic activity is sustained, moderate activity is beneficial to good health. In fact, Ferguson and Guest [6], found that the accelerated coagulation seen in conditioned athletes may have been the result of the haemoconcentration associated with exercise. Because most people normally look for any excuse to avoid exercise, it is important to point out the cardiopulmonary benefits to be gained from moderate activity.

Wallén et al. [2] evaluated platelet function and showed significant changes in activities that were proactive for these cells as a result of exercise, adrenaline and stress. All these activities were associated with an increase in catecholamines. Consequently, the procoagulant activities could be associated with the amine. Whereas in this study subjects were exercised to the point of exhaustion, it would be interesting to note how the changes in catecholamines and platelet aggregation might be effected by milder forms of exercise such as jogging. Most exercise specialists recommend exercising at between 60% and 80% of the maximum heart rate response. This suggests much lower catecholamine levels and perhaps less of an effect on platelet function. In addition, cardiologists are now recommending that individuals take an aspirin every day to prevent atherosclerotic heart disease. Considering the relationship between platelet aggregation and the products of the cyclo-oxygenase system, perhaps having the subjects take the recommended dosage of aspirin might reverse the platelet changes noted with exercise. It is certainly hoped that Wallén et al. will consider continuing their excellent studies, which may eventually give some answers to these questions. In light of the work presented by Wallén et al. [2], one would recommend that individuals who are participating in exercise programmes, especially severe regimens, such as those used to train for marathon runs, consume large amounts of fluids and take the recommended daily aspirin tablet.

When Professor Guest and his group performed their studies, they noted major differences between baseline levels of fibrinolytic activity in individuals based on their former physical fitness. Subjects who had been very athletically inactive, were overweight and did little in the way of physical activity had very low fibrinolytic activity. When they began their physical training, these individuals’ fibrinolytic activity returned to the baseline level or higher. Consequently, the data could be interpreted to support the performance of moderate physical activity. Perhaps Dr Wallén and colleagues might address this very important issue with their future studies.

In closing, it should be pointed out that catecholamines, severe prolonged exercise and stress have a detrimental effect on the coagulation system. In addition to the platelet changes reported in the study by Wallén et al. [2], other researchers have reported accelerated coagulation caused most likely by the release of factor VIII and Von Willebrand’s factor from the vascular endothelium [7]. These effects on coagulation may be minimized by physical conditioning [8]. Others have reported favourable outcomes in the blood coagulation that are of a similar nature to those reported with catecholamine and exercise-related issues [7]. One study has shown that moderate levels of catecholamines reduced the detrimental actions of endotoxin on platelet activity [9]. In addition, moderate exercise has been reported to improve existent blood coagulation problems after myocardial
infarction [10]. Severe exercise, with or without physical conditioning, is not conducive to longevity. Moderate exercise is the key to living a longer life.

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REFERENCES