Comment

In ex-Far East prisoners of war 84% of those with strongyloidiasis have the typical rash.[1] Given also the accepted limitations of our survey, this suggests that the prevalence of 0·5% for Burma Star veterans is an underestimate. Nevertheless, even this figure means that some 100 to 200 Burma veterans in Britain today have undiagnosed strongyloides infections. Although the infection rate in ex-Japanese prisoners is much higher, doctors should also be aware of the possibility of strongyloidiasis in veterans of the Burma campaign.

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β Endorphin: A factor in "fun run" collapse?

Over the past six years 38 entrants have collapsed near the finish of Tyneside's annual Great North Run (a half marathon "fun run"). Though they represent a very small proportion of the entry, which now exceeds 25 000 a year, we find it surprising that healthy men can run until they become confused, dehydrated, hyperthermic, and hypophosphataemic[1] without first experiencing intolerable discomfort. Because endogenous opioids suppress pain, have a possible role in temperature regulation, and may be responsible for "runner's high"[2 3] the concentration of β endorphin —one of the most potent of these peptides—is worth considering as an important factor facilitating collapse during such runs.

Subjects, methods, and results

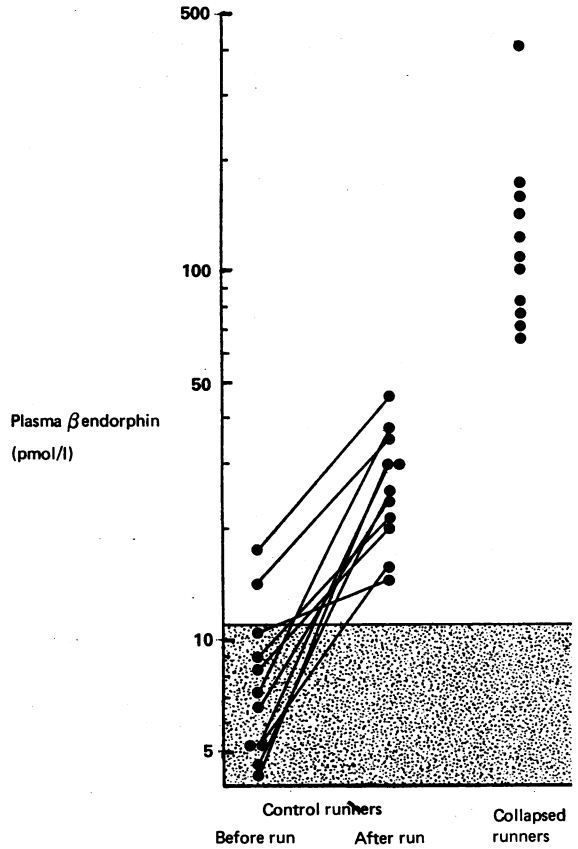
Blood samples were obtained from 11 runners who collapsed near the end of two consecutive Great North Runs and from a control group at both the start and finish of the race. Fortuitously, there were also 11 controls. Both groups comprised men of modest but previously undistinguished performance. The collapsers were aged 19-43 (median 27) and the controls 27-45 (37).

The plasma was separated immediately and stored at −20°C. As soon as was practicable after each race duplicate assays of plasma β endorphin were performed by radioimmunoassay, after immune affinity chromatography, using a method giving a cross reaction with β lipotrophin of less than 5%. The figure shows the results.

The control group had a mean β endorphin concentration of 8·4 (4·2) pmol/l before the run and 27·2 (9·7) pmol/l (SD) after the run. Two runners showed slightly increased initial concentrations, perhaps as a result of exercise or anxiety before the race. The highest control concentration after the run was 46·2 pmol/l. The collapsed group at the finish had a median β endorphin concentration of 110 pmol/l (range 66-414 pmol/l). The concentrations in the controls after the run were significantly higher than the corresponding starting concentrations ($p<0·005$, Wilcoxon signed rank test) and were themselves considerably exceeded by the concentrations found in those who collapsed during or at the finish of the race ($p<0·001$; Mann-Whitney rank sum test).

Comment

Though we cannot know the β endorphin concentrations of the runners before collapse, and they may reasonably be assumed to increase during the process of collapsing, the evidence from the control group is that the concentrations are already high before this happens. Janal *et al* showed in a double blind study that long distance runners experience hypoalgesia and "runner's high" and that these effects are associated with an increase in β endorphin concentrations and are inhibited by naloxone.[3] We suggest that the unusually high concentrations of β endorphin in those who collapsed were probably responsible for the insensitivity to pain, enabling the runner to keep going. The sense of wellbeing produced by opioid peptides may be a



Changes in β endorphin concentrations (log scale) in those who completed the half marathon and those who collapsed near the finish. ▨=Normal reference range.

factor that determines the competitor's enthusiasm for running. At times this seems to be extraordinary: of the men we studied, one had collapsed during a previous half marathon, and another, who spent considerable time in intensive care after his run, subsequently expressed the intention to continue participating in such events.

Treadmill exercise produces an increase in β endorphin concentration in both trained and untrained subjects.[4 5] Gambert *et al* found this to be much greater in men than in women.[5] Perhaps this accounts for the fact that over the past six years all of the runners who collapsed at the end of the Great North Run have been men.

Doubtless the potential collapser is caught up in the group enthusiasm that surrounds the run and is subjected to the pressures of self esteem and perhaps the knowledge that considerable sums of money given in sponsorship for charities are at risk. The important factor that enables such entrants to run until they collapse, however, is probably the high concentration of circulating endogenous opioids.

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