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To the Editor:

Regarding Dr. Cunnion's editorial "Myocardial Dysfunction in Sepsis" (Chest 1989; 95:941-44), I have considered a third postulate to account for myocardial depression in sepsis, as well as for the generalized depression in sepsis. As you noted in your editorial, the difference in oxygen content between arterial and coronary sinus blood is decreased, and extraction of oxygen in the coronary circulation is diminished. This is true of the circulation in general, and one of the first signs of sepsis is a rise in the mixed venous saturation, as indicated by the newer Swan-Ganz catheters available. This can be compared to the same effect of cyanide poisoning following prolonged sodium nitroprusside infusion. The metabolic product cyanide binds irreversibly with the cytochrome C enzyme and blocks respiration on a cellular level. Oxygen is circulated but remains unused and metabolism ultimately fails. The same kind of poisoning in this and other enzymatic systems is likely the mechanism in septic shock.

The body's response to anoxia on a cellular level is to increase cardiac output although, as you note, no matter what the cardiac output is, it will probably be inadequate for the metabolic needs of the organs and cells as the cells cannot extract the oxygen that is there. I believe the cardiovascular derangements are not the actual cause of the patient's demise in any real sense and that there is no deranged coronary flow, nor is there arteriovenous shunting in the sense that flow is bypassing the capillary bed.

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To the Editor:

As stated in our editorial, we feel that the 1985 article by Parrillo et al. does represent the first strong evidence that a circulating myocardial depressant substance (MDS) plays an important pathophysiologic role in human septic shock because it is the first study to clearly correlate, both temporarily and quantitatively, an in vivo assay of depression with an in vivo measure (ejection fraction) of myocardial depression.

Antibiotics did not account for the MDS activity since one of the control groups (the patients evaluated after recovery from sepsis) was receiving identical antibiotic regimens but had no depressant activity. Further, in a canine model of septic shock that closely simulates human disease, we have found high levels of MDS activity during cardiac depression in the absence of antibiotic therapy.

Finally, antibiotics have a molecular weight of less than 500 Daltons, whereas we have always found MDS activity to have a molecular weight greater than 500, probably greater than 10,000.

In both our editorial and the accompanying article, we cite and review the work of Drs. Carli and Lefer. As emphasized in our editorial, this work—though of interest—has largely been performed in animal models with unclear human relevance, and these studies have not related human myocardial depression to the presence of circulating depressant activity.

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Heat Stroke, Cardiac Dysfunction and Edema

To the Editor:

Zahger, Moses and Weiss (Chest 1989; 95:1089-91) have shown in two interesting cases that cardiac dysfunction and edema were present in patients whose body temperatures were elevated to approximately 40°C. Our experimental work on heat stroke in monkeys suggest a mechanism for this.1

Core temperatures elevated to 40°C were found to damage the walls of the intestines so that highly toxic bacterial lipopolysaccharide (LPS, endotoxin)—which is always present in the gut lumen—can leak into the portal vein. This LPS is carried to the liver, where some is removed and/or detoxified, and the remainder enters the systemic circulation, where it accumulates to substantial concentrations and causes vascular collapse, shock and death. An elevated plasma LPS concentration is well-known to cause pulmonary and systemic edema and cardiac dysfunction.2

Consistent with the above view, elevated plasma LPS concentrations were found in human ultramarathon runners who collapsed during a race run on a warm day.3 Those with the lowest plasma levels of natural anti-LPS IgG had the highest LPS concentrations and the most severe clinical signs. Administration of anti-LPS antibodies were protective in monkeys4 and should therefore be considered for treating patients with heatstroke. Anti-LPS antibodies are readily prepared in a blood bank.5

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University of Natal Medical School,
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