T he notions that pulmonary edema can be caused only by failure of the heart’s left ventricle, and that the occurrence of pulmonary edema incontestably establishes the presence of left ventricular failure, together comprise a system of circular reasoning that has stifled thinking for decades. However, a work published years ago 1 showed that pulmonary edema is a syndrome of many mechanisms and represents an imbalance between fluid filtration from the pulmonary capillaries and fluid reabsorption via the pulmonary lymphatics, with different factors operating on both sides of the equation under different circumstances. The critical role of pulmonary lymphatic function in regulating the occurrence of pulmonary edema has recently been re-affirmed. 2 Even in pulmonary edema due to a myocardial infarction—a situation commonly believed to represent left ventricular failure in its purest and most convincing form—physiologic studies show that left ventricular failure is a most inconstant finding. 3

Pulmonary edema occurs commonly in septic shock. In the main, theoreticians have given up attempts to explain this pulmonary edema as due to left ventricular failure. What is technically called septic shock is a state characterized—at least terminally—by low cardiac output, low peripheral arterial pressure, and high peripheral and pulmonary vascular resistance due to vasoconstriction. The condition responds poorly to treatment, including blood volume expansion. As was shown previously, hypovolemic shock may develop in febrile states under various circumstances, 4 but this is not the sort of shock under discussion here. The effect of bacterial toxins is first a hypodynamic state of brief duration, followed by a prolonged hyperdynamic state. The initial hypodynamic state, unlike septic shock, is responsive to treatment and is not accompanied by pulmonary edema. The pulmonary edema of septic shock is not merely a consequence of a hypodynamic state.

The mechanism of the pulmonary edema that occurs in septic shock is not fully known, but recent attention has been drawn to changes in the permeability of the pulmonary capillaries. Endotoxemia causes a great increase in pulmonary capillary permeability. 5,6 Recent work suggests that the pulmonary edema of sepsis is caused by a local release of oxygen radicals in the lungs and of granule-derived enzymes from the leukocytes that accumulate in the lung as a result of sepsis. The change in capillary permeability so induced is almost maximal, for when saline solution is given in endotoxemia, there is only a further small increase in transudation in the lungs, showing that the endotoxin itself causes close to maximal increases in permeability. 7 Giving homologous blood plasma in these experiments causes the same amount of increase as does giving saline solution. This latter observation, regrettably, cannot be interpreted since the plasma was "not over two weeks old," and we know that week-old plasma increases pulmonary vascular permeability. 7 At any rate, the notion that plasma (or plasma albumin solution) does not escape from the pulmonary capillaries is demonstrably wrong. The idea that these substances should be given, or can safely be given, to patients with pulmonary edema of sepsis should be re-examined.

Very little that is substantial can be said about the treatment of the pulmonary edema of sepsis. Perhaps the best starting point would be to reject the idea that it is a manifestation of cardiac dysfunction and concentrate on its possible humoral mechanisms. It is worth recalling that although antihistaminic drugs are effective in certain types of pulmonary edema, 1 they have not yet been tested in the pulmonary edema of sepsis. Giving certain prostaglandins is reported to decrease pulmonary lymph flow in sheep in which the flow was increased owing to the injection of endotoxin. 8 Until pharmacologic approaches to the problem are better studied, treatment remains unsatisfactory.

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