CHAPTER 1
INTRODUCTION

The heart and blood vessels comprise a highly complex dynamic system. Even the heart itself is a highly complex organ and when one considers the functional accomplishments of the heart, its durability is truly amazing. For example, at rest the average human heart (both ventricles) pumps about 10 L/m (2.6 gal/m).[1] At this rate, a 55-gallon barrel would be filled in 21 minutes! In a day, the right and left sides of the heart pump about 3,700 gallons, in a year, 1.4 million gallons are delivered and in a lifetime over 100 million gallons are pumped. Keep in mind that these estimates are computed for resting heart rates. During exercise, the heart can pump up to 4 to 5 times more blood than at rest. Thus, at full exercise the heart could fill a 55-gallon barrel in 4 to 5 minutes. Unbelievable!

At rest, the heart consumes about 10 W of chemical energy and outputs about 2 W of hemodynamic energy, which results in an efficiency of 20%. On the systemic side, the heart can generate about 2.5 psi of pressure under normal conditions and under stress can reach pressure levels of 5 to 7 psi. It is about the size of your fist and it weighs about 200 grams.

In summary, the heart performs impressive feats of performance over many decades. The interaction between the heart and the vasculature system is a highly dynamic and complex relationship.

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[1] **72bpm*70mL/beat*2 ventricles**