Liver failure is associated with high morbidity and mortality without transplantation. There are two types of device for temporary support: artificial and bioartificial livers. Artificial livers essentially use non-living components to remove the toxins accumulated during liver failure. Bioartificial livers have bioreactors containing hepatocytes to provide both biotransformation and synthetic liver functions. We review here the operating principles, chemical effects, clinical effects and complications of both types, with specific attention paid to bioartificial systems. Several artificial support systems have FDA marketing authorisation or are CE labelled, but the improvement they provide in terms of patient clinical outcome has not yet been fully demonstrated. At present, different bioartificial systems are being investigated clinically on the basis of their promises and capacity to provide and replace most liver functions. However, important issues such as cost, cell availability, maintenance of cell viability and functionality throughout treatment, and regulatory issues, as well as difficult challenges, including implementing cell-housing devices at the patient’s bedside on an emergency basis, have delayed their appearance in intensive care units and on the market. Bioreactors are, nevertheless, when combined with artificial components, a pragmatic approach for future treatment of liver failure.