Detailed physiological studies on the direct effects of high concentration of carbon dioxide exist only in reference to isolated parts of the nervous system and respiratory system, but little has been stressed on its actions on the isolated cardiac muscles maintained in vitro; though attention has been focussed on the cardiovascular system sporadically. The purpose of the present work is to describe the actions of high concentrations of carbon dioxide, particularly during its withdrawal phase on the cardiovascular system and to present some results on the relation between ionic fluxes and mechanical activities of cardiac muscle influenced by hypercapnia and its abrupt withdrawal. Accordingly, the present work is arranged: the background and aims of investigation are mentioned in the introduction, the available information from the literature regarding the action of hypercapnia on the different systems are arranged in the review section, and the experimental procedures adopted under different chapters are briefly described in the methodology section. Effects of hypercapnia and its withdrawal have been studied on the cardiovascular system and the cardiac muscle in particular, under individual chapters, each of which includes a brief introduction, materials and methods, results and discussion. This is followed by a section under the heading General Discussion which includes a discussion of methodological problems and a correlation of the comments arising out of the experimental results of individual chapters.