CHAPTER 7

Beta-Adrenergic Receptors in Pathophysiologic States and in Clinical Medicine

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1. Introduction

As is well documented in other chapters of this book, beta-adrenergic receptors play an important role in modulating a variety of target cell responses to catecholamines. Accordingly, there has been much speculation as to whether alterations in these receptors contribute to disease states characterized by alterations in catecholamine response. Within the past decade, radioligand binding techniques have begun to allow a direct test of such speculation. The focus of this chapter is on the application of those techniques, and available evidence regarding alterations in beta-adrenergic receptors in various disease states is reviewed (Table 1). The principal emphasis is on information available in human subjects. The use of peripheral blood cells as a means to assess beta-adrenergic receptors in humans is discussed initially, and then the various disease states listed in Table 1 are reviewed. In general, material published since a previous review on this topic by Motulsky and Insel (1982) is emphasized.
2. Beta-Adrenergic Receptors in Blood Cells

2.1. Identification of Beta-Adrenergic Receptors in Blood Cells

The application of radioligand binding techniques to the study of beta-adrenergic receptors in humans presents several problems that must be considered in evaluating data on this topic. The first problem is the relative inaccessibility of the key target cells that may preferentially express disease-related alterations in beta-adrenergic receptors. At the present time it is difficult, if not impossible, to assay beta-adrenergic-receptor expression on organs, such as heart, liver, lung, brain, and kidney, from living subjects, although these may be tissues in which alterations in receptors are most clinically pertinent. As a result, the most common approach in humans has been to use peripheral blood cells as accessible “marker cells” that may demonstrate changes that occur on other tissues (Motulsky and Insel, 1982; Insel, 1985; Insel and Motulsky, 1987). Beta-adrenergic receptors have been detected on leukocytes (including lymphocytes, monocytes, and polymorphonuclear [PMN] cells), erythrocytes, and platelets (Williams et al., 1976; Galant et al., 1978; Brodde et al., 1981; Steer and Atlas, 1982; Sager, 1983; Marinetti et al., 1983; Halper et al., 1984; Kerry et al., 1984; Cook et al., 1985, 1987; Motulsky et al., 1986; DeBlasi et al., 1986a; Szefler et al., 1987; Liggett et al., 1988; reviewed in Insel, 1985) (Table 2).