3 Recent Advances in Steroid Receptor Research: Focusing on Estrogen Receptors


3.1 Introduction

Estrogen is mainly secreted from the ovary and plays an important role in the development and maintenance of the reproductive system in the female. It mainly exerts its effect by binding to the specific receptors present in each target cell. The mode of action of the estrogen receptor (ER) is illustrated in Fig. 1. The ER waits for the incoming estrogen (the most potent physiological one being 17β-estradiol, E2) in the cell nucleus, and when this ligand comes into the cell through the cytoplasm,
the ER binds $E_2$ with a very high affinity, and then binds to a certain DNA sequence, named the estrogen responsive element (ERE) and activates the specific genes that have this element (Jensen and DeSombre 1973, Evans 1988, Green and Chambon 1988). In this sense, ER may be said to be a ligand- ($E_2$-) dependent transcription factor.

Other steroid receptors are also known, including androgen receptors (AR), progesterone receptors (PR), glucocorticoid receptors (GR), and mineralocorticoid receptors (MR), each of which is activated by its specific hormonal ligand. There are other kinds of receptor molecules too, which bind to the thyroid hormone, to vitamin D$_3$, and to retinoic acids (vitamin A derivatives), and there are also other endogenous as well as exogenous ligands which regulate various aspects of cell differentiation and function in the same manner as steroid receptors do; they all together form the large superfamily of the nuclear receptors (Mangelsdorf et al. 1995).

In this article, we will focus on ER research, with special reference to the newly discovered ERβ, which is providing a new dimension in the understanding of estrogen action.