



FIGURE 12.1 Life stages between conception and birth with associated air pollution risks from maternal and *in utero* exposures. (For color version of this figure, the reader is referred to the online version of this book.) Ref. 1.

endosulfan, and methoxychlor), polychlorinated biphenyls (PCBs), dioxins, alkylphenols (e.g. nonylphenol), plastic additives (e.g. bisphenol A, diethyl phthalate), polycyclic aromatic hydrocarbons (PAHs), and pharmaceutical hormones (e.g. 17 $\beta$  estradiol, ethinyl estradiol).<sup>4</sup>

An endocrine disrupting molecule may react with a receptor molecule on the cell's surface. This reaction may signal the feminine or masculine responses (e.g. hair growth, testis or ova development) much like a hormone would do (Figure 12.4). In other words, the EDC and the natural hormone both bind to the cell's receptor. They are both ligands, i.e. molecules that travel through the bloodstream as chemical messengers that will bind to a target cell's receptor. Or, the new polypeptide that is formed from this receptor–contaminant interaction may react with DNA in the nucleus. The former reaction

is an example of an endocrine response, while the latter may lead to mutagenicity or cancer.

One of the first EDCs heavily researched was DDT.<sup>5</sup> Throughout the 1980s, exposure to this pesticide was associated with abnormal sexual differentiation in seagulls, and thinning and cracking of bald eagle eggs.<sup>6</sup> Numerous pesticides and chemicals have been associated with endocrine related abnormalities in wildlife, including the inducement of feminine traits, such as secretion of the egg laying hormone, vitellogenin, in males of numerous fish downstream for wastewater treatment plants (likely the result of chemicals used in homes, e.g. household chemicals and drugs) that bypassed treatment.<sup>7a,7b</sup> Numerous species of aquatic and terrestrial animals are affected by EDCs.<sup>8</sup> Recently, these problems have found their way to humans, such as those exposed to halogenated compounds and