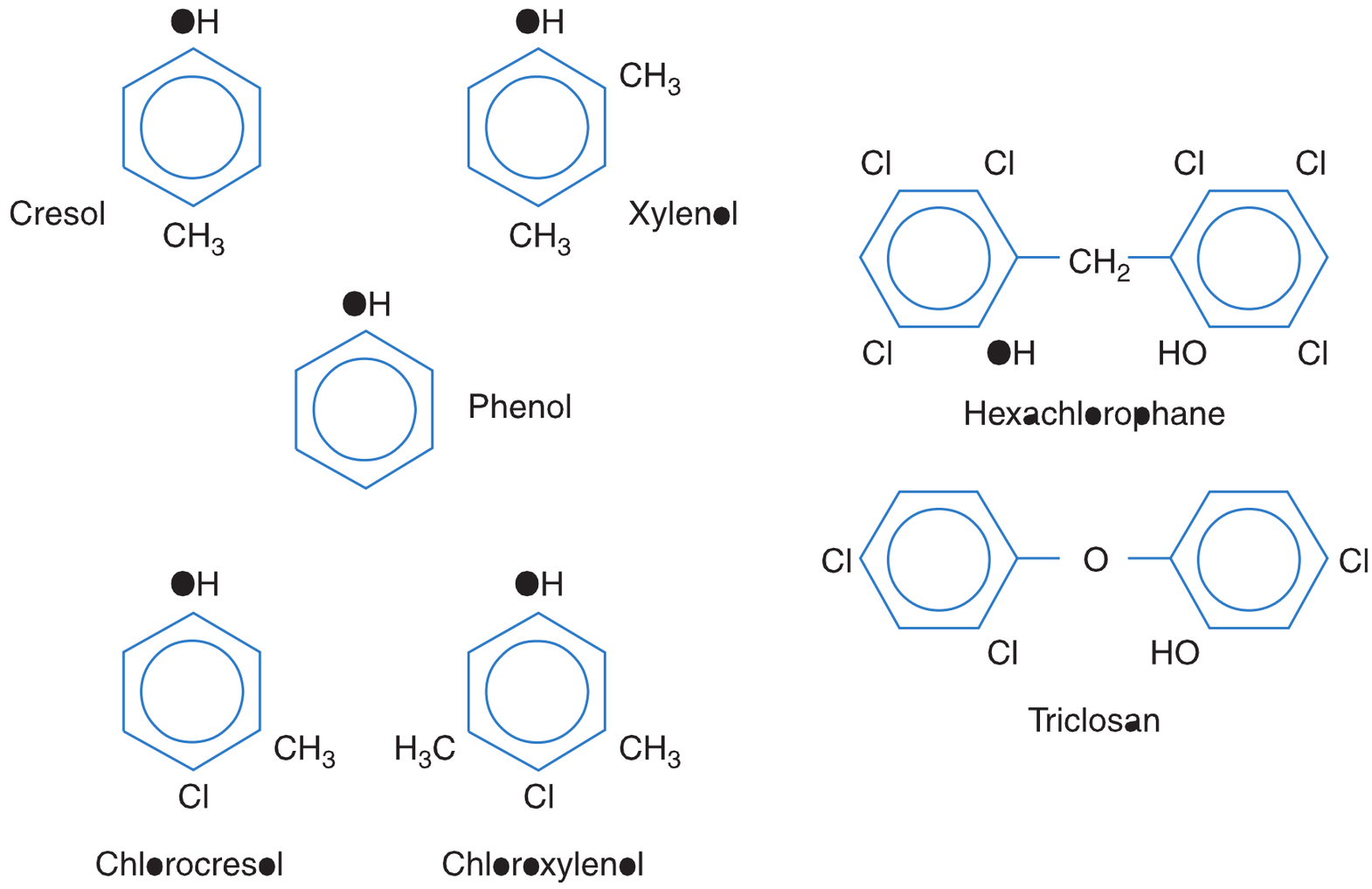

Fig. 15.4 • Chemical structures of a range of phenols.

derivatives described but have a substantive effect which makes them particularly useful as skin antiseptics. Formulated as creams, cleansing lotions or soaps, they have proved valuable in reducing postoperative infections and cross-infection. Again toxicity concerns have emerged. Consequently, hexachlorophane, for example, is restricted in the UK both in respect of the concentrations that may be employed and the type of product in which it may be used.

Phenols are generally active against vegetative bacteria and fungi, are readily inactivated by dilution and organic matter and are most effective in acid conditions. Depending on concentration, phenols may cause cell lysis at low concentrations or general coagulation of cell contents at higher concentrations.

Alcohols,.aldehydes,.acids.and.esters

Ethanol has long been used, usually as 'surgical spirit' for rapid cleansing of preoperative areas of skin before injection. It is most effective at concentrations of 60–70%. It is rapidly lethal to bacterial vegetative cells and fungi but has no activity against bacterial endospores and little effect on viruses. The effect of aromatic substitution is to produce a range of compounds which are less volatile and less rapidly active and f nd general use as preservatives, e.g. phenylethanol for eye drops and contact lens solutions, benzyl alcohol in injections, Bronopol (2-bromo-2-nitropropane-1,3-diol) in shampoos and other toiletries. Phenoxyethanol, which has good activity against *Ps. aeruginosa*, has been used as an antiseptic. In general the alcohols act by disrupting the bacterial cytoplasmic membrane and can also interfere with the functioning of specif c enzyme systems contained within the membrane.

Formaldehyde and glutaraldehyde are both powerful disinfectants, denaturing protein and destroying vegetative cells and spores. Formaldehyde is used in sterilization procedures both as a gas and as a solution in ethanol. Glutaraldehyde solutions are also used to sterilize surgical instruments.

The organic acids, sorbic and benzoic and their esters, because of their low toxicity, are well established as preservatives for food products and medicines (see Chapter 50). The exact mode of action of these agents on microorganisms is still uncertain but they have been shown to influence the pH gradient across the cell membrane. At higher concentrations, the parabens (esters of parahydroxybenzoic acid) induce leakage of intracellular constituents.

Quaternary.ammonium.compounds

The chemical formula for quaternary ammonium compounds is shown in Figure 15.5.

These cationic surface-active compounds are, as their name implies, derivatives of an ammonium