

Bifidobacterium bifidum by Holcomb et al. in 1991.

These incidences paved way for a new concept of probiotics in medicine and dentistry. [8-10]

Mechanisms of action

Probiotics

The mechanism of action vary according to the specific strain or combinations of strains used, the presence of prebiotics and the condition that is being treated, as well as the stage of the disease process in which the probiotic is administered. [11] There are common themes emerging in studies of the modes of action of probiotics and numerous mechanisms have been proposed [11,12] including:

- Inhibition of pathogen adhesion, colonization and biofilm formation
- Induction of expression of cytoprotective proteins on host cell surfaces
- Inhibition of collagenases and reduction of inflammation associated molecules
- Stimulation and modulation of the host immune system, e.g. by reducing production of pro-inflammatory cytokines through actions on NFκB pathways, increasing production of anti-inflammatory cytokines such as IL-10
- Modulation of cell proliferation and apoptosis eg. Prevention of cytokine induced apoptosis
- Killing or inhibition of growth of pathogens through production of bacteriocins or other products, such as acid or peroxide, which are antagonistic towards pathogenic bacteria.
- Probiotics can also modify the surrounding environment by modulating the pH and/or the oxidation–reduction potential, which may compromise the ability of pathogens to become established. **Prebiotics** The major mechanism of action of prebiotics is assumed to be indirect, i.e. facilitating the proliferation of beneficial components of the resident microflora. Some **388**

prebiotics also exert direct effects on the host; independent of their effects on resident bacterial populations. [13] These include stimulation of expression of IL-10 and interferon γ , enhancement

