Genetic engineering and dental caries

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Genetic engineering: also called genetic modification or genetic manipulation, is the direct manipulation of an organism's genes using biotechnology. New DNA is obtained by either isolating and copying the genetic material of interest using recombinant DNA methods or by artificially synthesizing the DNA.

Dental caries, a multifactorial disease requires four principle factors: the host, the microflora, the substrate & time for its occurrence and can be prevented or managed by elimination/modification of either of the above factors. Hence the application of genetic engineering in dental caries includes knowing the structure and function of the genome in the cell and applying genetic information to patient care.

Dental graduates should demonstrate foundational knowledge of fundamental genetic principles, including :modes of single gene inheritance, chromosomes and chromosomal abnormalities, multifactorial inheritance and the role of genetic factors in common disease, concepts of penetrance, expressivity, pleiotropism, genetic heterogeneity, mosiacism, and new mutation and phenomena of imprinting and anticipation.

The conventional preventive measure being followed for long time for the dental caries are not successful to the desirable extent due to their non avaibailaballity in the rural areas, lack of awareness & inaccessibility of dental services. Therefore, the focus has now been shifted to submicroscopic level to ensure that these measures can be reached to the farthest areas & each & every member of the population is benefitted.

The strategies by which can genetic modifying for prevent dental caries including:

- Modifying the pathogenic bacteria , particularly *Streptococcus. mutans*, with the use of various preventive measures, can reduce dental caries to a significant level.
- Searching the antagonist peptides to work against the specific enzyme system (Glucosyltransferase) of S. Mutans.
- Bio-engineering to *S. mutant* which can delete the gene encoding lactate dehydrogenase in some strain that making it entirely deficient in lactic acid production
- The effector strain BCS3-L1 was also designed to produce elevated amounts of a novel peptide antibiotic called mutacin 1140 that gives it a strong selective advantage over most other strains of *S. mutans*,in laboratory and rodent model studies. This strain was significantly less cariogenic than wild-type *S. mutans* in gnotobiotic rats, and it did not contribute at all to the cariogenic potential of the indigenous flora of conventional Sprague-Dawley rats. And, its strong colonization properties indicated that a single application of the BCS3-L1 effector strain to human subjects should result in its permanent implantation and displacement over time of indigenous, disease-causing *S. mutans* strains. Thus, BCS3-L1 replacement therapy for the prevention of dental caries is an example of biofilm engineering that offers the potential for a highly efficient, cost effective augmentation of conventional prevention strategies
- Changing the oral environment by those genetically modified organisms that will produce bases (instead of acids) & these bases provides a milieu favoring remineralization.
- modified foods can help in the prevention of caries.

Inherited disorders of tooth development with altered enamel structure increase the incidence of dental caries. Specific genetic linkage has not been determined for all of the syndromes of altered tooth development. Consequently, genetic screens of large populations for genes or mutations associated with increased caries susceptibility have not been done. Genetic linkage approaches on well-characterized populations with clearly defined dental caries incidence will be required to further analyze the relationship between inheritance and dental caries.