Advancing Pharmaceutical Nanotechnology in the Treatment of Peridontitis

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Introduction

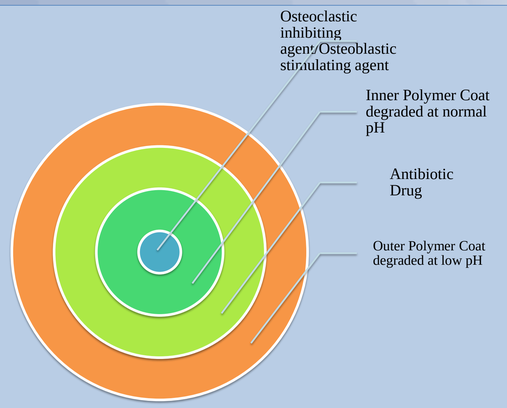
- Periodontal disease is defined as bacterially induced chronic infectious inflammatory diseases that effects the tissues that support and anchor the teeth.
- According to american academy of periodontology (AAP) periodontal diseases are classified as below in 1986.
- Type 1—gingivitis
- Type 2—early periodontitis
- Type 3 ---moderate periodontitis
- Type 4 ---advanced periodontitis
- Type 5 ---refractory and juvenile periodontitis
- Treating advanced periodontitis is still challenge to periodontics with very little change in treatment over last several decades.
- The introduction of nanoparticles in dentistry is giving new scope of application in diagnosis, treatment planning and tissue regenerative procedures

Current Treatment Options

- Nonsurgical therapy which includes eliminating etiological agents, modifying risk factors, mechanical plaque controls, chemical plaque control agents is the first line of antimicrobial therapy in treating generalized periodontitis [1].
- Recently new silver nanotechnology chemistry was proven to be effective in disrupting biofilm by interacting within bacterial cell and inactivating bacterial cell all synthesis, membrane transport, nucleic acid synthesis and translation, protein folding and electron transport [2].
- Surgical therapy consists of open flap debridement either alone or as a combination with respective or regenerative procedures [2] .
- Regenerative surgical therapy consists of bone replacement grafts, guided tissue regeneration (GTR),biologic modifiers like growth and differentiation factors (GDF) and extracellular matrix proteins like enamel matrix proteins(EMD)[2].
- Nanodrug delivery is the recent advanced system which targets on improving controlled release, patient safety, efficient delivery agent and reducing side effects .
- One of which is periodontal chip which is a pharmaceutical composition in the form of gel, sheet, film or bar placed in periodontal pocket for the purpose of treating periodontal diseases ,it releases a controlled and effective amount of active ingredients at the periodontal pocket [3].
- In advanced periodontics nonsurgical therapy may not be sufficient, It need to be treated those with regenerative surgical procedures.
- Some of these regenerative techniques have restricted usage due to their limited success predictability, high cost and technique sensitive .
- In such cases nanoparticles as a vehicle of local delivery agent has improved role in tissue regenerative therapy.
- Topical application of bisphosphonate 1%ALN(alendronate) is a beneficial adjuvant to nonsurgical periodontal therapy[4].

Future Research Scope

- Currently various approaches have followed in treating Periodontitis effectively . Nanocapsules loaded with antibiotics is also drawing attention.
- Hollow spheres, core-shell structure, nanotubules and nanocomposite can be used as periodontal drug delivery system in near future [5].
- Aresin with incorporated tetracycline was used to treat periodontal pockets[5].
- Multilayered composite nanoparticles with pH sensitive release and hydroxyapatite coating will bring tremendous scope to nonsurgical regenerative procedures[6]
- When multilayered nanocapsule is placed by local delivery system it is then degraded layer by layer releasing drug in slow controlled manner.
- Due to low pH in inflamed tissue the outer coating will degrade and release antibiotic for treating localized inflammation. However, still the nanoparticle with remaining inner layer of polymer will remain intact at low pH.
- Once the infection subsides and pH returns to normal. Which now allows the inner polymer coat to degrades and release osteoclastic inhibition agents and osteoblastic stimulating agent to correct osseous defects..
- Further research and investigation must be done to understood the design, structure, criteria required to fabricate stimuli, responsive and biofunctional multilayered composite nanoparticles.
- As the Pharmaceutical drugs advanced and Drug delivery options has become more effective with these new Nanotechnology.
- And once such approach is layer by layer nanocapsules as a multi drug delivery option.



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