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IP International Journal of Periodontology and Implantology

Journal homepage: https://www.ijpi.in/

Editorial

# Role of salicylic acid base poly anhydride esters (SAPAE) in periodontitis and periimplantitis

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ARTICLE INFO

*Article history:*
Received 30-05-2023
Accepted 19-06-2023
Available online 29-06-2023



Several polymeric and conjugated prodrugs that prolong the blood concentrations of the drug after administration when compared to the free drug administered alone have been created recently. This phenomena demonstrates the prodrugs' capacity for controlled drug release, which enables site-specific drug targeting and minimises negative effects that could result from instantaneous drug release. Two examples are Naproxen connected via lactic acid to a low molecular weight protein and salicylic acid-L-alanine conjugate, both of which considerably prolong the drug lifespan in the blood compared to free drug.

Salicylic acid has a half-life of 2-3 hours in low dosages and 20 hours in higher doses. It is an antipyretic, anti-inflammatory analgesic.The insertion of salicylic acid into a polymer backbone may result in a polymeric prodrug with potential for a range of medical treatments due to the compound's medicinal characteristics and ease of metabolism.

Building on the success of polyanhydrides, create poly(anhydride-ester)s derived from salicylic acid (SA-based PAEs), which breakdown into active drug molecules and may also serve as drug carrier matrices. Because it is a nonsteroidal anti-inflammatory medicine (NSAID) that helps cure the swelling and pain brought on by periodontal disease, salicylic acid is particularly important. Using SA-based PAEs as drug delivery mechanisms, salicylic acid and physically admixed antimicrobials that are both released following hydrolytic degradation of the polymer matrix can be delivered simultaneously. For the treatment of periodontal disease, the simultaneous administration of an antibiotic and an anti-inflammatory is of special interest.

## Salicylic acid-based poly(anhydride-ester) and periodontal applications

Erdmann et al. created a polymeric prodrug that enables a higher percentage of the drug to be delivered (62 wt%) as the polymer breaks down. These polymers are distinctive from other polymeric prodrug systems in that the drug is chemically integrated into the polymer backbone rather than attached as a side group. This design makes it possible to incorporate up to 100 weight percent of the medicine into the polymer framework. Because of the anhydride and ester connections in the polymer backbone, the polymer totally degrades, which is another characteristic. They report the creation of a poly(anhydride-ester) made of salicylic acid aromatic moieties and alkyl chains connected by ester linkages. [1]

The limited ability of these techniques to repair significant bone lesions in pertinent timescales is highlighted by the addition of osteogenic growth agents to these methods. The use of biodegradable membranes as GBR barriers might enhance this method of correcting bone abnormalities by preventing the need for a second surgery

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https://doi.org/10.18231/j.ijpi.2023.012

to remove non-biodegradable GBR membranes, such as polytetrafluoroethylene (PTFE). Poly(anhydride-esters) based on salicylic acid (SAPAEs) as GBR barrier materials

Salicylic acid (SA) has medicinal promise because of its ability to reduce inflammation and kill bacteria. The short half-life of SA in vivo is a drawback of treatment, however this can be solved by incorporating it into a polymer backbone for prolonged release, creating biodegradable salicylic acid-based poly(anhydride-esters) (SAPAE). In addition to having a delayed release for up to a month, SAPAE is easy to make and a good, affordable substitute for biologic factors. These qualities are helpful in supporting bone repair, especially when inflammation is exacerbated by systemic diseases like diabetes.[2]

## Nsaid-derived poly (anhydride-esters) in bone and periodontal regeneration

The early stages of wound healing in calvarial defects grafted with demineralized bone matrix (DBM) and covered with membranes manufactured from a novel class of non-steroidal anti-inflammatory medication (NSAID)-derived poly(anhydride-esters) are described in this preliminary study by Reynolds et al. The NSAIDs are released during hydrolysis of these polymers, which chemically integrate salicylic acid (SA) into the polymeric backbone. At 21 days, defects treated with PLA consistently showed a moderate to severe inflammatory cell infiltration compared to defects treated with DBM and covered with NSAID-derived polymers. There were no abnormalities with NSAID-derived polymers that showed histopathological characteristics such large foreign body cells or fibrous encapsulation. In all grafted defects, cellular characteristics indicative of bone growth were discovered. This brand-new group of NSAID-derived poly (anhydride-esters) was well tolerated and did not cause any discernible rise in inflammation.[3]

## Potential role of sapae in peri-implantitis in normal or diabetic situations

The majority of current periimplantitis treatment options are uncertain and frequently ineffective. Access flap surgeries, implant surface cleansing, local and systemic antibacterial agent administration, and bone grafting procedures have been the mainstays of periimplantitis treatment techniques. The two main problems are how to efficiently induce bone regeneration surrounding the implant once peri-implantitis has advanced and how to limit the progression of peri-implantitis. Given that there is now no effective medication, both are difficult in healthy persons. Furthermore, it is believed that diabetes-related local and systemic inflammatory diseases will be more difficult to treat. The sustained local delivery of antibacterial agents that reduce periimplantitis prolonged inflammation and lead to bone healing and reattachment to the implant surface has been regarded as the ideal treatment, even though surgical debridement and surface decontamination/detoxification have been widely used to treat peri-implantitis. Polymeric biodegradable devices, like polymers of SAPAEs, can be used to administer controlled substances over an extended period of time.[1]

## Conclusion

Salicylic acid is an antipyretic, anti-inflammatory, and analgesic. Salicylic acid's short half-life is a limitation of treatment, but it can be overcome by incorporation into a polymer backbone for sustained release, creating biodegradable salicylic acid-based poly(anhydride-esters) (SAPAE).Based on its anti-inflammatory and antibacterial qualities, salicylic acid-based poly(anhydride-esters) (SAPAEs) as GBR barrier materials have therapeutic potential. These qualities are helpful in supporting bone repair, especially when inflammation is exacerbated by systemic diseases like diabetes.

## Source of Funding

None.

## Source of Funding

None.

## References

1. Erdmann L, Uhrich KE. Synthesis and degradation characteristics of salicylic acid-derived poly (anhydride-esters). *Biomaterials*. 2000;21(19):1941–6.
2. Mitchell A, Kim B, Cottrell J, Snyder S, Witek L, Ricci J, et al. Development of a guided bone regeneration device using salicylic acid-poly (anhydride-ester) polymers and osteoconductive scaffolds. *J Biomed Mater Res A*. 2014;102(3):655–64.
3. Reynolds MA, Prudencio A, Aichelmann-Reidy ME, Woodward K, Uhrich KE. Non-steroidal anti-inflammatory drug (NSAID)-derived poly(anhydride-esters) in bone and periodontal regeneration. *Curr Drug Deliv*. 2007;4(3):233–9. doi:10.2174/156720107781023866.

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**Cite this article:** Mutthineni RB. Role of salicylic acid base poly anhydride esters (SAPAE) in periodontitis and periimplantitis. *IP Int J Periodontol Implantol* 2023;8(2):59-60.