Molecular Iodine - The World's Most Perfect Antimicrobial Agent: Can It Control Periodontal Disease In Your Practice?

A Major Breakthrough in Antimicrobial Chemistry Can Yield Better Treatment Outcomes and Greater Practice Profits….With Less Time Spent at the Chair.

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Some of the leading periodontists in the United States, the President of the American Academy of Otolaryngology, the President of the Israel Society of Oral Implantologists and the past-president of the Israel Society of Periodontology are collaborating with a Florida based company that has developed a unique antimicrobial product that may do just that....and a lot more.

The two oral antimicrobial agents that have enjoyed widespread use and have decades of clinical history are chlorhexidine gluconate (CHG) and povidone iodine (PVP-I). Each is an effective germicide. Let's add a third antimicrobial agent, molecular iodine (I_2) (which has been in continuous use for 5,600 years) and see how they all stack up in our search for the world's most perfect antimicrobial agent.

The principal characteristics of the perfect antimicrobial agent would include:

Broad Spectrum of Activity	Ease of Use
Rapid Speed of Kill	Affordable to Patients
Lack of Microbial Resistance Development	No Deleterious Side Effects
Excellent Safety Profile	Indicated for Chronic Use
Substantivity	

First, let's distinguish between PVP-I and I_2 so that we better understand these very similar sounding, but very different acting, germicidal agents. PVP-I is an aqueous solution of several different species of iodine (including iodide, iodate, triiodide, hypoiodous acid and molecular iodine). The iodine in PVP-I is bound to a large organic molecule, polyvinylpyrrolidone, which, being highly soluble in water, carries the different iodine species, which have varying degrees of solubility, into solution along with it. 10% PVP-I (common brand: Betadine) is used in hospitals, medical and dental offices worldwide. It contains 31,600 ppm of total iodine. The iodine species present in the least amount is I_2 which is present at only1-3 ppm[1]. All of the other species of iodine present contribute to staining, toxicity and irritation, but are not biocidal. **Out of the 31,600 ppm of total iodine, the 1-3ppm of I_2 accounts for all of the antimicrobial activity of PVP-I[2].**

IoTech International, a Florida-based antimicrobial company, has developed stable, patent-pending, aqueous formulations of I_2 which contain over 100 times the available I_2 (compared to PVP-I) while limiting the other non-bioactive iodine species from 31,600 ppm to just a few hundred ppm (see Figure1). This dramatically increases efficacy while

drastically minimizing overall toxicity. The need for polyvinylpyrrolidone is also eliminated in these formulations**. IoTech's I_2 formulations are essentially clear and do not stain compared to PVP-I, even at 10 times the strength of PVP-I** (see Figure 2).

IoTech vs Povidone Iodine (PVP-I)

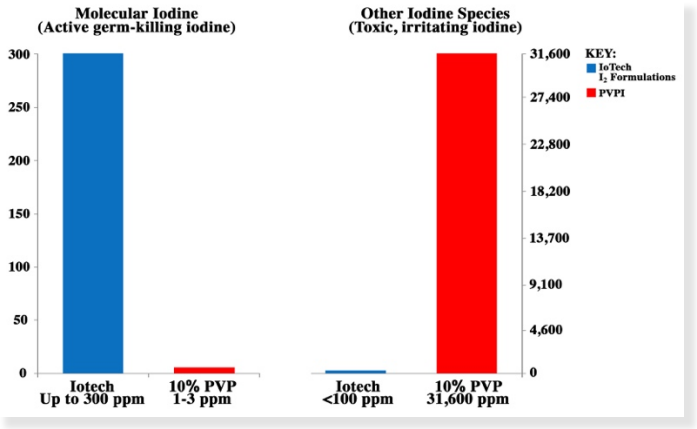

Figure 1

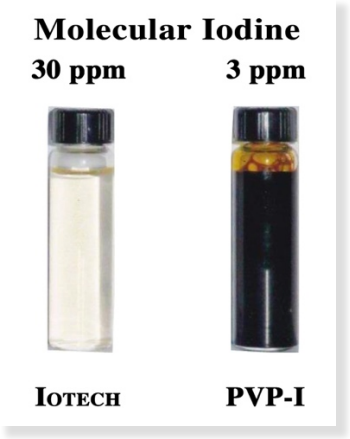

Figure 2

In comparing the efficacy of PVP-I to CHG against 6 periodontal bacteria (Porphyromonas gingivalis, Actinobacillus actinomycetemcomitans, Fusobacterium nucleatum, Tannerella forsythensis, Prevotella intermedia and Streptococcus anginosus), Nakagawa, et al. determined that PVP-I reduced all bacterial strains to below detectable limits within 15 seconds. By contrast, there were more than 1,000 viable colonies remaining 60 seconds following treatment with CHG[3].

ChloraPrep, a leading pre-operative surgical skin prep containing 2 germicidal agents, 2.0% CHG and 70% isopropyl alcohol, required 4 times longer to achieve a 4.0 log kill of Aspergillus brasiliensis (a highly resilient fungus) than a 300 ppm solution of I_2 alone. PVP-I was completely ineffective against Aspergillus brasiliensis after 30 minutes but was completely inactivated within 1 minute by I_2. Similarly, Staph aureus was completely inactivated by an I_2 formulation within 30 seconds but required 5 minutes for PVP-I to achieve the same result[4,5].

Several studies have demonstrated the ability of iodine to inactivate Strep mutans and to inhibit caries[6,7]. A 25ppm I_2 mouth rinse, developed by IoTech, completely inactivated Rhinovirus (a resilient, non-enveloped virus largely responsible for Upper Respiratory Infections (URIs)) in 30 seconds, where Listerine, Scope and Colgate Total mouthwashes were completely ineffective[8]. An I_2 pre-procedural mouth rinse for patients is a far better choice to inactivate aerosolized bacteria and viruses than currently available mouthwashes. A recent study conducted at the Department of Periodontology, Tokyo Dental School concluded that at a 30 second contact time, iodine was effective in inactivating the bacteria in periodontal biofilms[9]. A joint study conducted by the

Departments of Periodontology at 3 European dental schools found that the persistent effect of iodine on subgingival microbial flora was far greater for iodine than for CHX (31 days vs 7 days)[10].

I_2 is rapidly effective against viruses, bacteria (both Gram negative and Gram positive), fungi and spores. In one study of hospital-level surface disinfectants, **an IoTech I_2 formulation inactivated major pathogens responsible for Hospital Acquired Infections 7 times faster than the fastest acting of 29 EPA-registered hospital disinfectants from major U.S. manufacturers. In another study, an ioTech I_2 formulation inactivated a broad range of pathogens in one application, within one minute, that required Clorox Disinfectant Spray and Lysol Disinfectant Spray 10 minutes and multiple applications to achieve.**[11]

A key benefit of iodine formulations is that, unlike CHG and other antimicrobial agents, iodine does not induce resistance development in targeted microorganisms.[12] The substantivity (ongoing residual effect) of iodine for up to 72 hours is also well documented.[13]

I_2 is not only safe for human administration, it is necessary for human health. It is an essential nutrient, without which, iodine-deficiency diseases would be prevalent. Common table salt is iodized as an inexpensive public health measure to minimize iodine-deficiency diseases. I_2-based formulations have received the highest EPA safety ratings for acute dermal sensitization, lymph node assay, oral ingestion, inhalation toxicity, and ocular irritation.[14] I_2, unlike iodide, is not actively transported into the thyroid gland and is therefore, not thyrotoxic.

IoTech formulations can be made available as a gargle, mouth rinse, gel, toothpaste, spray, or lozenge. Because iodine inhibits and disrupts biofilm, it is also important for plaque control.[15] In Japan, school children and nursing home patients are required to routinely gargle with iodine to reduce URIs. I_2 formulations are easy-to-use, patient-friendly, inexpensive and because of their extreme safety, should be indicated for long term, chronic use compared to CHG, which is only indicated for short term use.

There have been numerous product recalls and outbreaks due to microbial contamination of both PVP-I and CHG. Included in these recalls was a recall of 4.0% CHG, with 33 times greater amount of active than 0.12% CHG oral rinse. I_2 formulations destroy the pathogens responsible for microbial contamination.

Unlike CHG and PVP-I which stain and are not pleasant tasting, I_2 formulations are non-staining and are available in several good-tasting flavors.

One IoTech product, IoRinse, is available as a pleasant tasting, ready-to-use mouth rinse, also as a concentrated subgingival irrigant and as a subgingival gel. The ready-to-use mouth rinse is formulated at 100 ppm I_2 and is used twice daily. The IoRinse concentrate is admixed with water to be used as a subgingival irrigant, delivered with an oral irrigation device with a periodontal tip. This oral irrigation is part of a home-care regimen

to be performed by patients daily. Administered in this way, allows ioRinse to thoroughly reach 90% of pocket depths up to 6mm deep and 64% of pocket depths 7mm or greater.[16]

IoRinse was used in this regimen in a pilot clinical study of 53 patients over a 6 month period by one periodontist-investigator. Its' success in reducing gingivitis and slowing the progression of periodontal disease was noted, along with the conclusion **"IoTech products will likely be as therapeutically effective as scaling and root planing in the treatment and management of periodontal disease".**[17]

IoRinse is only available from IoTech International, either directly to dental professionals for sale to their patients or directly from ioTech's website on the advice of their dentist. It is not sold in stores. Superior treatment outcomes for periodontal patients are possible without requiring additional dentist or hygienist chairtime, since the treatment is performed by patients at home.

The use of ioRinse could usher in a higher standard of care for your patients and a much improved profitability for your practice. Not using I_2 might mean supervising the neglect of your patients. As an antimicrobial agent, I_2 is not perfect, but it is far better than any other agent available. This natural and organic antimicrobial will be the chemotherapeutic agent of choice in the foreseeable future.

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