To the Editor

Many antimicrobial agents can be used for the control of bacterial colonization, plaque accumulation, inflammation, postoperative infection after the oral surgery [1]. It had been hypothesized to compare Ankaferd Blood Stopper (ABS), Hypochlorous acid (HOCl) and Chlorhexidine gluconate (CHG) at specific microorganisms such as; Streptococcus mutans, Staphylococcus aureus, Actinomyces israelii, Lactobacillus casei to find ideal antimicrobial agent.

In this hypothesis it was seen that higher concentration and long exposure time of all agents are more impressive at all of the microorganisms. In the long-term exposure, it was found that HOCl and CHG affect faster than ABS for Lactobacillus casei.

For A.İsraelli, the effect of CHG is more than ABS and HOCl (CHG>HOCl>ABS) for all organisms at short-term exposure,. However in long-term exposure, HCOI is more effective for L. casei and S. aureus than ABS but for A. İsraelli and S. mutans there was not a significant difference. Although the effect of CHG at S.mutans started in 120 sn, ABS and HOCl needed more time to affect. Coleghon et al showed that CHG had a larger inhibition zone than ABS at
both long and short term exposure similar with our study [2]. In the long duration time effectiveness of CHG continued for all microorganisms in this study (Table 1) (Figure)

In disc diffusion, lower concentrations of all agents were more effective for microorganisms. ABS had better results for A. israelii, L. casei than other agents. At disc diffusion CHG was worse than ABS and HOCl (Table 2).

Barry et al applied CHG at 1100 strains of Gram positive and Gram negative bacteria and the resistance to CHG is seen low[3]. Sensitivity of Streptococcus mutans to CHG is more than sensitivity of Lactobasillus species to CHG dealing with pH level[4]. In this study, pH didn’t examined but a significant difference didn’t seen between L. Casei and S. Mutans according to the concentration and duration time. Only the concentration of CHG is found as important at the efficiency on S.mutans group.

Cinar et al. showed that ABS had a smaller inhibition zone but at long term exposure the results of ABS doesn’t differ from the other antimicrobial agents[2]. ABS has an additional hemostatic and antiinflamation effect, beside antimicrobial effect [5]. In this study, the time needed for the effectiveness of ABS is observed more than CHG and HOCl. On the other hand, ABS disc diffusion form can be preferred as its superiority to CHG and HOCl.

ABS has pleiotropic effects on blood cells, vascular endothelium, angiogenesis and cellular proliferation that can help the tissue regeneration and wound healing[6]. In the literature it was shown that ABS deactivate the proliferation of the cell lines and cancer cells[7]. So combined effect (antimicrobial, hemostatic and improving wound accelerator) makes ABS more valuable than its equivalents.

Possible advantageous use of ABS for human health were seen on Helicobacter pylori, an antibiotic resistant species shown in the literature [8]. If ABS is so effective at a resistant
microorganism like H. pylori at high concentration without any damage to the living tissues, this antibacterial agent can be a good choice for precaution of the other resistant microorganisms.

Cinar et al observed that lactobasillus species have a resistance to ABS[2]. In our study L.casei was resistant to ABS in short term exposure, but it was seen that in long term exposure and at high concentration the effect of the ABS did not differ from CHG and HOCl. ABS had the same effect with CHG and HOCl for A. israelli in long-term exposure with high concentration but there is not sufficient research in the literature about the effect of ABS on Actinomyces species.

HOCl is an important antimicrobial agent that is synthesized with acidification of H₂O₂. In this research, it was seen that HOCl is effective on S. aureus more than ABS, less than CHG. Also, when the concentration(200ppm) is higher, the efficiency of HOCl is better. Ishihara et al show that when applying 100 ppm HOCl, chlorine levels can reduce by the presence of organic compounds. So, if concentration is higher, chlorine level and effectiveness can be higher [9].

As a result, in long term exposure, 3 of the agents have similar antimicrobial effects and can be preferred successfully during oral surgery. Clinician should keep in mind the tissue friendly character of HOCl, wound healing effect of ABS and antiplaque activity of CHX while choosing the agent to prefer for the oral surgery patients.

Acknowledgement/Disclaimers/Conflict of interest

The author declares no financial or other conflict of interest related to this paper.
References


<table>
<thead>
<tr>
<th>Time</th>
<th>Ankaferd(%)</th>
<th>CHG(%)</th>
<th>HOCl(ppm)</th>
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<tbody>
<tr>
<td>5. minute</td>
<td>Staphylococcus aureus ATCC 23235</td>
<td>7.880814</td>
<td>5.892095</td>
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<td>5. minute</td>
<td>Actinomyces israelii (Kruse) Lachner-Sandoval ATCC 10049</td>
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<td>5.70757</td>
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<tr>
<td>5. minute</td>
<td>Lactobacillus casei ATCC 334</td>
<td>7.653213</td>
<td>5.838849</td>
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</table>

Table 1 The effect of ABS, CHX and HOCl at different bacterial species in short and long term

Green= Active Biocidal Applications decrease at least 3 log according to CLSI and EUCAST

Yellow= Insufficient Applications defined by CLSI and EUCAST
Figure. The graphic of the effects of antimicrobial agents at bacterial species.

Table 2. The effect of disc diffusion of ABS, CHX and HOCl at bacterial species.