

## **Investigation of the metronidazole benzoate controlled release rate in dental implants coated by titanium nanotubes and chitosan biopolymer**

**Introduction:** Titanium (Ti) and its alloys have been used in dental implants due to their mechanical and chemical properties that directly affect it. Bacterial infections are one of the most common causes of failure of dental implants. The present study aims to design dental implants based on nanotubes, which not only have high biocompatibility, but also have the ability to load drugs.

**MATERIALS AND METHODS.** TiO<sub>2</sub> titania nanotube arrays were made on the surface of titanium disk by two-step anodic oxidation (90 Sample). For the synthesis of titania nanotubes, the anodization process is used with a constant DC power supply of 80 volts and a time of 1, 2, 4, 8 and 10 hours. Titania nanotube arrays were studied by Field Emission Scanning Electron Microscope (FESEM), Atomic Force Microscope (AFM) and Contact Angle (CA), EDX and XRD tests. In this research, synthesized nanotubes were used for drug loading at 4, 8, and 10 hours. The synthesized titania nanotubes have a diameter of 110-130 nm and an approximate length of 35  $\mu$ m. Next, metronidazole benzoate drug is used as the main drug to control dental infections for loading into nanotubes by dipping and pipetting. Examining drug release from the samples was done using a UV-visible device. A biodegradable polymer coating of chitosan is used to Controlled drug release from titania nanotubes. After collecting the data, it was analyzed using repeated measures ANOVA and the Pillai effect.

**RESULTS.** FE-SEM images of titania nanotubes show the presence of elongated tube structures. The XRD pattern of the synthesized titania nanotubes shows the crystalline phase of anatase titania. AFM atomic force microscope analysis to investigate the effect of anodization on the electrochemical and surface properties of drug-released amorphous titanium from samples anodized in 4, 8, and 10 hours, 3, 11, and 24 hours, respectively, and the duration of drug release of anodized and chitosan coated samples, it was 6, 8 and 13 days, respectively. Also, statistical tests showed a significant difference in drug release in different groups (P-Value < 0.01).

**Keywords:** dental implant, titania nanotube, electrochemical anodizing, chitosan biopolymer, coating, drug release