

Nanochemistry and Nanobiotechnology

Effect nanoparticles penetration as total disinfection of the root canal system of teeth

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Objective:

The objective was to prove the effect of penetration of silver nanoparticles with potential bactericidal action in dentinal microtubules and effectiveness against *E.Coli* in the tooth root canal.

Materials and Methods:

52 extracted single-root human teeth were used in the experiment. Spherical colloidal silver nanoparticles with diameter 120nm were used as bactericidal agent. To determine the depth of penetration of silver nanoparticles in dentinal microtubules the scanning electronic microscope was used. The study focused on penetration of nanoparticles into dentinal microtubules in free penetration regime with stimulation by ultrasonic waves. The teeth samples were inoculated with 2mkl strain of bacteria *E.coli* (ATCC29212). After incubation period of 24h at 37°C the seeding of bacteria was performed from root canals to culture medium, followed by bacteriological count. The teeth samples were divided in 2 groups. One group served as a control, the other group had a colloidal solution of silver nanoparticles added into the macrocanal.

Results:

Presence of Ag nanoparticles on walls of macrocanal and their effect of free and ultrasound-stimulated penetration into dentinal microtubules at depth of, respectively, 20mkm and 60mkm were proved. Dramatic bactericidal effect of silver nanoparticles on germs was manifested in inhibition of germ colonies in 4 log steps at application of minimal dilution of colloidal silver solution at 0.39 mg/ml. The statistical margin of error was $p \leq 0,05$.

Conclusions:

Application of nanoparticles with bactericidal action permits to radically disinfect not only the macrocanal but also the tooth root canal system, which opens new prospects in modern nanoendodontics.