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And scientific Research
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Evaluation of Microbial Contamination of as Received Orthodontic Arch Wire from Manufacture (An *In Vitro* Comparative Study)

A Thesis

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By
Suha Saad Hassan
B.D.S.

Supervised by

Prof. Dr. Nidhal H. Ghaib
B.D.S., M.Sc.

Prof. Dr. Batool H. Al-Ghurabi
B.S.c., M.Sc., Ph.D.

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Abstract

Infection by microorganisms is a concern for health care professionals in general and for dental practitioners in particular, and the dental literature has long pointed to the need to sterilize or disinfect any material before its use in the oral cavity. Decontamination of dental instruments has recently been the subject of considerable debate. However, little information is available on the potential bacterial colonization of dental arch wires received from manufactured. The present study was carried out to assess whether as received arch wires from manufactures are free from microbial contamination as well as to determine the microbial counts and types of microorganisms attach to the arch wires.

Eighty test group samples of arch wires were included in this study consisted of two types of arch wires (Nitinol and Stainless-steel), they were from four companies (3M, Ortho Technology, Jiscop and G&H). The wires were cut in to four pieces by sterilized wire cutter then four pieces of the arch wires from both groups of each company were inserted into plane tubes that contain 10 ml of Brain Heart Infusion broth (40 tubes) and Tris-Ethylenediamine Tetraacetic Acid buffered solution (40 tubes), and then samples were homogenized by Vortex mixer for one minute. Further 0.1 ml was withdrawn from plane tube and spread by using sterile microbiological spreader on agar plates. Moreover 16 plane tubes (8 tubes with brain heart infusion broth and 8 tubes with Tris- Ethylenediamine Tetraacetic Acid buffered solution) without arch wires were considered as control groups.

Microbial sampling yielded growth from 13 of the 80 arch wires studied, the predominant bacteria isolated were *staphylococci spp.* and *Bacillus rod.* The total viable count of bacteria in Brain Heart Infusion reagent is more than that in Tris-Ethylenediamine Tetraacetic Acid buffered solution reagent with statistically significant difference. However, within all companies and wires the

total viable count of bacteria in Brain Heart ionInfus reagent was more than that in Tris-Ethylenediamine Tertraacetic Acid buffered solution but statistically not significant. All cases of contamination with *Bacillus rod.* were appeared in Brain Heart Infusion reagent and no cases found in Tris-Etylenediamine Tertraacetic Acid buffered reagent.

Meanwhile this study found that the Jiscop Company have more viable count as compared to other companies G&H, OrthoTechnology and 3M respectively, however there are no significant differences among them. In regards to the presence and distribution of bacteria according to types of wires the current results noticed that the Stainless steel wires have more viable count than that in Nitinol but statistically not significant. Five cases of contamination with *staphylococci spp.* were recorded in stainless steel wires and there is no growth of these bacteria in Nitinol wires with statistically significant differences. Moreover, all cases of contamination with *Bacillus rod* were found also in nitinol wires and no growth was appeared in Stainless steel wires with statistically significant differences.

In conclusion these results give additional evidence that the arch wires received from manufactured are often contaminated and therefore there is a need for routine disinfection of such items. This study found that the Brain Heart Infusion more effective in dislodge the bacteria from orthodontic arch wires than Tris-Ethylenediamine Tertraacetic Acid buffered solution. The stainless-steel arch wires were more contamination than nitinol and most common contaminant were *staphylococci spp.* and *Bacillus rod.*