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# **The Effect of the Poly Vinyl Pyrrolidone (PVP) Addition on Some Properties of Heat- Cured Acrylic Resin Denture Base Material**

**A Thesis**

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## ***Abstract***

The most common materials used for fabrication of denture base are poly methyl methacrylate (PMMA) and methyl methacrylate (MMA). Preparation of heat cured, altered or modified, denture base acrylic resin was carried out by preparing of poly (methyl methacrylate) Polymer, - PMMA- (80%) and poly vinyl pyrrolidone -PVP - (20%), and the liquid part composed of methyl methacrylate -MMA- monomer. A pilot study was done to evaluate the experimental material, with different percentages of PVP to PMMA (10, 20 and 30)% (by the weight). Evaluation was made by measuring fatigue, compressive, hardness, impact, tensile strengths and elongation percentage. 120 specimens, 5 specimens for each experimental or control test. The polymer with 20% had the closest testing values in comparison with the control therefore PVP was used in the formula for the preparation of the experimental material. All the specimens were cured by using short curing cycle (90 min. at 74°C followed by 30 min. at 100° C). The chemical, physical, mechanical and biological properties of the prepared material were evaluated in comparison with the control denture base acrylic resin. The polymer was prepared by graft copolymerization method. The total 250 specimens, 10 specimens for each experimental or control material were tested.

Viscosity average molecular weight was measured for the prepared polymers in additions to the control. The results showed that the experimental polymer has viscosity average molecular weight higher than that of control polymer.

Measurement of the residual monomer percentage after 24 hours from curing, was by using UV spectrophotometer the result indicated that difference in the percentage of residual monomer of experimental and control groups was not significant.

Water sorption and solubility test was done in accordance to ADA specification No.12, 1999. Statistically, water sorption of the experimental material was significantly less than control material, while the tested materials showed no significant differences regarding the solubility test. Moreover, mechanical properties including tensile strength, compressive strength, hardness, impact strength, modulus of elasticity and transverse strength and deflection are higher in experimental materials, but no significant differences were observed, while, fatigue strength, percentage of elongation and bending showed significantly higher value for control material.

Biocompatibility was evaluated in comparison with the control materials through subcutaneous implantation in the rabbits. 50 specimens were prepared, 5 specimens for each period interval of biological study. Excision biopsies were taken after 1 day, 3 days, 7 days, 14 days, and 28 days. Microscopically, the count of the inflammatory cells was used as a parameter in the evolution of the tissue response in relation to the tested material. No significant differences were noticed among time intervals except after one – day interval. This could be due to the similarity between the tested materials chemically.

In conclusions, according to the results obtained in this study, the recommended formula of prepared (experimental) heat - cured denture base acrylic resin showed more acceptable properties than control denture base.