static magnetic field so that fibrin fibers were oriented parallel to the magnetic field because of the anisotropic magnetic susceptibility of fibrin fibers, and the other was polymerized without a magnetic field. The $T_2$ relaxation times of the fibrin gels were measured by the Carr-Purcell-Meiboom-Gill (CPMG) method using a Varian 7.05 T MR imaging system equipped with a 300 MHz volume RF coil.

**RESULTS:** Water molecules in the fibrin gel that was polymerized in the magnetic field exhibited only one relaxation time $T_2 = 0.35$ s, whereas, water molecules in the fibrin gel that was not exposed to a magnetic field during polymerization had at least two components in the $T_2$ relaxation time. The long component, $T_2 = 0.35$ s, was the same order as the $T_2$ of the fibrinogen solution (= 0.41 s) and the fibrin gel polymerized in the magnetic field. The short component was $T_2 = 0.01-0.15$ s.

**DISCUSSION:** In the fibrin gel polymerized without a magnetic field, fibrin fibers were randomly oriented. Each fibrin monomer generated microscopic magnetic fields. The water protons far from the fibrin fibers were not exposed to the microscopic fields. However, the water protons near the fibrin fibers were exposed to the microscopic fields, which gave rise to the short component of the $T_2$ relaxation time. In the fibrin gel that was exposed to a static magnetic field, the fibrin fibers aligned parallel to the magnetic field during the polymerization. All the magnetic characteristics of the fibers are consequently eliminated. Thus, the water protons are no longer exposed to the microscopic magnetic fields from the fibrin fibers. Cell structural transformations such as tumors causes a change in the $T_2$ relaxation time. The mechanism of the change is partially understood by these results.

This study was supported in part by a grant from the Ministry of Education, Science and Culture, Japan.

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**P-65 Student**

**EFFECT OF A STATIC NON-UNIFORM MAGNETIC FIELD ON THE SURFACE PROPERTIES OF ACRYLIC RESIN.** A. Gasparetto$^1$, I. Hibler$^2$, A.J. Palangana$^2$, C.R. Paula$^3$, R. Oliveira$^4$. $^1$Department of Dentistry Universidade Estadual de Maringá, Maringá, Paraná 87080-310 Brazil. $^2$Department of Physics, Universidade Estadual de Maringá, Maringá Paraná, 87020-000 Brazil. $^3$Department of Microbiology, Universidade de Sao Paulo, Sao Paulo 05508-730 Brazil. $^4$Center of Biological Engineering, Universidade do Minho, Braga, 4710-057 Portugal.

**INTRODUCTION:** The acrylic resin is a polymeric material with several applications in different scientific and technological fields, especially in medicine and biotechnology. Its physical characteristics or their possible modifications can imply new ways of utilization and applicability.

**OBJECTIVE:** To study the effect of a magnetic field on the surface physico-chemical properties usually implied in bacterial adhesion, especially surface hydrophobicity.

**METHODS:** the hydrophobicity of the resin surface was determined by sessile drop contact angle measurements, using van Oss (1994) methodology. Accordingly, a substance (i) is considered hydrophobic when the variation of the free energy of interaction between two entities of substance (i) immersed in water is negative ($\Delta G_{iwi}<0$). That is to say, the two entities of substance (i) interact preferentially between them then with water. On the contrary, if $\Delta G_{iwi}>0$, substance (i) is hydrophilic.

Two types of resin samples were used: hydrated and non-hydrated ones. The hydrated samples were obtained by autoclaving at 121°C. Before contact angle measurements, the samples submitted to the magnetic field were exposed during 24 hours to a field of 500gauss generated between to parallel magnetite plates.

**RESULTS AND DISCUSSION:** The principal results are summarized in Table 1. As could be expected the hydrated resin is hydrophilic, while the dehydrated is hydrophobic. However, when the hydrated resin is submitted to the magnetic field it becomes even more hydrophobic than when dehydrated. This can be explained by the effect of the magnetic field on the orientation of the water molecules of hydration. Consequently, there is an evident alteration of surface properties promoted by the magnetic field.
Table 1 – Acrylic resin degree of hydrophobicity expressed as $\Delta G_{\text{iwi}}$

<table>
<thead>
<tr>
<th>Acrylic Resin Condition</th>
<th>$\Delta G_{\text{iwi}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>dehydrated</td>
<td>-9.232704494</td>
</tr>
<tr>
<td>hydrated</td>
<td>0.371220915</td>
</tr>
<tr>
<td>hydrated and under magnetic field exposition</td>
<td>-22.06587279</td>
</tr>
</tbody>
</table>

References.

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EFFECTS OF STATIC MAGNETIC FIELDS ON FIBRINOLYSIS. *R. Emura¹, *J. Hashimoto¹, T. Higashi¹, T. Takeuchi². ¹School of Allied Health Sciences, Faculty of Medicine, Osaka University, Suita, Osaka 565-0871, Japan, ²Low Temperature Center, Osaka University, Toyonaka, Osaka 560-0043, Japan.

OBJECTIVE: Since orientation of fibrin fibers was shown by Torbet et al in 1981 [1], many studies have been reported in relation to the phenomenon [2, 3]. Fibrinogen is a rod-like protein, and has an anisotropic diamagnetic susceptibility because of its alfa-helix. As they are polymerized orderly by thrombin, the anisotropic diamagnetic susceptibility of fibrin fibers increases additively. When the reaction was advanced in a static magnetic field, the magnetic energy becomes larger than the thermal energy, and the growing polymers are rotated by the magnetic moment. Fibrin fibers were oriented with their long axis parallel to the magnetic field direction.

What are the effects of static magnetic fields on fibrinolysis? After completing the clot of fibrin fibers outside the magnetic field, it is putted into the field. The small fragments must be oriented as the fibrin fibers are lyzed by plasmin. We investigated the effects of their shaking and mixing powers on the fibrinolysis time.

METHODS: Experiment 1 (Effects of continuous exposure): The fibrinogen solution (700mg/dl) was mixed with plasminogen (0.42u/ml) and urokinase (0.83u/ml) in advance. Five minutes after adding thrombin (0.025u/ml) and forming the clot, the sample was putted into the sample space of superconducting magnet (8T in max.). The laser light was introduced into and out of the sample and the change of optical transmissivity was monitored among about 60 minutes.

Experiment 2 (Effects of periodic exposure): The process of fibrinolysis was monitored in the same as Experiment 1 except the condition of magnetic exposure. The sample was exposed for 15 seconds at 15 seconds’ interval.

RESULTS AND DESCUSSION: At both of Experiment 1 and 2, there was no difference in the fibrinolysis time between the clots in and outside the magnetic field. It is considered that the higher intensity of magnetic field, the higher frequency of exposure period and the higher viscosity of sample solution will bring the positive results.

References.