Introduction: Acrylic cement has large applications in orthopedic surgery. Its characteristics are good mechanical skills but it's not reabsorbable and could cause foreign body-like rections. Several studies focus on finding a biocompatible material, which, for its chemical-structural characteristics, promised a biomechanical strength adequate till to its complete re-habitation by the neo-formed bone tissue.

Objectives: The purpose of this study is the analysis of a new acrylic bone cement (Calcemex®) based on polymethylmethacrylate (PMMA) and β-tricalcium phosphate (TCP).

Methods: From May 2007 to now, we have tested the new porous cement into 3 phases: the first, on which it was evaluated the biocompatibility on 8 New Zealand rabbits (fig.1), the second, in which we have analyzed osteoconduction and osteointegration on 12 New Zealand rabbits (fig.2) and the third, to test the biomechanical strength on large animals, 5 pigs (fig.3).

For each sample analyzes were conducted macroscopic, microscopic with suitable colors for bone, X-ray and electron microscopy (SEM).

Results: The first phase of the study has demonstrated the excellent biocompatibility of the cement. The second phase of the study showed that the Calcemex® was characterized by macroscopic porosity, with pores of 200-500 µm that create a structure similar to that of trabecular bone. The formation of neotrabecole within the cement, is entirely determined by the resorption of the β-TCP that releases calcium ions and phosphorus, osteoconductive factors.

The last phase of the study is providing encouraging results on the biomechanical strength of the Calcemex® the material implanted on the femur and tibia of large animals that were on average 220 kgs of weight is plotted periodically with standard radiographs, has shown weight-bearing biomechanical resistence 5 times high than trabecular bone.

Conclusions: The almost total re-housing by newly formed bone in Calcemex® with partial-progressive resorption of the cement, making this an ideal material in the daily practice of orthopedic surgery.

Further studies should be conducted on this material but the applications seem to be promising for the future (fig. 4).

References: