

## BONE CEMENT COMPRISING MICROENCAPSULATED ANTIMICROBIAL COMPOUNDS

Application number EP16382170.5

### DESCRIPTION OF THE INVENTION

The present invention relates to bone cements with microencapsulated antimicrobials.

A first aspect of the present invention relates to bone cement comprising microcapsules containing an antimicrobial selected from rifampicin, rifabutin, rifapentine, rifalazil, amphotericin B, imidazole antifungicides, triazole antifungicides, carbapenem antibiotics, vancomycin and any combination thereof.

The microcapsules are formed by a biocompatible material, i.e. a biologically benign material.

The cement of the invention comprises microcapsules formed by fatty acids or polymers (in the examples, alginate and PHBV have been used) which contain an antimicrobial, i.e. the antibiotic is microencapsulated in a coating made of those materials; preferably, the microcapsules are polymers.

The aforementioned antimicrobial agents cannot be added directly to the bone cement, since it prevents it from setting, or interact with the bone cement such that elution does not occur. Surprisingly, encapsulating these antimicrobials in microcapsules enables elution thereof without significantly affecting the mechanical properties of the cement.

Bone cements transfer the loads from the implant to the bone, filling in the spaces therebetween and absorbing impacts, damping the transfer of forces and distributing them throughout the interface. Bone cement is understood to be polymer materials which are used for the purpose of fixing prostheses or as spacers when a prosthesis is removed due to infection.

Microencapsulation is a widely known technique which is defined as the process of coating substances in the form of particles or liquid globules with materials of different nature, generally polymers, to obtain micrometric-sized particles. Therefore, the microcapsules are micrometric-sized particles with a fatty acid or polymer coating which contain an antimicrobial.

Antimicrobial is understood to be the antimicrobial compound and also its pharmaceutically acceptable salts.

### APPLICATION BUSINESS SECTORS

The invention may be categorised under the field of medicine, specifically drugs for preventing and treating periprosthetic infections.

### TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The present invention has the following advantages:

- The microencapsulation of rifampicin and subsequent incorporation to the bone cement enables controlled release thereof in terms of time and place.
- The microencapsulation of rifampicin in, for example, alginate or PHBV (polyhydroxybutyrate-polyhydroxyvalerate) allows the bone cement to set completely within surgically reasonable timeframes and comparable to those of the control cement (without antibiotic).
- The bone cement that comprises the microcapsules has good mechanical properties after 45 minutes of setting, compared to the cement that contains unencapsulated rifampicin.

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- The alginate and PHBV microcapsules with rifampicin show good elution in PBS (phosphate buffer with similar characteristics to the physiological medium).
- The biocompatible and biodegradable microcapsules.
- The microencapsulation of rifampicin in alginate shows good encapsulation performance, with less PHBV content.
- Cements containing alginate and PHBV microcapsules have shown good results in microbiological assays with *S. aureus* and superior results with alginate.

### STATUS DEVELOPED OF THE TECHNOLOGY

The efficacy of the technology developed in this invention for the prevention and treatment of periprosthetic infections has been demonstrated by in vitro and in vivo tests with animals.

### INTELLECTUAL PROPERTY RIGHTS

The intellectual property rights of this invention belong to:

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### COLLABORATION SOUGHT

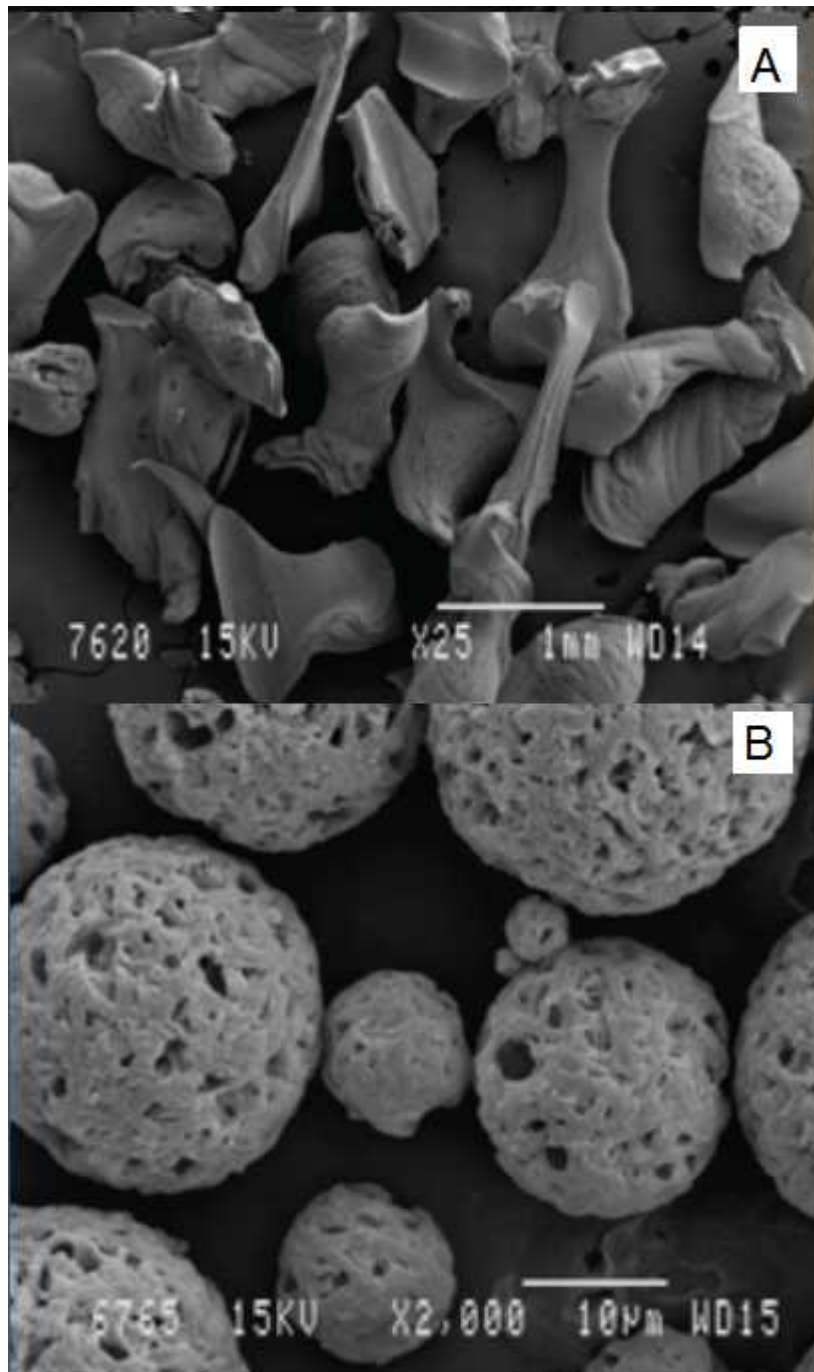
We are looking for companies interested in the following ways of cooperation:

- Patent licensing agreements.
- Agreements for the development of technology and exploitation.

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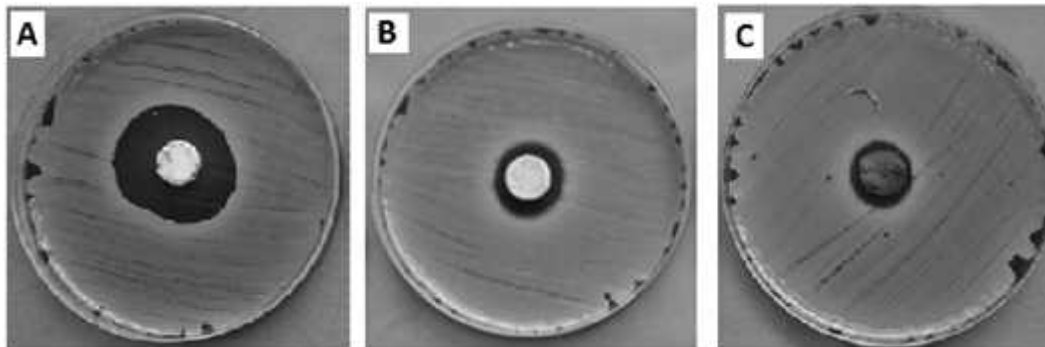
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**Fig. 1**

**BONE CEMENT COMPRISING MICROENCAPSULATED ANTIMICROBIAL COMPOUNDS**

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**Fig. 2**

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