

# Infections sur prothèses articulaires l'antibiothérapie locale les « spacers »

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# Antibiothérapie Locale

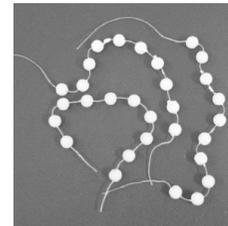
Associe un ou plusieurs antibiotiques + un support  
Concentration locale élevée + toxicité générale moindre

Support :

- **PolyMethylMetAcrylate = PMMA (« ciment »)**
  - **En bloc = spacer**
    - Adapté à la cavité = limite hématome
    - **Maintient rapports anatomiques**
    - Mobilité ?? Stabilité ±



- **Billes PMMA**  
Difficiles à enlevées  
A terme = corps étrangers



- Autres supports = biorésorbables  
Intéressants : ostéites > arthroplasties



# Les Spacers



## 3 buts :

- **Antibiothérapie locale** => concentration élevée (Genta x 200 / IV)
  - Adaptée au germe
  - Possibilité d'ajouter d'autres AB (vancomycine, clindamycine ...) selon
    - Le germe
    - La synergie des AB
- **Stabiliser l'articulation** entre 1<sup>er</sup> et 2<sup>ème</sup> temps
- **Faciliter la réintervention** : rapports anatomiques conservés = espace articulaire + tension des parties molles + cavité articulaire non fibrosée

# Les Spacers

**Associe un ou plusieurs antibiotiques + un support**  
**Concentration locale élevée + toxicité générale moindre**



**Caractéristiques requises des AB: aminosides (gentamicine/vancomycine/clindamycine)**

Activité sur germes responsables

Thermostable

Soluble dans l'eau

Peu allergène

**En prophylaxie**

Faible posologie ( $\leq 1\text{g}$  pour 40g ciment)

**En curatif**

Forte posologie ( $> 3.6\text{g}$  pour 40g ciment)

**Indications**

**Changement 2 temps + spacer AB (genta, vanco +++)**

**Changement en 1 temps avec prothèse cimentée**

# Ciment AB: Elution bimodale

Etudes *in vitro*

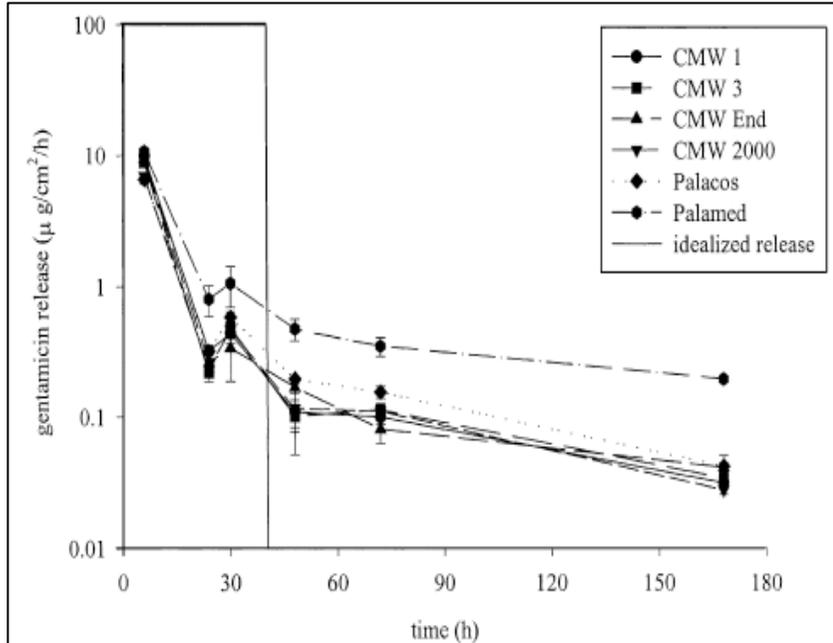
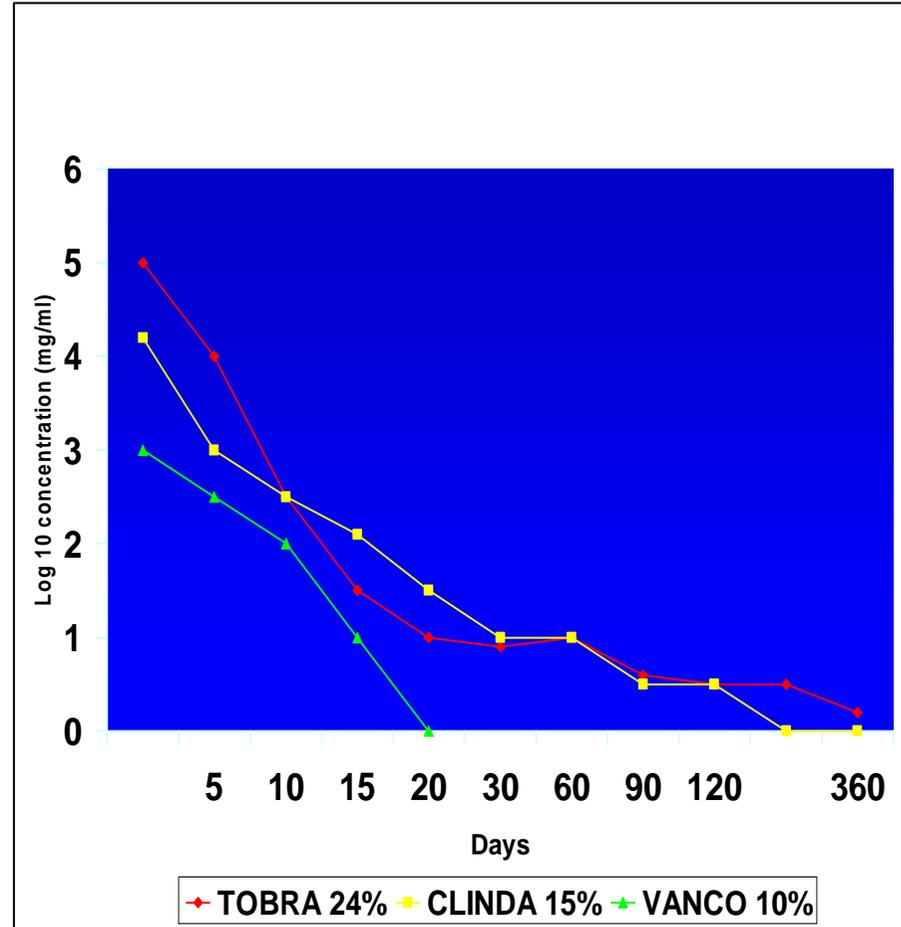


Fig. 1. Gentamicin release rates of different antibiotic-loaded bone cements as a function of time during exposure to phosphate-buffered saline, together with a hypothetical ideal release kinetics. Results are averages of three experimental runs, with separately prepared discs with bars indicating SD.

Van de Belt, *Biomaterials* 2000



Mader J and al. *AAC* 1997; 41: 415-418

## Elution bimodale

- Deux premières semaines: rapide, puis lente pendant des mois

10% de quantité d'antibiotique diffusée

# Ciment AB: Emergence de résistance

## Biomaterial-associated infection of gentamicin-loaded PMMA beads

Neut, JAC 2001

Culture de billes gentamicine (30 billes de 4.5mg gentamicine) de 20 patients avec infection prothèse

Comparaison **culture standard** (4/20 positives) vs **culture prolongée** sur milieux enrichis (18/20 positives)

**Table I.** Bacteria isolated from excised tissue of patients with a suspected infection of an orthopaedic prosthesis by routine hospital culture and from gentamicin-loaded PMMA beads by an extensive laboratory procedure

Patient	Prosthesis	Routine hospital results		Extended procedure results	
		tissue I	tissue II	beads I	beads II
1	hip	no growth	no second insertion	CNS	no second insertion
2	knee	<i>Peptostreptococcus magnus</i>	no second insertion	anaerobe	no second insertion
3	knee	no growth	no growth	CNS	CNS
4	hip	no growth	no growth	<i>P. aeruginosa</i>	<i>P. aeruginosa</i>
5	hip	no growth	no growth	<i>Pseudomonas diminuta</i>	no growth
6	hip	not tested <sup>a</sup>	no second insertion	<i>S. maltophilia</i>	no second insertion
7	knee	not tested <sup>a</sup>	no second insertion	<i>S. aureus</i>	no second insertion
8	hip	no growth	no second insertion	CNS	no second insertion
9	shoulder	no growth	no second insertion	<i>Pseudomonas</i>	no second insertion
10	hip	no growth	no second insertion	CNS	no second insertion
11	hip	no growth	no second insertion	<i>S. aureus</i>	no second insertion
12	hip	no growth	no growth	CNS	no growth
13	hip	no growth	no second insertion	no growth	no second insertion
14	hip	<i>P. aeruginosa</i>	no second insertion	<i>P. aeruginosa</i>	no second insertion
15	hip	CNS	no second insertion	CNS	no second insertion
16	hip	<i>Enterococcus faecalis</i>	no second insertion	CNS (2×)	no second insertion
17	hip	no growth	no second insertion	<i>C. acidovorans</i>	no second insertion
18	hip	no growth	no second insertion	<i>Enterococcus</i>	no second insertion
19	knee	no growth	no second insertion	CNS	no second insertion
20	hip	not tested <sup>a</sup>	no second insertion	CNS	no second insertion
	hip	no growth	no second insertion	CNS	no second insertion
				<i>S. sanguinis</i>	

Samples taken after the first insertion of a chain of gentamicin-loaded PMMA beads are indicated I, while samples taken from patients requiring a second insertion are denoted II.

<sup>a</sup>No tissue samples taken based on a per-operative visual inspection of the wound area by the orthopaedic surgeon, concluding that the patient was free of infection.

**Table II.** MICs for bacteria isolated from the gentamicin-loaded PMMA beads retrieved from patients with a suspected infection of an orthopaedic prosthesis, obtained by an extensive laboratory culture procedure

Patient	Beads I	MIC (mg/L)	Beads II	MIC (mg/L)
1	CNS	>256	no second insertion	
2	anaerobe	not tested <sup>a</sup>	no second insertion	
3	CNS	0.75	CNS	1.0
4	<i>P. aeruginosa</i>	2	<i>P. aeruginosa</i>	4
			CNS	>256
5	<i>P. diminuta</i>	96 <sup>b</sup>	no growth	
	<i>S. maltophilia</i>	>256 <sup>b</sup>		
6	<i>S. aureus</i>	12 <sup>b</sup>	no second insertion	
	CNS	0.75		
7	<i>Pseudomonas</i>	24	no second insertion	
8	CNS	0.50	no second insertion	
	<i>Pseudomonas</i>	4		
9	no growth		no second insertion	
10	CNS	>256	no second insertion	
	<i>S. aureus</i>	0.75		
11	CNS	>256	no second insertion	
12	CNS	0.25	no growth	
13	no growth		no second insertion	
14	<i>P. aeruginosa</i>	6	no second insertion	
	CNS	>256		
15	CNS	>256	no second insertion	
	CNS	32 <sup>b</sup>		
16	<i>C. acidovorans</i>	24	no second insertion	
17	<i>Enterococcus</i>	1.5	no second insertion	
18	CNS	0.38	no second insertion	
19	CNS	>256	no second insertion	
20	CNS	>256	no second insertion	
	<i>S. sanguinis</i>	>256 <sup>b</sup>		

Samples taken after the first insertion of chains are indicated I, while samples taken from patients requiring a second insertion are denoted II.

<sup>a</sup>Anaerobes are resistant to gentamicin.

<sup>b</sup>Development of resistant sub-populations.

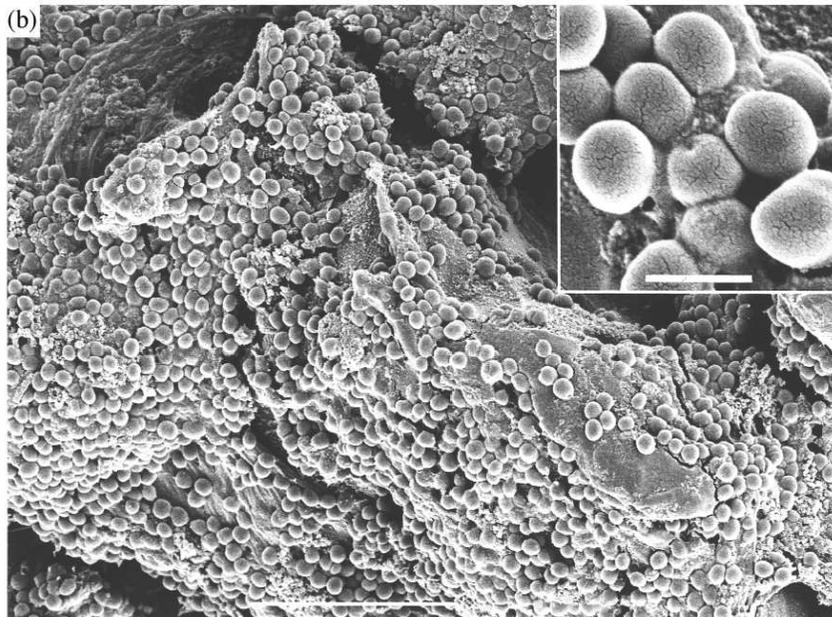
# Ciment AB: Emergence de résistance

Biomaterial-associated infection of gentamicin-loaded PMMA beads

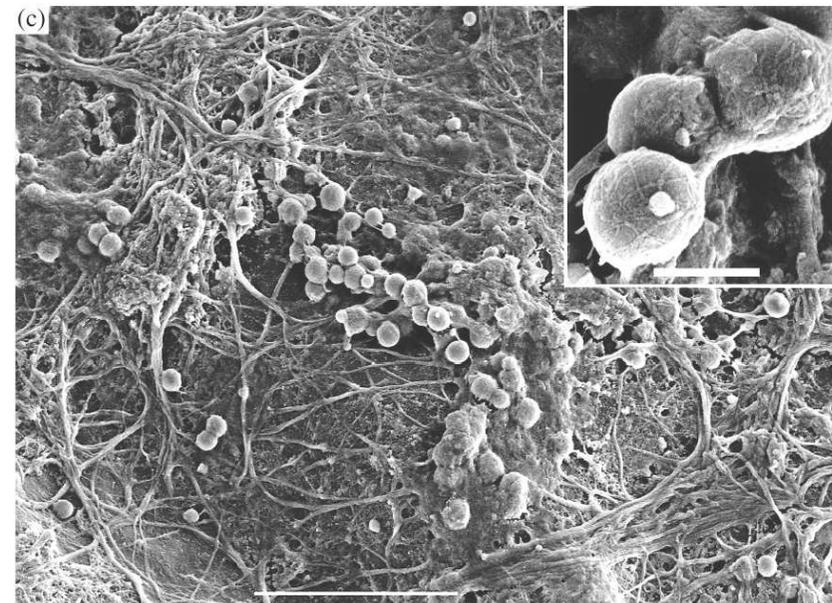
*Neut, JAC 2001*

Mise en culture de billes de gentamicine (30 billes de 4.5mg gentamicine) de 20 patients pris en charge pour infection prothèse.

Comparaison de culture standard vs culture prolongée sur milieux enrichis



Patient 11: culture prolongée avec SCN



Patient 14: culture prolongée avec SCN et *P. aeruginosa*

# Spacers : aspects techniques

En pratique = Préparation extemporanée

- Moules



- « artisanale » ± armature métallique (clou, tige)



# Les Spacers : conclusions



## Efficacité / Inconvénients

- **Diminuent le volume de l'hématome**
- **Sur l'infection** Iarikov D Clin Inf Diseases 2013 – (review)
  - Non prouvée, pas d'études randomisées
  - Risque de sélection de germes à la surface
  - Résistance aux AB
- Toxicité << voie IV
- Si laissé en place = corps étranger ... => luxation et infection
- **Sur le geste de repose**
  - **simplifie la reprise (surtout pour le genou)** gestion des parties molles = appareil extenseur + équilibre ligamentaire... mais ... :
  - Instabilité -> luxation -> altération du stock osseux
  - Fracture
  - Si 2<sup>ème</sup> temps impossible = corps étranger laissée en place

