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B13: Are Monoclonal Antibodies Capable of Eradicating Orthopedic Infections

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B13: “Are monoclonal antibodies capable of eradicating biofilms in orthopedic infections?”

Vaibhav Bagaria, Dina Raafat, Gowrishankar Muthukrishnan, John L. Hamilton, Adrienn Markovics, Javad Parvizi, Edward M Schwarz

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Why this is question is important?

The resilience of biofilms necessitates the exploration of novel therapeutic strategies capable of penetrating these barriers and effectively eradicating the bacteria within.

Monoclonal antibodies (mAbs) against bacteria and biofilm targets have been investigated for this purpose, as they are highly specific for a single antigen, and have revolutionized treatment in various diseases, including oncology, rheumatology, and infectious diseases.

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Rationale

In infection research, mAbs can be designed to target specific pathogens. They function through mechanisms such as the neutralization of target molecules, the recruitment of immune effector cells, and through direct antimicrobial effects, they can be effectively used to disrupt the integrity of the biofilm matrix, promote opsonization, enhance immune clearance by exposing bacterial cells to immune cells, and inhibit the signals that promote biofilm growth and maintenance.

Rationale

Preliminary studies have shown that combinational treatment strategies involving mAb together with conventional antimicrobial therapies show enhanced effectiveness and reduced bacterial persistence.

mAbs could disrupt biofilm formation or trigger biofilm dispersal, thereby allowing the co-administered antibiotic to more effectively kill the bacteria released from the biofilm, providing a more successful clinical outcome.

Potential mABs

- Anti-DNABII mAb
- Anti-PNAG antibodies
- mAB 3H33
- Anti-Atl mAb:
- MEDI4893
- Multi-mechanistic mAb combination (AZD6389*)
- Conjugated MAbs

Methodology

A comprehensive literature search was conducted using the search words “monoclonal antibody” and “biofilm” within PubMed and Embase, which identified 190 unique studies, 27 of which were formally reviewed to answer this question.

Conclusion

Monoclonal antibodies represent a revolutionary approach to combating the resilience of biofilms in infectious diseases. By targeting specific structural components of biofilms, these antibodies not only disrupt the biofilm but also can restore antibiotic sensitivity to otherwise resistant bacteria by removing the physical barrier of the biofilm and by increasing the metabolic activity of the resident bacteria.. The ongoing research and development in this field hold significant promise for the management of chronic orthopedic infections.

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Limitation

- No Robust Clinical Study

- Preclinical Study also from Isolated Centres

- Widespread Research or adoption is lacking

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❖**Response:**

Unknown. While there is preclinical evidence that monoclonal antibodies (mAbs) can disrupt biofilm structure, passive immunization clinical trials for orthopaedic infections have only reached phase 1.

Thus, further preclinical as well as clinical research is needed to explore the full potential and the efficacy of mAb therapy

LEVEL OF EVIDENCE: moderate

❖ **Vote:**

- **Agree n=47; 100%**
- **Disagree 0**
- **Abstain 0**

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