To make material reliably, validation of the melting process is key. Density is a measure of how effectively we melt and fuse powders, but we also track silver content, as it gets hot enough to boil silver.

**Why do we need this?**

- 22% of joint implant removals and replacements are due to infection

- up to 20% of cranioimplant surgeries become infected

**How might metal 3D printing help?**

By selective laser melting from a powder feedstock, we can create entirely new alloys just by mixing metal powders. We use this to integrate silver, an antimicrobial metal.

The technique builds up layers thinner than a human hair. This lets us create complex hollow implants we can fill with antimicrobial cements.

**3D printing offers new ways to safeguard implants against infection using silver**

We are developing new alloys to prevent bacteria gaining a foothold, and cements that naturally degrade in the body to release bacteria-fighting ions.

**Melting metals**

To make material reliably, validation of the melting process is key. Density is a measure of how effectively we melt and fuse powders, but we also track silver content, as it gets hot enough to boil silver.

Taking our alloy, we expose it to bacterial cultures, check it disrupts biofilm formation, and makes life that bit harder for infections like e. coli or staph. aureus.

**Old cements | new tricks**

Magnesium oxychloride cement (MOC) has uses in construction but degrades in contact with water - allowing it to break down in vivo.

Addition of silver phosphate allows Ag⁺ ion release as cements degrade, without weakening the cement when dry.

These new formulations change colour as they cure, crucial for surgeons to check it is setting correctly during surgery.