

Multifunctional β -Ti₃AuAg Coatings For Enhanced Artificial Joints And Beyond

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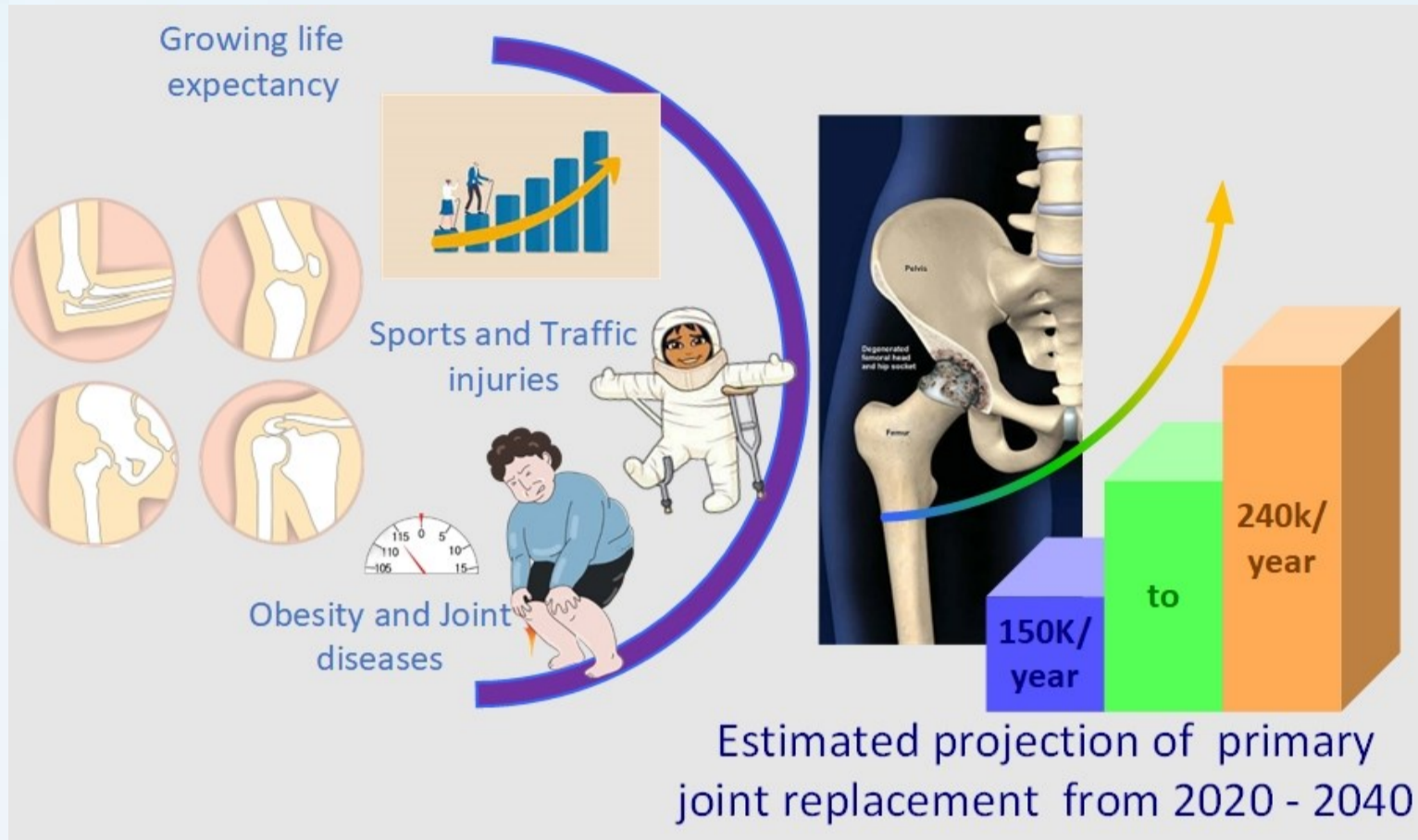
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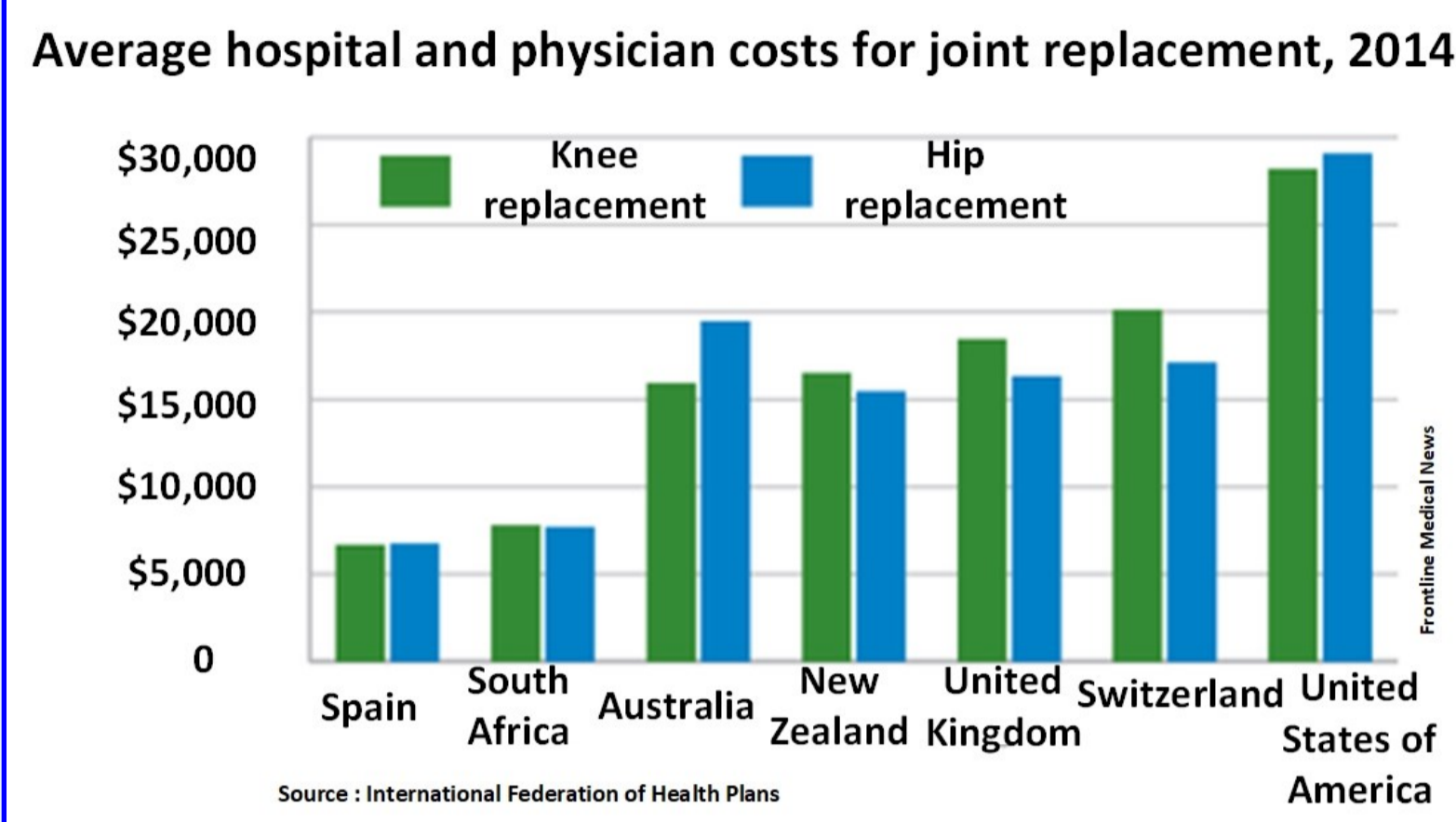
Joint Replacement Surgeries

Radically transforms the quality of life for patients suffering from degenerative joints, caused by various reasons **But**

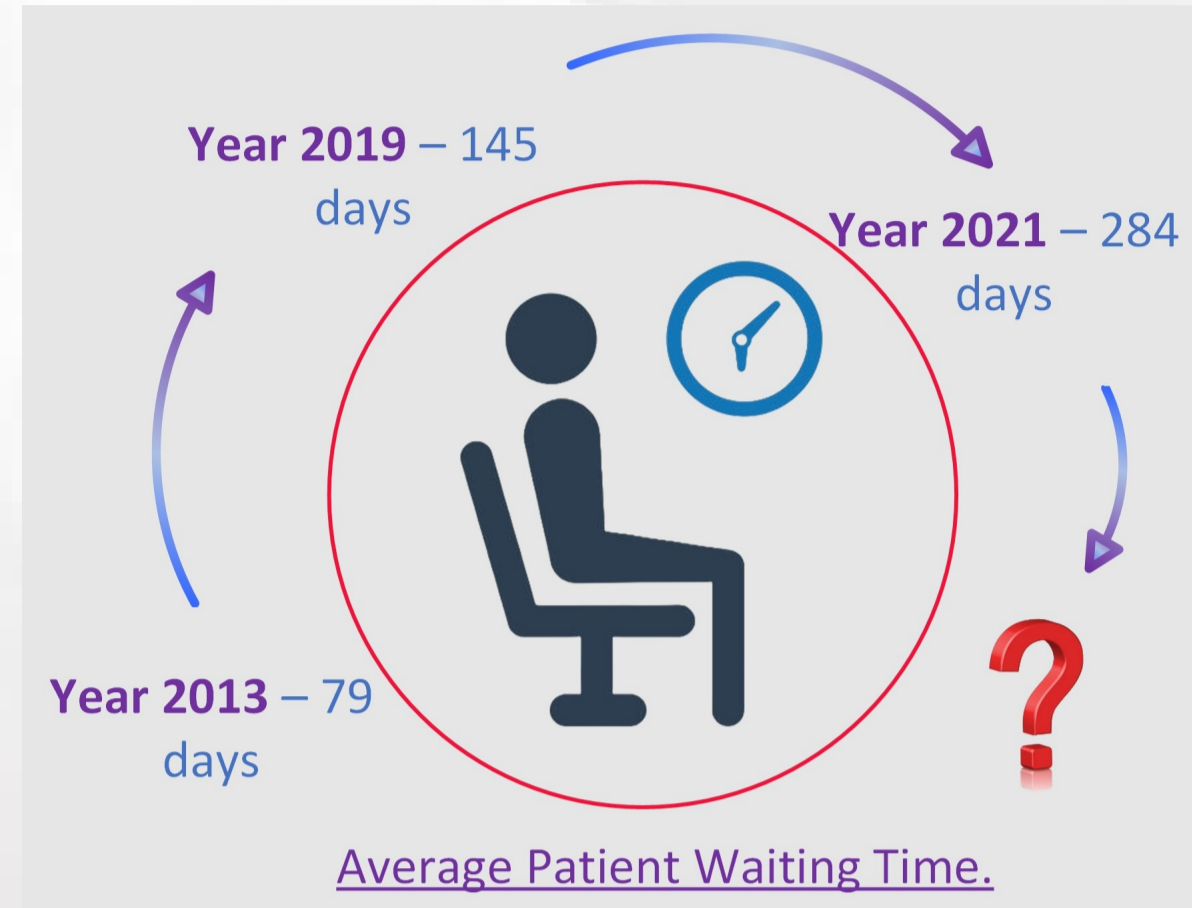
It Is On The Rise



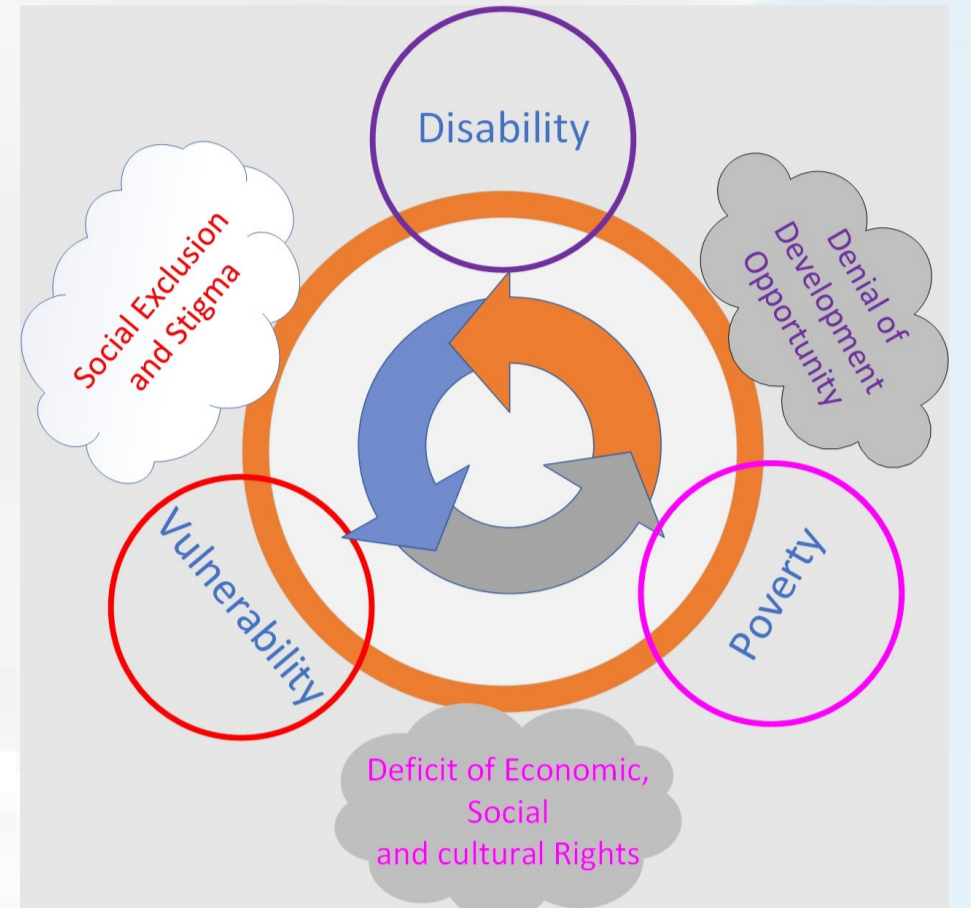
It Is Expensive



It Is Not Quick



It Is Life Changing

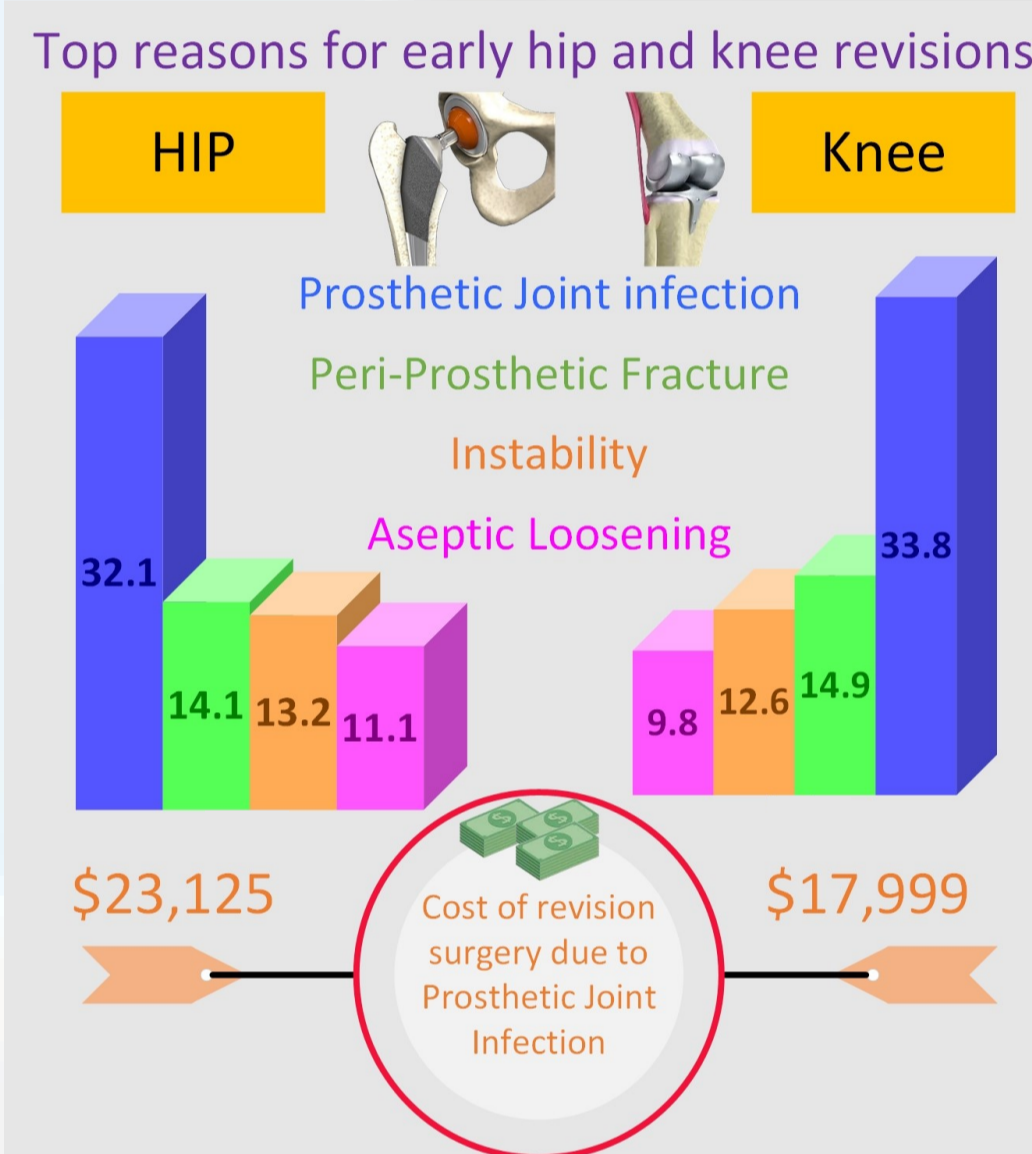


- It costs NHS a good fortune — £1.5 billion annually.
- Projected to be £2.4 billion by 2040, without accounting inflation.
- Physicians, surgeons and nursing teams are pushed beyond limit.
- Patient waiting time increase by 96.6% since 2019 level.
- Waiting causes vulnerability & confidence issues.
- Some categorise it as 'State Worse Than Death'.

Joint Replacement Surgery Is Best Done Once—But Joint Implants Do Fail !!!

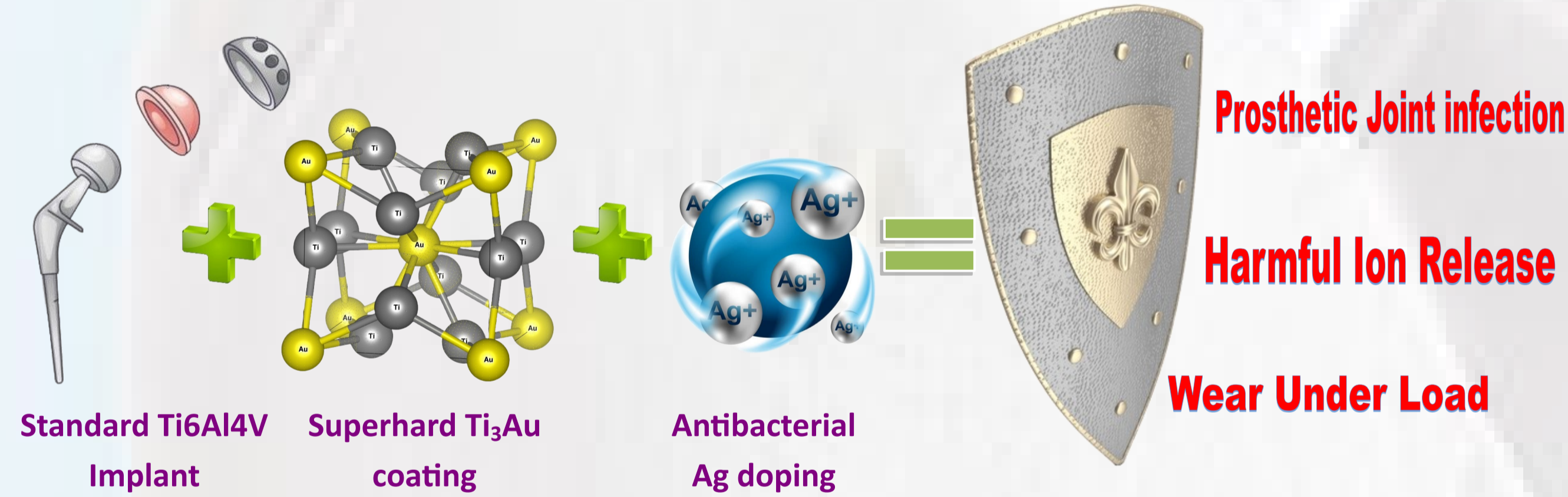
Why Do Implants Fail.?

- Almost 5-15% of joint implants fail within 10 years of primary -7500— 20,000 revisions/year.
- Cost without inflation £75M/year to £200M/year — Whereas complications cases cost even more.
- Revision due to Prosthetic Joint Infection or PJI's on an average cost double the primary surgery.



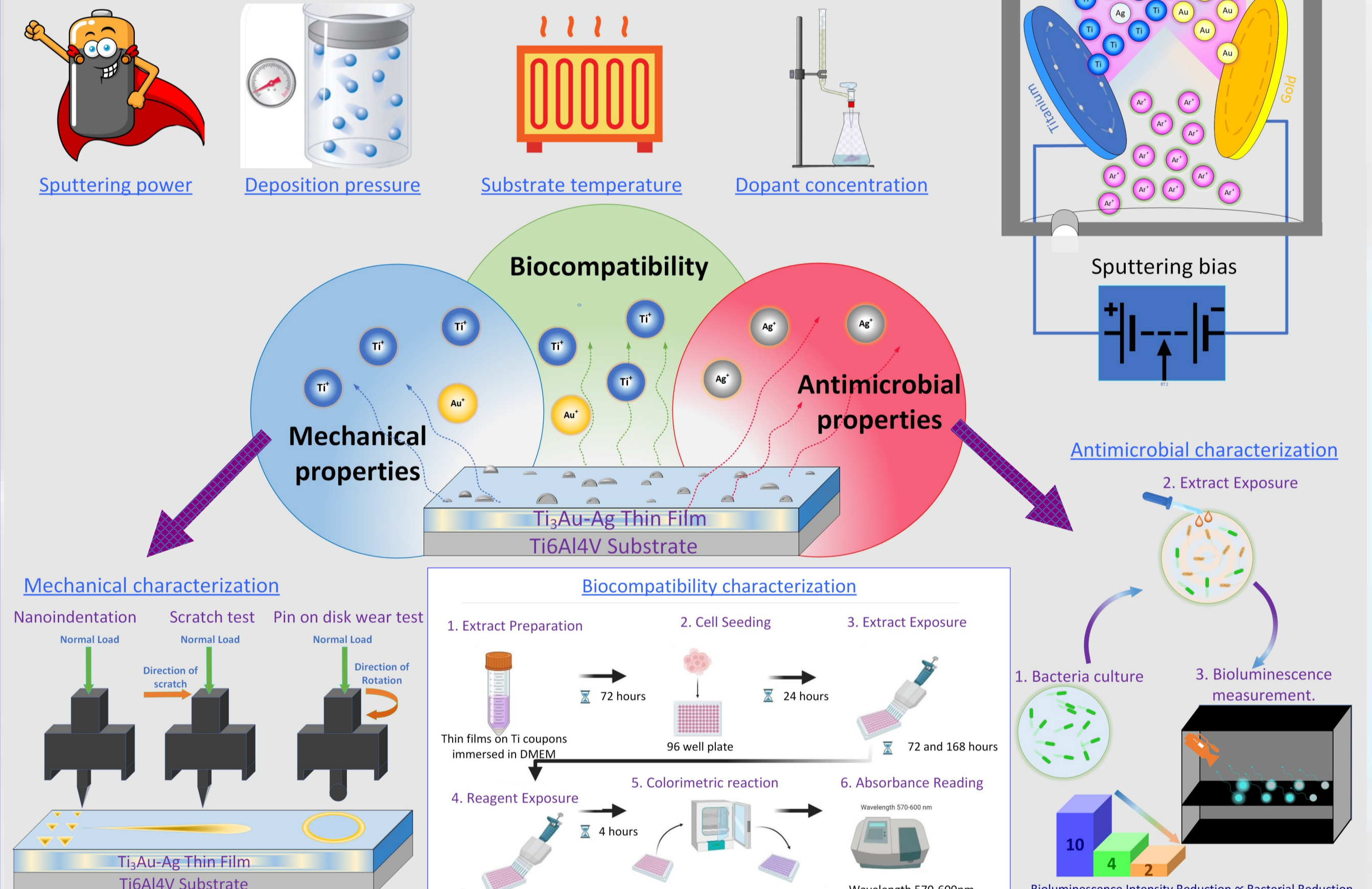
How To Improve Their Lifecycle?

- We coated articulating surface with multifunctional Ti₃Au-Ag thin films.
- Ti₃Au formed superhard-wear resistant- biocompatible protection for these surfaces and Silver (Ag) provided protection against post surgery infections.



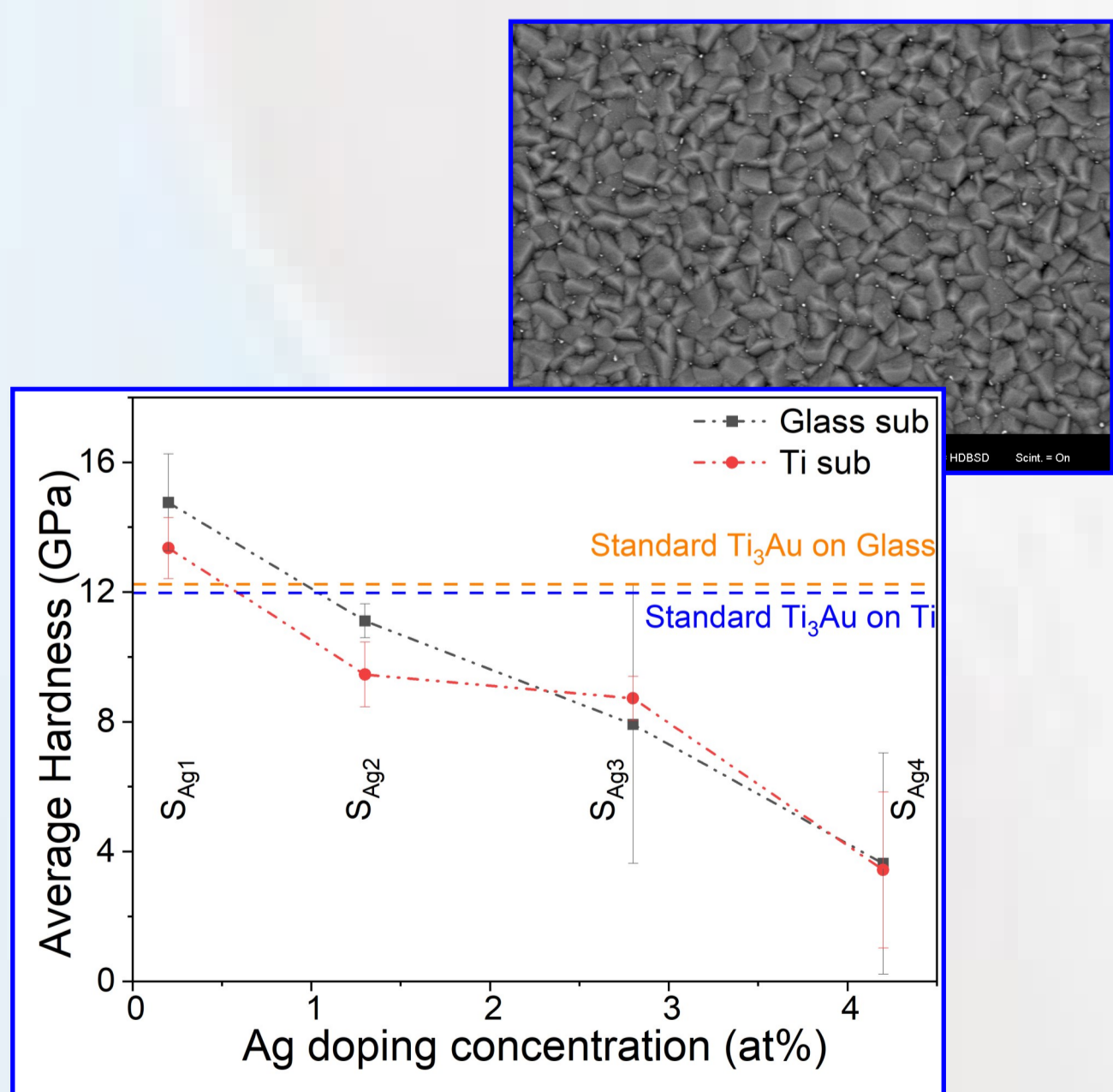
How Can Implants Be Coated And Tested

- Articulating surface of artificial joints can be coated using **Magnetron Sputtering** technique.
- Ti₃Au-Ag thin films were deposited on glass an Ti64 coupons.
- We explored the effects of varying -



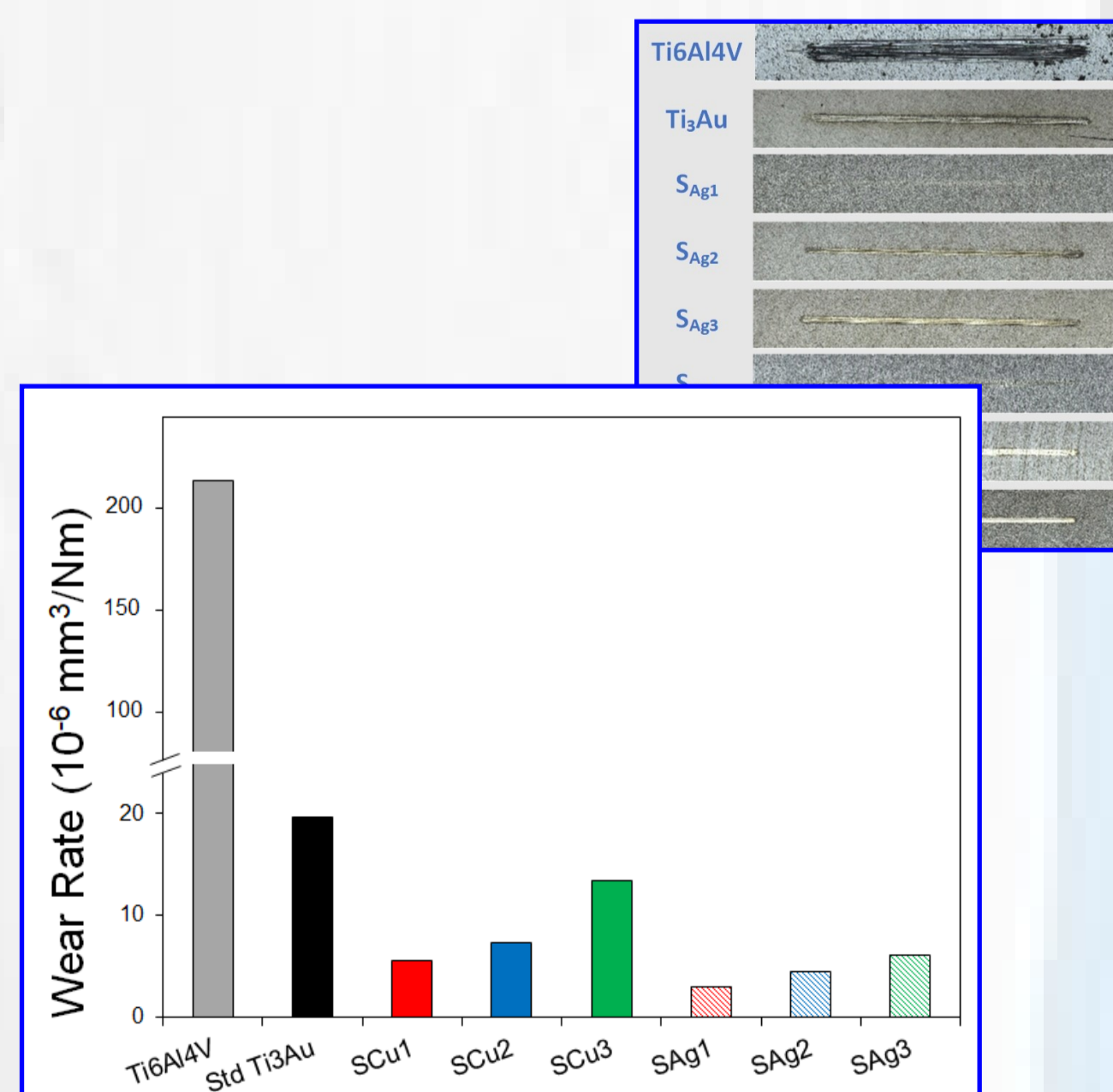
The Performance Of Ti₃Au-Ag Multifunctional Coatings

Increased surface Hardness > 14 GPa



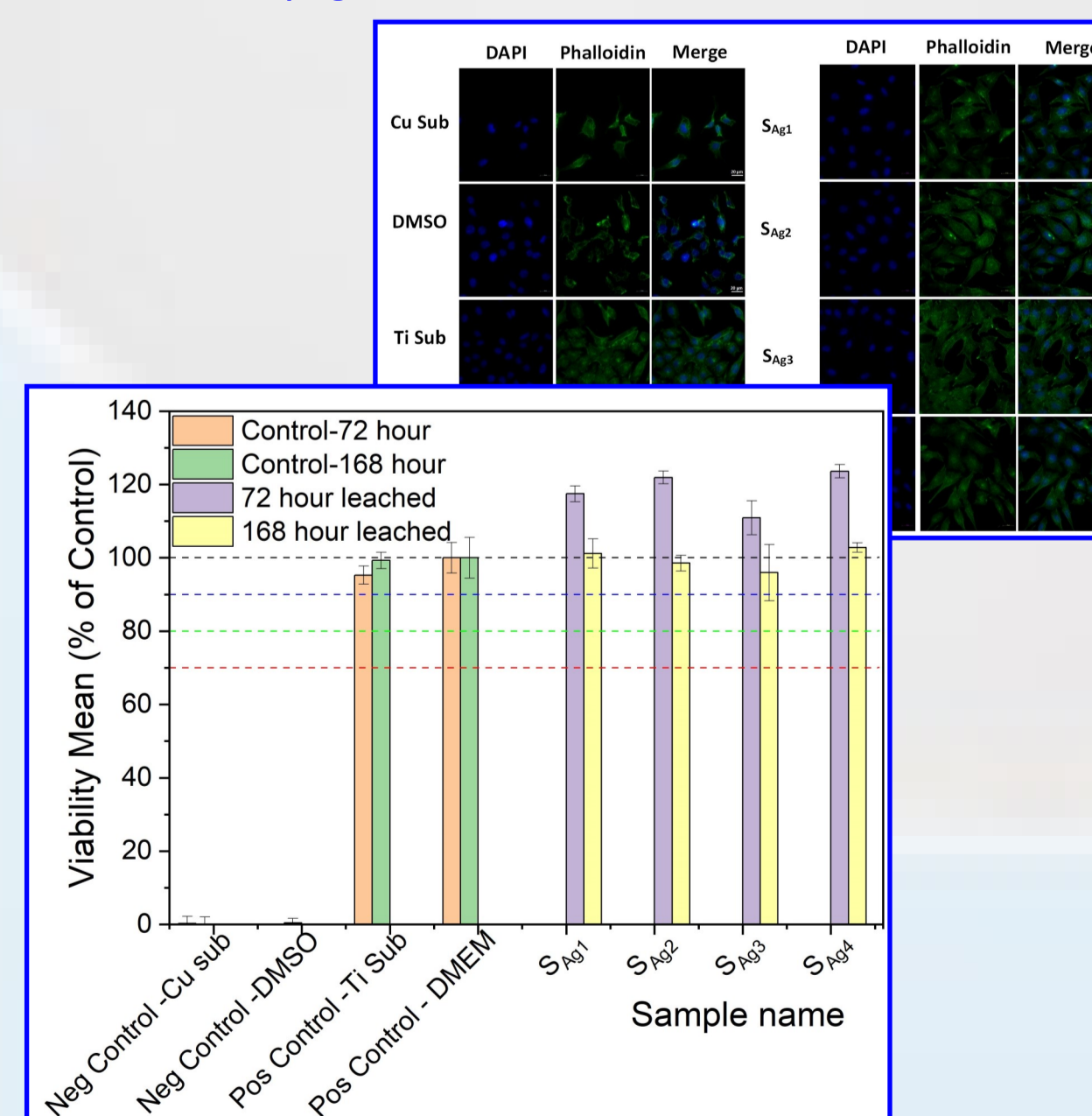
Surface Hardness

60 times increase in wear resistance



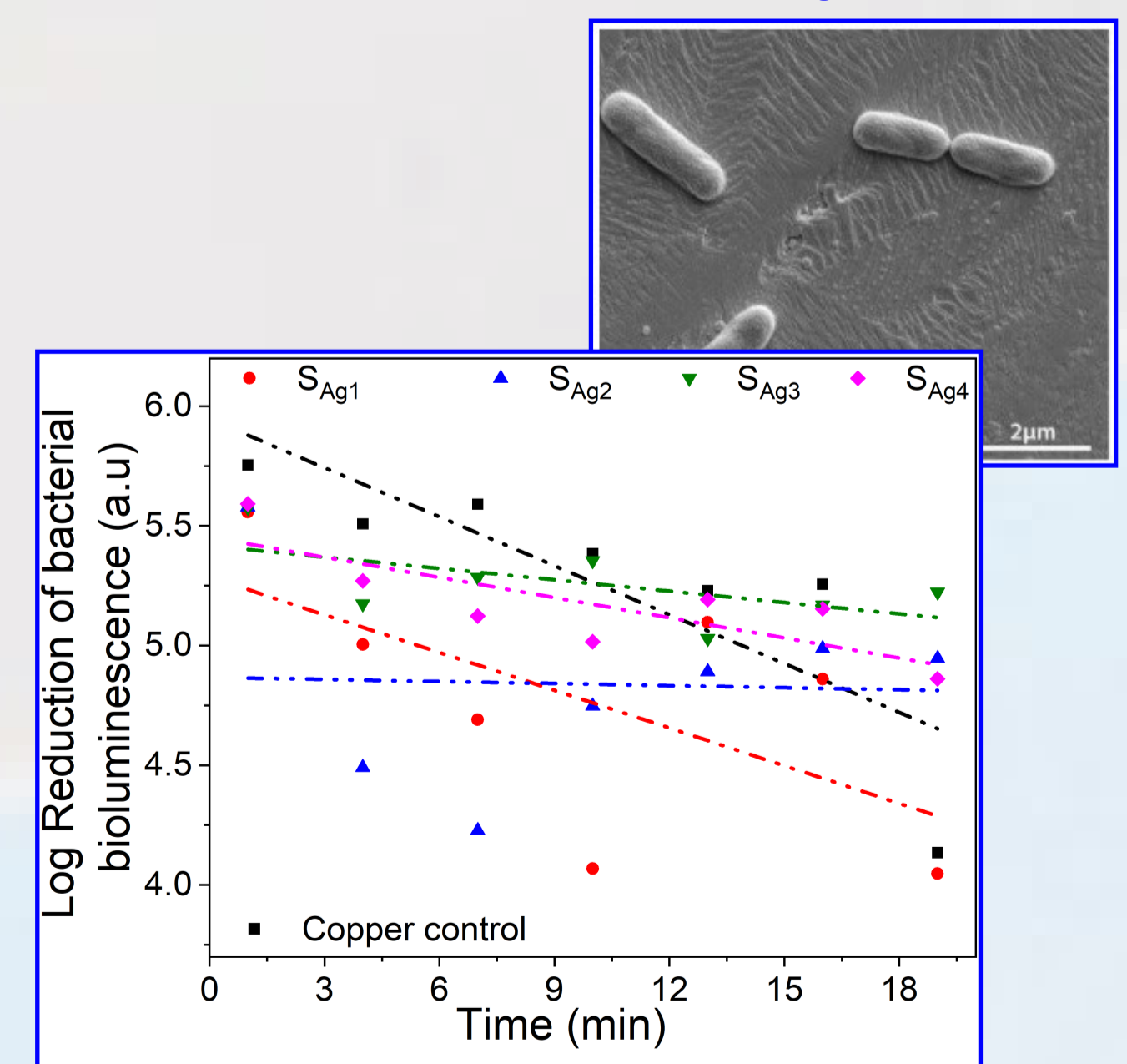
Wear Resistance

Cell viability greater than 95%

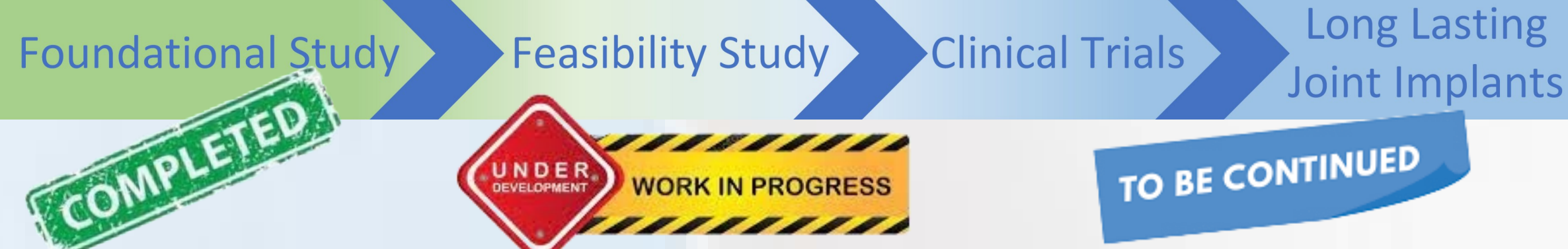


Biocompatibility

Bacterial reduction >1.5log



Antimicrobial Resistance



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