properties of the resulting layers were evidenced against various micro-organism such as *L. ivanovii*, *P. aeruginosa* or *E. coli*. Additionally, smart coatings switching their surface properties from bactericidal to cell-repellent with temperature were prepared by grafting the peptide onto a thermoresponsive macromolecular layer. Our strategies should be advantageously adapted to coat various materials or items used in medicine or food industries.

**Tribological behaviour of oral mixed biofilms**

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The use of dental implants has been increasing even though failures do occur. The presence of wear debris and oral microorganisms can contribute to infections and jeopardize implant integration. The aim of this work was to study the influence of mixed biofilms in the tribological behaviour of commercially pure titanium for dental implants under different concentrations of fluoride. Samples of titanium with two different surface topographies were used. Mixed biofilms of *Candida albicans* and *Streptococcus mutans* were formed on both surfaces at 37 °C in a tryptic soy broth containing mucin, peptone, yeast extract and sucrose. After 8 days, biofilm biomass was analysed by crystal violet staining method. Biofilm biomass was significantly higher for the samples with higher roughness. Some samples with biofilms were analysed under friction (using a force of 100 mN) in an artificial saliva solution (Fusayama) without or with different concentrations of fluoride (30 and 227 ppm). It was verified that the coefficient of friction (COF) decreased in the presence of biofilms. Moreover, samples with more biomass (0.4 μm of roughness) presented the lowest values of COF. Concerning the effect of the presence of fluoride, although there were no significant differences on the COF for 30 ppm, for 227 ppm a transition regimen was observed. These results were confirmed by sample observation under scanning electron microscopy.

In conclusion, it can be highlighted that biofilm formation on dental implants can significantly affect the tribological behaviour of titanium, namely, the presence of biofilms reduces the release of wear debris.

**Session 3: Global scale biofilm systems**

**Utility of Biofilms in Geologic Carbon Sequestration**

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Geologic carbon sequestration involves the injection of CO₂ into underground formations including oil beds, deep un-minable coal seams, and deep saline aquifers with temperature and pressure conditions such that CO₂ will likely be in the supercritical state.

Four trapping mechanisms are proposed to play significant roles in the deep geologic sequestration of CO₂: formation trapping, capillary trapping, solubility trapping, and mineral trapping.

Our research has shown that microbial biofilms are capable of enhancing formation trapping, solubility trapping, and mineral trapping under conditions found in deep brine aquifers.

i) We have demonstrated that engineered microbial biofilms are capable of reducing the permeability of rock cores at pressures and temperatures, which would be found in the presence of supercritical CO₂.

ii) The biofilms have been demonstrated to be resistant to supercritical CO₂.

iii) Biofilms precipitate CO₂ in the form of calcium carbonate (CaCO₃), which resists dissolution by brine and scCO₂.

iv) Microbial activity can increase CO₂ solubilization in brine thus improving solubility trapping.

**Pathogen interactions within phylloplane biofilms: importance of the VBNC state**

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The phylloplane is an essential global ecosystem, experiencing hostile fluctuating environmental stresses, yet host to diverse microbial colonists and plant pathogens forming biofilm. Recently, disease outbreaks caused by fresh produce consumption have turned interest to survival of zoonotic pathogens on the phylloplane; despite strong epidemiological evidence suspected pathogens are frequently undetectable. This study aims to understand the size and spatial distribution of bacterial biofilm communities on the salad phylloplane and assess their role in zoonotic pathogen attachment and survival as viable but nonculturable (VBNC) forms. Spinach or watercress leaves were examined for biofilm and exopolymeric substances (EPS) using EDIC/EF microscopy. Microorganisms were confirmed and quantified using culture, DAPI and BacLight staining. Leaves were also spiked with *Salmonella Typhimurium*, *S. Thompson or Escherichia coli* O157:H7, some carrying gfp fluorescent markers, and cell-cell or cell-phylloplane interaction monitored continuously using real time fluorescence imaging. Microcolonies and EPS slime were observed in leaf margins, between margins and around stomata. Spiked cultures of motile *S. Thompson showed subpopulations with different attachment strategies including directly binding to the leaf surface or to biofilm, and also chemotactic swimming into stomata. ΔrpoS