



International Travel Report on the Ewing's Sarcoma Collaborative Project

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The Institute of Engineering and Technology (IET) supported my visit to the Shanghai Jiao Tong University (SJTU) Affiliated Sixth People's Hospital in Shanghai, China, in October 2024 (Figure 1). This visit aimed to forge collaborations and develop new strategies for the immunotherapy of Ewing's sarcoma (EWS), a rare and aggressive bone cancer affecting children and young adults. EWS remains a challenging disease due to its low incidence in the UK (fewer than 50 cases annually), which limits large-scale clinical trials and robust data collection. By collaborating with a centre that treats over 1000 EWS cases annually, I hoped to gather valuable insights and expand our immunotherapy research by integrating data from a diverse patient population.

The core objectives of my visit included: 1) enhancing the 3D tumour organoid model for EWS to replicate the tumour microenvironment more precisely, improving drug screening and immunotherapy research outcomes; 2) establishing the first UK-China EWS proteomic database to study variations across ethnic groups, facilitating more personalised treatment strategies; 3) learning about advanced EWS treatments, particularly in T-cell receptor-engineered T cell (TCR-T) immunotherapy; 4) exploring potential collaborations in developing TCR-T therapy, organoid platforms, and proteomic data collection; and 5) discussing funding opportunities to secure a long-term strategic partnership. Overall, the visit was highly productive, achieving significant progress in all planned objectives.

Exchange of Knowledge and Initial Meetings

In the first few days, the SJTU Hospital team and I held several focused meetings to review the latest EWS treatment strategies and clinical protocols.

- ◆ Current EWS treatment innovations: We discussed the standard treatments for EWS,

which typically involve surgery, radiation, and intensive multi-agent chemotherapy. While these methods target the primary tumour, their effectiveness is limited by low selectivity and high toxicity, which can severely impact patient quality of life. The SJTU team presented promising lab-based data on TCR-T immunotherapy, an approach with significant potential for solid tumours like EWS due to its enhanced infiltration abilities. However, challenges remain, particularly in efficacy and side effects. The most pressing need identified was to discover novel biomarkers with higher specificity and affinity for TCR-T cell targeting.

- ◆ Advances in bone cancer organoids: The hospital team shared invaluable insights on their experience in developing 3D tumour organoid models. Their models primarily aim to replicate EWS tumours' cellular and biochemical environment, but a shared goal emerged: designing an organoid that could incorporate biomechanical stimuli and bone-like shell, essential to mimicking the bone structure and rigidity associated with EWS. By enhancing the model's complexity, we aim to make it more representative of the tumour's in vivo state. The team proposed using the biomaterials I developed and a bespoke bioreactor to achieve this environment, which could improve drug screening accuracy.
- ◆ Preparation for the UK-China EWS proteomic database: Another key objective was to establish a shared EWS proteomic database, which involved navigating both UK and Chinese regulatory frameworks for patient sample collection. We agreed on data handling protocols to ensure ethical compliance and finalised a formal collaboration agreement for this database (Figure 2), which will enable us to study EWS characteristics across different ethnic backgrounds. This shared database promises to be a valuable resource for personalised medicine research in EWS.

Clinical Observations and Protocol Development

To gain a comprehensive understanding of the treatment approach in China, I observed the SJTU team's clinical work over three days, joining them during outpatient visits (Figure 3), patient consultations, and surgeries. This experience highlighted the importance of rapid diagnosis and intervention in EWS, as well as the challenges faced in integrating novel treatments within a high-volume clinical setting. Observing these procedures allowed me to identify key areas where biomarker research could further assist in early diagnosis, an area critical for improving patient outcomes in EWS.

Following these observations, we collaborated to draft initial protocols for patient sample collection. Given the extensive number of EWS cases treated at SJTU Hospital, sample availability and variety will contribute significantly to our proteomic research. We also discussed possible funding opportunities to ensure that these protocols can be sustained long-term, with support from both national and international grants. This protocol includes parameters for collecting tissue samples, proteomic data storage, and patient information handling, thereby laying the groundwork for a sustainable, ethically-compliant proteomic resource.

Supplementary Visit to China National Centre for Orthopaedics

After the primary visit to SJTU, I visited the China National Centre for Orthopaedics (Figure 4), a state-of-the-art facility established in 2023 with extensive government support. The centre has emerged as a leading force in bioengineering and rare disease research in China, focusing on advanced cancer research and bioengineering. During this visit, I met with top researchers and attended seminars that introduced the latest advancements in medical bioengineering and regulatory frameworks in China. This activity was invaluable, as it provided insights into how regulatory priorities and technological advancements align, shaping a collaborative framework for integrating our research goals with national policies in both China and the UK.

The supplementary visit also broadened the scope of our collaboration, providing perspectives that would enrich the project's research angle. By engaging with experts across orthopaedics, cancer biology, and bioengineering, we identified potential joint projects, such as leveraging the orthopaedic centre's genomics and bioinformatics expertise for the EWS proteomic database. These discussions led to the development of a roadmap for our collaboration that aligns with both UK and China's research priorities.

Outcomes and Future Impact

Reflecting on this visit, several critical outcomes have paved the way for impactful, long-term collaboration. We successfully exchanged knowledge on EWS treatment strategies, particularly in advancing TCR-T cell immunotherapy. This partnership deepened our understanding of refining a 3D organoid model that integrates both cellular and biomechanical aspects, enhancing its value for drug screening. Additionally, our agreement to establish the first UK-China EWS proteomic database is a pivotal step toward understanding disease variations across populations and supporting personalised treatments. A strategic roadmap now guides our collaboration, with joint funding prospects to sustain our work. Securing additional resources will support biomarker discovery and the EWS proteomic database, essential for guiding future research and clinical protocols.

This visit to SJTU and the China National Centre for Orthopaedics has laid a strong foundation for continued collaboration. By aligning expertise across TCR-T therapy, organoid models, and proteomics, we can accelerate efforts to address EWS's unique challenges. The IET's support was instrumental in achieving these milestones. By enabling this visit, the award facilitated collaborations, access to valuable resources, and opportunities for joint research. I am grateful to the IET for supporting this transformative visit and look forward to our continued work advancing rare disease treatment and EWS therapy worldwide.



Figure 1. The gate of SJTU's main campus with a history spanning 130 years.



Figure 2. Representatives from UCL and SJTU signed a collaborative agreement.



Figure 3. The busy outpatient waiting area at SJTU Hospital.



Figure 4. The newly-built, 11-floor China National Centre for Orthopaedics.