Successful realisation of nanomedicines in clinical application is limited and can be considerably attributed to the biological heterogeneity between animals used in preclinical testing, and the patients assessed in clinical trials. In the modern era of a search for personalised treatment nanomedicines provide the perfect architecture to build an individualised treatment plan, but translation of these new constructs requires a robust and flexible treatment methodology that can be validated not only in mice but in animal models more similar to humans. Here we report on the first ever comparative oncology approach to the diagnosis and treatment of a canine patient with spontaneously occurring prostate cancer (Figure 1) with targeted nanomedicines. The canine patient was diagnosed with prostate cancer and the standard clinical tracer targeted towards prostate-specific membrane antigen (PSMA) ⁶⁸Ga-PSMA was used to confirm this diagnosis using PET-CT. A nanomedicine prepared for the same target was also injected at a later time. Neither the ⁶⁸Ga-PSMA or nanomedicine were able to positively identify the tumour, and after biopsy it was found that the tumour was in fact PSMA negative. The canine was treated with a nanomedicine loaded with a chemotherapeutic and after analysis of a biopsy of the tumour tissue taken prior to treatment, a more specific target (EGFR) was found to be overexpressed in the cancer. After imaging a second time with the nanomedicine targeted to this receptor, positive identification of the tumour was made. MRI also revealed a change in the composition of the tumour tissue, indicating a positive effect by the therapeutic nanomedicine and further validating the application of these constructs for use in future personalised medicine approaches to cancer treatment in humans.

Figure 1: Comparative oncology approach of validating nanomedicines for the diagnosis and treatment of prostate cancer.