



**Figure S1.** Two novel HMOS cell lines. Tumor tissues were harvested from the primary lesions of the upper arm (primary lesions) (a) and the newly emerging, late sternal lesions during treatment (b). Multicentric osteosarcoma cell lines were established at HMOS-A (c) and HMOS-P (d). Scale bar, 200  $\mu\text{m}$  (reference 8).

**Table S1.** Phage Library Screening for HMOS-P. A comprehensive screening of antibodies against HMOS-P was performed using the AIMS7 phage library. Finally, four screenings were performed, concentration was performed until the denominator of the recall rate was 103, and 95 clones of antibodies were selected.

Round	Wet Weight (Cells)	Input	Output	Recovery
First	110 $\mu\text{L}$ $\rightarrow$ 60 $\mu\text{L}$	$3.79 \times 10^{13}$	$4.25 \times 10^8$	$1/8.92 \times 10^4$
Second	115 $\mu\text{L}$ $\rightarrow$ 70 $\mu\text{L}$	$4.89 \times 10^{10}$	$1.88 \times 10^5$	$1/2.60 \times 10^5$
Third – 1	65 $\mu\text{L}$ $\rightarrow$ 35 $\mu\text{L}$	$1.28 \times 10^9$	$1.40 \times 10^4$	$1/9.14 \times 10^4$
Third – 2	110 $\mu\text{L}$ $\rightarrow$ 65 $\mu\text{L}$	$1.30 \times 10^9$	$2.32 \times 10^4$	$1/5.60 \times 10^4$
Fourth	155 $\mu\text{L}$ $\rightarrow$ 90 $\mu\text{L}$	$1.35 \times 10^9$	$3.07 \times 10^6$	$1/4.40 \times 10^3$