Validated S180 Allograft Model:
Subcutaneous And Metastatic Allograft Tumor Model

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Advancing Sarcoma Studies with Allograft Models

Sarcomas are a diverse and challenging group of malignant tumors originating from mesenchymal tissues such as bone, muscle, and fat. The complexity of these tumors makes it difficult to develop effective treatments. Various animal models, including allografts, patient-derived xenografts (PDXs), and cell line-derived xenografts (CDXs), are essential for studying sarcoma biology and testing new therapies. Allograft models involve transplanting tumor cells or tissue from a donor mouse into a genetically similar recipient, preserving the immune system's role in tumor progression and response to treatments. CDX models use established cancer cell lines, providing a consistent and reproducible platform for evaluating drug efficacy. These models complement each other, offering insights into immune responses, tumor microenvironment interactions, and metastatic behavior. By combining allografts, PDXs, and CDXs, researchers gain a comprehensive understanding of sarcoma biology, accelerating the discovery of novel therapies and advancing clinical applications.

S180 Cell Line

The sarcoma 180 (S180) cell line is a widely used murine cancer model originally isolated from a soft tissue sarcoma in a mouse. As a transplantable sarcoma, S180 cells can be propagated in immunocompromised mice, making them valuable for studying tumor growth, progression, and therapeutic responses in a fully functional immune system. This cell line exhibits rapid proliferation and has been instrumental in evaluating the efficacy of chemotherapeutic agents and immunotherapies. S180 tumors can be grown in various mouse strains via subcutaneous or intraperitoneal injection, providing flexible *in vivo* models for drug screening. Due to its consistent tumorigenic properties, S180 is useful as a model for assessing host immune responses and tumor microenvironment interactions.

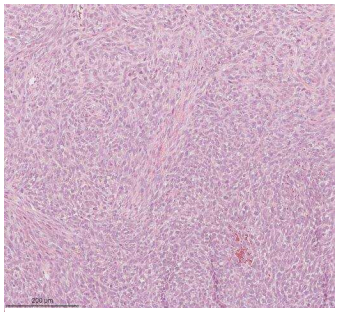

Figure 1. Tumor Histology. H&E stained slide of subcutaneously-implanted S180 tumor (Altogen Labs).

Altogen Labs Validated S180 Allograft Model

At Altogen Labs, the preclinical study begins with S180 cells grown under exponential conditions, which are then collected and tested to ensure a viability of 98-99%. The cell suspension is adjusted to a concentration where a 120-140 µL injection, composed of Matrigel and S180 cells, contains a total of 1 × 10^6 cells. Each 10 to 12-week-old athymic BALB/C or NOD/SCID mouse receives a single subcutaneous (s.c.) injection in the hind leg. Tumor establishment is monitored through palpation, and once tumors reach a volume of 75-100 mm^3, the in-life portion of the study begins. Mice are then randomized into treatment groups to ensure equal tumor distribution, and compound administration follows the designated treatment schedule. Throughout the study, mouse body weights are recorded biweekly or triweekly, while tumor measurements are taken daily. The study concludes when tumor volumes reach 2,000 mm^3, at which point necropsy and tissue collection are conducted as outlined in the study quote. Excised tumors are weighed and digitally imaged, and standard gross necropsies are performed for further analysis. Upon client request, collected tumors and tissues can be either snap-frozen or preserved in RNAlater for downstream applications.

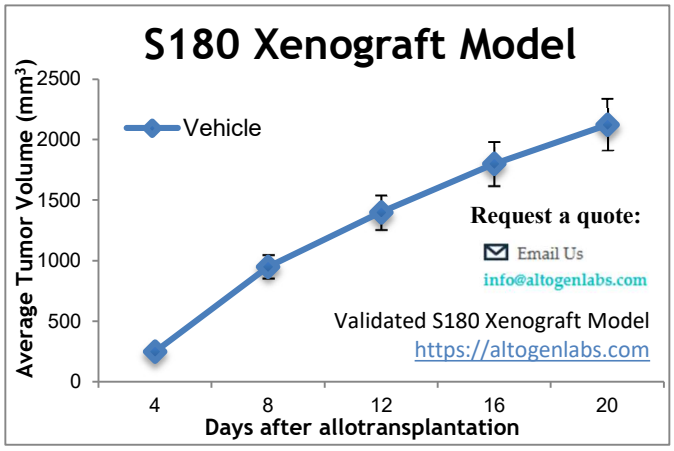

Figure 2. S180 sarcoma allografted in athymic mice, mean values +/- SEM (Altogen Labs).

Subcutaneous S180 Models in Preclinical Cancer Research

The subcutaneous S180 model is a widely used murine system for studying soft tissue sarcomas and testing potential cancer therapies. In this model, S180 cells, derived from a mouse sarcoma, are injected subcutaneously into immunocompromised mice, typically in the flank area. This model is advantageous due to its ability to form palpable, reproducible tumors that can be easily monitored and measured. Tumor growth is closely observed, and therapeutic interventions can be administered as the tumor reaches a specific size threshold. Subcutaneous S180 models are particularly valuable for evaluating the efficacy of chemotherapeutic agents, targeted therapies, and immune-based treatments. Furthermore, they allow researchers to study tumor biology, including tumor progression, angiogenesis, and immune response, in a controlled environment. The model is also cost-effective and straightforward, making it a go-to for preclinical testing in drug development.

Exploring Tumor Spread with Metastatic S180 Models

Metastatic S180 models are crucial for studying the spread of sarcoma cells to distant organs, particularly the lungs, and for evaluating therapeutic approaches targeting metastasis. In these models, S180 cells are injected into immunocompromised mice, often intravenously, to mimic the process of cancer dissemination. The S180 tumor model is frequently used to study lung metastasis, as the cells have a natural tendency to spread to this organ. This model provides insight into key aspects of metastasis, such as the initial seeding of cancer cells, the formation of metastatic lesions, and the tumor microenvironment's role in supporting secondary growth. Researchers use metastatic S180 models to test the efficacy of drugs aimed at inhibiting metastasis or promoting tumor regression. These models are particularly useful for studying the molecular mechanisms underlying metastasis and evaluating treatments that target metastatic progression.

Case Study: S180 Sarcoma Suppression through DVDMS and Ultrasound Synergy

In a study by Xiong W, *et al*. published by *Scientific Reports* journal, explores the anti-tumor potential of a novel sonosensitizer, sinoporphyrin sodium (DVDMS), in combination with multiple focused ultrasound treatments against S180 sarcoma cells. The research highlights the efficacy of this sonodynamic therapy (SDT) in both *in vitro* and *in vivo* models, demonstrating significant suppression of tumor growth, increased apoptosis, and inhibition of angiogenesis. The S180 sarcoma model was used to evaluate the therapeutic effects, revealing that DVDMS accumulates preferentially in tumor cells, enhancing its cytotoxic effects upon ultrasound activation. Notably, the combination therapy resulted in an 89.82% tumor weight inhibition ratio, far surpassing the efficacy of ultrasound alone (32.56%) or a single treatment of DVDMS-SDT (59.33%). Mechanistically, the therapy promoted apoptosis via mitochondrial pathways, inhibited cell proliferation by reducing PCNA expression, and suppressed angiogenesis by downregulating VEGF levels. DVDMS-SDT did not cause significant toxicity or weight loss in treated animals, suggesting its potential as a safe and effective cancer therapy. These findings position S180 sarcoma as a valuable model for investigating SDT and provide strong evidence that DVDMS-mediated SDT could serve as a promising non-invasive treatment strategy for solid tumors.

Additional Case Study: Buckwheat Polysaccharide as an Adjuvant Therapy for S180 Sarcoma

Another study conducted by Fan DJ, *et al*., published by *Archives of Medical Science* journal, investigates the effects of buckwheat polysaccharide (BP) as an adjuvant therapy for S180 sarcoma, a widely used experimental tumor model. S180 tumor-bearing mice were treated with varying doses of BP, either alone or in combination with cyclophosphamide (CTX), to evaluate tumor suppression, immune function, and survival outcomes. While BP did not significantly inhibit tumor growth, it markedly improved lifespan and survival rates, with the medium-dose group showing the highest benefits. Additionally, BP enhanced immune function by increasing thymus and spleen indexes, which were otherwise suppressed by CTX treatment. Flow cytometry analysis revealed that BP arrested S180 tumor cells in the G0/G1 phase, indicating potential anti-proliferative effects. The combination of BP and CTX provided further protective effects by mitigating CTX-induced toxicity without compromising its tumor-suppressive efficacy. Although BP did not directly eliminate S180 sarcoma, its immune-enhancing properties and ability to improve survival suggest its potential as a complementary cancer therapy.

Oncogenes and Host Susceptibility in S180 Tumor Metastasis

The S180 sarcoma cell line is a widely used experimental model for studying tumor metastasis and oncogene-driven cancer progression. These cells exhibit metastatic potential due to genetic alterations that enable them to evade immune recognition, particularly through beta-2 microglobulin deficiency and MHC class I destabilization. As a result, S180 cells can proliferate unchecked in various inbred mouse strains, forming aggressive tumors in the lungs when introduced via the bloodstream. Recent studies highlight strain-specific differences in susceptibility to pulmonary metastasis, with some

genetic backgrounds exhibiting complete tumor clearance, suggesting an interplay between oncogenic drivers and host immune responses. Additionally, oncogene-driven factors regulating adhesion, extravasation, and proliferation are key determinants of metastatic efficiency in S180 tumors. Immune-mediated mechanisms, particularly T-cell activity, have been shown to play a crucial role in tumor clearance, as T-cell depletion significantly enhances S180 metastasis. Understanding the genetic and immune interactions that dictate S180 tumor behavior provides valuable insight into metastasis regulation and potential therapeutic interventions.

The following options are available at Altogen Labs for the S180 allograft model: Tumor Growth Delay (TGD), which measures latency; Tumor Growth Inhibition (TGI); and flexibility in dosing frequency and duration of administration. Various dosing routes can be utilized, including intravenous, intratracheal, continuous infusion, intraperitoneal, intratumoral, oral gavage, topical, intramuscular, subcutaneous, intranasal, and advanced micro-injection techniques, as well as pump-controlled IV injections. The model also supports S180 tumor immunohistochemistry and alternative cell engraftment sites for further exploration. Blood chemistry analysis can be performed, along with toxicity and survival studies, which may include a broad health observation program if desired. Gross necropsies and histopathology are conducted for comprehensive evaluation. A positive control group can be employed, with cyclophosphamide administered at a dosage of 20-25 mg/kg via intramuscular injection daily throughout the study duration.

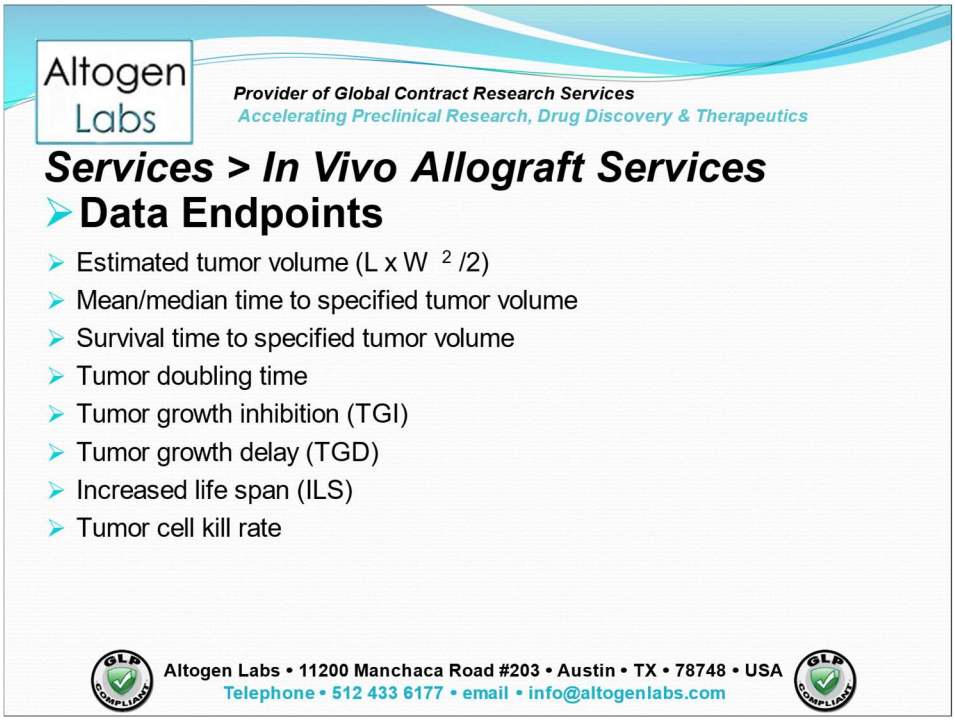

Figure 3. Data endpoints of *in vivo* allograft services (Altogen Labs).

Exploring Tumor Immunology with Syngeneic Models

Syngeneic mouse models are valuable in cancer research, particularly for studying tumor-immune system interactions. These models involve the transplantation of tumor cells into genetically identical, immunocompetent mice, ensuring that the immune system is fully functional and can respond to the tumor. Syngeneic models are commonly used to test immunotherapies, as they allow for the evaluation of immune responses within a natural host environment. They are particularly useful in exploring how tumors evade immune surveillance and identifying potential therapeutic targets. These models can also be used to study metastasis, tumor microenvironment, and the effects of various treatments on immune activation. By preserving the host's immune system, syngeneic mouse models provide more clinically relevant data for developing cancer therapies that modulate immune responses.

Advancements in Organoid Models for Cancer Research

Organoids represent a breakthrough in cancer research as three-dimensional *in vitro* cultures derived from patient tumor samples. These models preserve the key characteristics of the original tumor, including both genetic and phenotypic diversity, allowing for a more accurate representation of the tumor's complexity. Unlike conventional two-dimensional (2D) cell cultures, which fail to recapitulate the intricate tissue architecture of tumors, organoids maintain the natural structure and functionality of the tissue. This makes them highly valuable for personalized cancer research, enabling more precise drug testing and therapeutic evaluations. Organoids can be efficiently expanded from primary patient-derived material, offering a scalable and faster alternative to traditional models like xenografts and allografts, which provide tumor-stroma and immune system interactions. Recent advancements in organoid technology have further accelerated their utility, with

the creation of patient-derived tumor organoid (PDTO) biobanks, which serve as living resources to study cancer progression, metastasis, and resistance to treatment. These biobanks are especially useful for high-throughput drug screening, enabling researchers to identify targeted treatments that match individual tumor profiles, ultimately improving the development of personalized therapies.

S180 Handling Procedures and Subculturing Protocols

To ensure optimal S180 cell viability, it is crucial to thaw the vial and initiate culture as soon as possible after receiving. In cases where continued storage is required, the frozen culture should be stored in the vapor phase of liquid nitrogen, as storing at -70°C will result in a loss of viability. Thaw the vial quickly by gentle agitation in a 37°C water bath, ensuring the O-ring and cap remain above the water to minimize the risk of contamination. The thawing process should take approximately 2 minutes for rapid recovery. Once the contents are thawed, remove the vial from the water bath and decontaminate it by dipping or spraying with 70% ethanol. All subsequent procedures should be performed under strict aseptic conditions. Transfer the vial contents into a centrifuge tube containing 9.0 mL of complete culture medium, then spin at approximately 125 x g for 5 to 7 minutes. After centrifugation, resuspend the cell pellet in the recommended complete medium, as specified by the batch's culture information, and dispense the suspension into a 25 cm^2 or 75 cm^2 culture flask. It is important to ensure that the medium's pH remains within the optimal range (7.0–7.6) during cell recovery. To achieve this, pre-warm the culture vessel containing the complete growth medium for at least 15 minutes in the incubator prior to adding the vial contents. Incubate the culture at 37°C in a suitable incubator with a 5% CO_2 atmosphere if using the specified growth medium. Cultures should be initiated at a density of 2 × 10^5 cells/mL, and maintained within a range of 1 × 10^5 to 1 × 10^6 cells/mL. To ensure optimal growth conditions, fresh medium should be added or replaced every 2 to 3 days, depending on the culture's needs. Regular medium renewal supports cell health and maintains the appropriate nutrient levels required for sustained proliferation.

References:

S180 Allograft Syngeneic Model. https://altogenlabs.com/xenograft-models/sarcoma-xenograft/s180-xenograft-model/

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Xiong W, Wang P, Hu J, Jia Y, Wu L, Chen X, Liu Q, Wang X. A new sensitizer DVDMS combined with multiple focused ultrasound treatments: an effective antitumor strategy. *Sci Rep*. 2015 Dec 3;5:17485. doi: 10.1038/srep17485. Erratum in: Sci Rep. 2021 Aug 23;11(1):17288. doi: 10.1038/s41598-021-96653-5. PMID: 26631871; PMCID: PMC4668354.

Keywords: S180, sarcoma, allograft, sarcoma cancer, *in vivo*, cancer, preclinical, research, *in vivo* pharmacology, PDX, CDX, syngeneic, organoids

Other Available Altogen Labs Validated Xenograft Models:

A549 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/a549-xenograft-model/

Calu-3 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/calu-3-xenograft-model/

Cal-6 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/calu-6-xenograft-model/

NCI-H460 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/h460-xenograft-model/

NCI-H1975 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/nci-h1975-xenograft-model/

NCI-H226 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/nci-h226-xenograft-model/

NCI-H1155 Xenograft Model: https://altogenlabs.com/xenograft-models/lung-cancer-xenograft/h1155-xenograft-model/