

Two-Photon Intravital Microscopy of Glioblastoma in a Murine Model

Kerem Nernekli¹, Dilyana B. Mangarova^{*1}, Yifeng Shi², Zahra Shokri Varniab¹, Edwin Chang¹, Oguz Ziya Tikenogullari³, Laura Pisani¹, Grigory Tikhomirov², Gordon Wang⁴, Heike E. Daldrup-Link¹

¹Molecular Imaging Program at Stanford (MIPS), Department of Radiology, Stanford University School of Medicine ²Department of Electrical Engineering and Computer Sciences, University of California, Berkeley ³Department of Mechanical Engineering, Stanford University ⁴Department of Psychiatry and Behavioral Sciences, Stanford University, Wu Tsai Neuroscience Institute, Stanford University

*These authors contributed equally

Corresponding Author

Dilyana B. Mangarova
mangarod@stanford.edu

Citation

Nernekli, K., Mangarova, D.B., Shi, Y., Varniab, Z.S., Chang, E., Tikenogullari, O.Z., Pisani, L., Tikhomirov, G., Wang, G., Daldrup-Link, H.E. Two-Photon Intravital Microscopy of Glioblastoma in a Murine Model. *J. Vis. Exp.* (205), e66304, doi:10.3791/66304 (2024).

Date Published

March 1, 2024

DOI

10.3791/66304

URL

jove.com/video/66304

Materials

Name	Company	Catalog Number	Comments
0.9% sodium chloride infusion solution	Baxter Corp	533-JB1301P	
Dulbecco's Modified Eagle Medium	Invitrogen	11965-092	
1 mL syringes	BD	Luer-Lok syringe, REF309628	
10% FBS	Thermo fisher	Cytiva SH30910.03HI	
10% DMSO	Sigma-Aldrich	D8418-50ML	
2-photon microscope	Prairie Technologies, Bruker	Prairie Ultima IV	
Alcohol applicators, 70%	Medline Industries, LP	MDS093810	
Alcohol, spray bottle	Decon Labs Inc	Decon SaniHol, 04-355-122	
Aluminum foil	Reynold Brands	Reynold Wrap non-stick aluminum foil	
Anesthesia machine	Patterson Scientific	SAS3	
Anesthesia monitoring	Kent Scientific	MouseSTAT Jr. Rodent Pulsoxymeter	
Antibiotic-Antimycotic (100x), liquid	Invitrogen	15240-096	
Betadine applicators	Professional Disposables International, Inc	S41125	
Biopsy punch, 5 mm	Miltex	Size 5	
Buprenorphine sustained release	Zoo Pharm	Bup SR Lab, 1.0 mg/mL	A generic drug can be used instead.
C6 rat glioma cell line	ATCC (American Tissue Culture Collection)	CCL-107	
Cannulas	BD	16 G, 1.1/2", 30 G, 1"	
Carprofen	Pfizer	Rimadyl, 50 mg/ml	A generic drug can be used instead.
Cefazoline	Sagent Pharmaceuticals	25021-101-10, 1 g/vial	A generic drug can be used instead.
Cell strainer, 40 µm	Fisher Scientific	87711	
Cotton tip applicators, 6"	Dyad Medical Sourcing, LLC	HCS1005	

Dental cement	Stoelting Co	51459	Dental cement kit, clear, 2 components
Dexamethasone	Bimeda	138RX, 2 mg/mL	A generic drug can be used instead.
DietGel	ClearH2O	Recovery, 72-06-502	
Drape	Cardinal Health	Bio Shield Wrap	
Drill	Saeyang Microtech	Escort Pro, B08350	
Drill tips	Hager & Meissinger GmbH	REF310104001001005	Size 005, US 1/4
Fiji imaging analysis software	National Institute of Health	https://imagej.net/software/fiji/	
Forceps	Fisher Scientific	13-812-41	
Gauze	Fisher HealthCare	Sterile Cotton Gauze Pad, 4 x 4", 22-415-469	
Gelfoam	Ethicon Inc.	Surgifoam absorbable gelatin sponge, Ref. 1972	
Germinator	Cellpoint Scientific	Germinator 500, No. 11688	
Glass coverslips, 5 mm diameter	Fisher Scientific	Menzel Cover glass	
Gloves, non-sterile	Fisher Scientific	Nitrile powder-free medical examination gloves	
Gloves, sterile	Medline Industries, LP	MDS104070	
Hair removal cream	Church & Dwight	Nair Hair remover lotion	
Hamilton syringe	Hamilton Company Inc	Gastight #1701, 10 µL	
HBSS without Ca, Mg	Fisher Scientific	PI88284	
Head bar	Hongway	5 mm inner diameter O-rings	
Heating pad	Stoelting Co.	Rodent warmer X2	
Insulin syringes	Exel International Medical Products	29G x 1/2"	
Iron oxide nanoparticles	Covis Pharma GmbH	Feraheme ferumoxytol injection, 510 mg/17 mL, 59338077501	
Isoflurane	Dechra	26675-46-7	
Mice	Jackson Laboratories	NSG, Strain 005557	
Microscope (surgery)	Seiler Medical	Seiler IQ Q-100-220	
Nanoparticles	Custom		Iron oxide nanoparticles (Ferumoxytol) labeled with fluorescein isothiocyanate
Ophthalmic ointment	Major pharmaceuticals	Lubrifresh P.M. nighttime ointment, 203964	
Oxygen	Linde Gas & Equipment Inc.	High Pressure Steel K Style Cylinder, 249CF, 2000PSIG, CGA 540	
Plastic cups	Georgia-Pacirif Consumer Products	Dixie Portion Cup, 2 oz., Plastic, Clear, PK2400	
Polyethylene tubing	Braintree Scientific	50-195-5494	
Scale	Ohaus Corp	CR2200	
Scalpel	Integra Life Sciences Production Corp	Integra Miltex Stainless steel disposable scalpel	
Scissors	Fisher Scientific	13-804-18	
Sealant	Henkel Corp	Loctite 4014	
Single use lab gown	High Tech Conversions	17-444-081	
Stereotactic frame	Stoelting Co.	Stoelting New Standard TM	
Sterile Vacuum Bottle Top Filtration Systems	Fisher Scientific	S2GPU05RE, MilliporeSigma NO.:S2GPU05RE	
Styrofoam box	N/A	N/A	
Surgical gloves	Cardinal Health	19-163-108	
Surgical glue, 3M Vetbond tissues adhesive	3M Animal Care Prodcuts	1469SB	

Tail vein catheter	Custom		Consists of two 30 G cannulas connected with silicone tubing
TrypLE Express (1x), no phenol red	Invitrogen	12604-039	
Ultraviolet torch	Spring sunshine technology	Consciot	