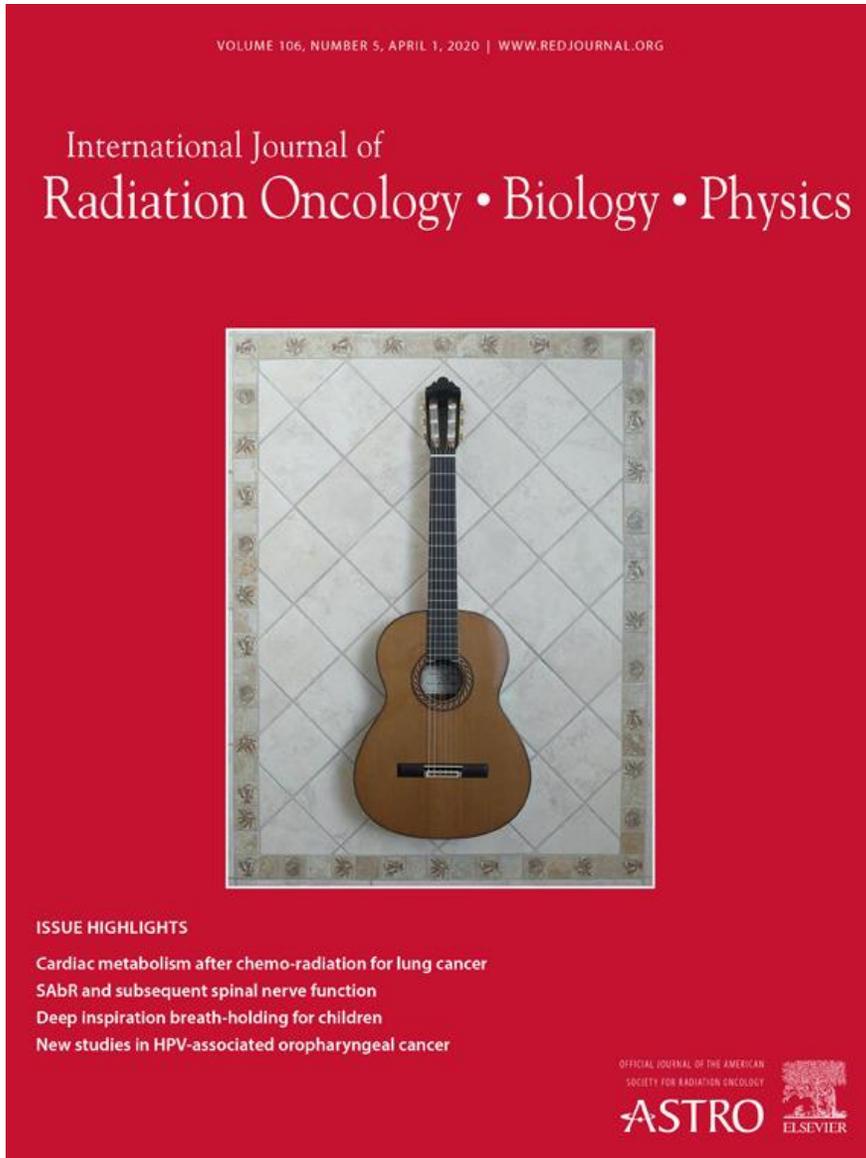


# Breve Update ai tempi del Covid-19



- Template “aperto” di articolo da sottomettere. Il contenuto finale dipende da quanto saranno ancora bloccati I lavori.

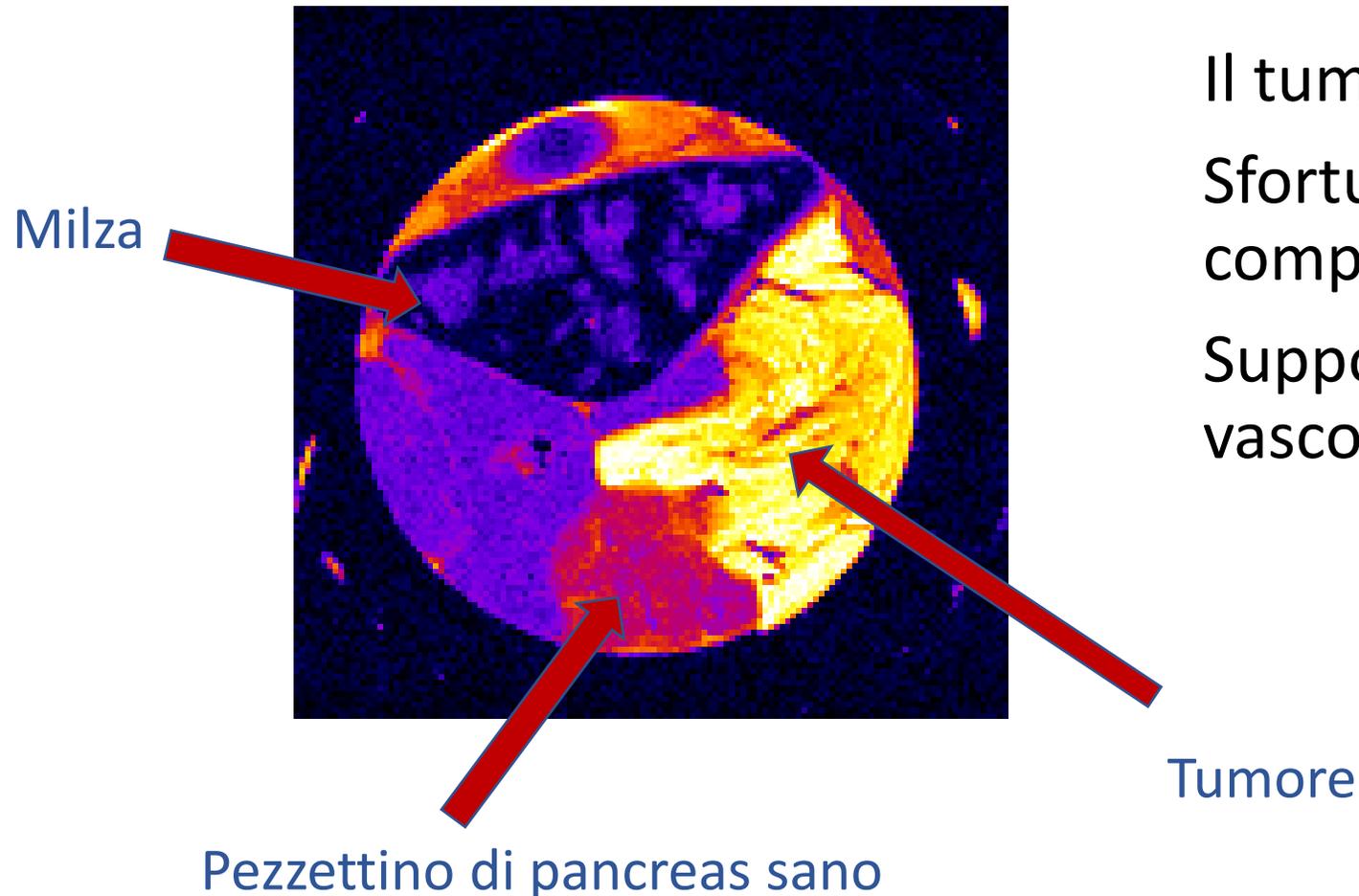
- Worst case scenario: F-BPA come molecola di riferimento per P/B NCT

Per trattamento in pancreas con la possibilità di essere tracciata.

- Se va bene: + tecniche ortogonali (Pavia, Caserta)
- Nuove tecniche di internalizzazione (Nanoparticelle Ferritina)
- F12B12

# Breve Update ai tempi del Covid-19

- Test di imaging su tessuto tumorale



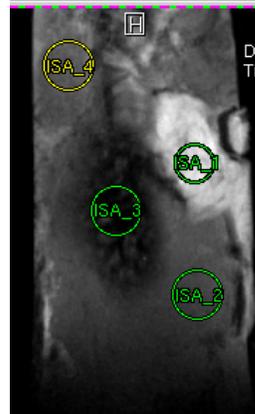
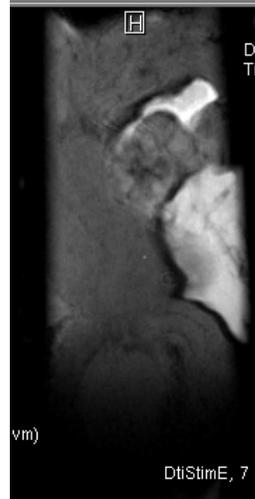
Il tumore è grande e ben definito.  
Sfortunatamente denso e compatto.  
Supponiamo anche molto poco vascolarizzato.

# Breve Update ai tempi del Covid-19

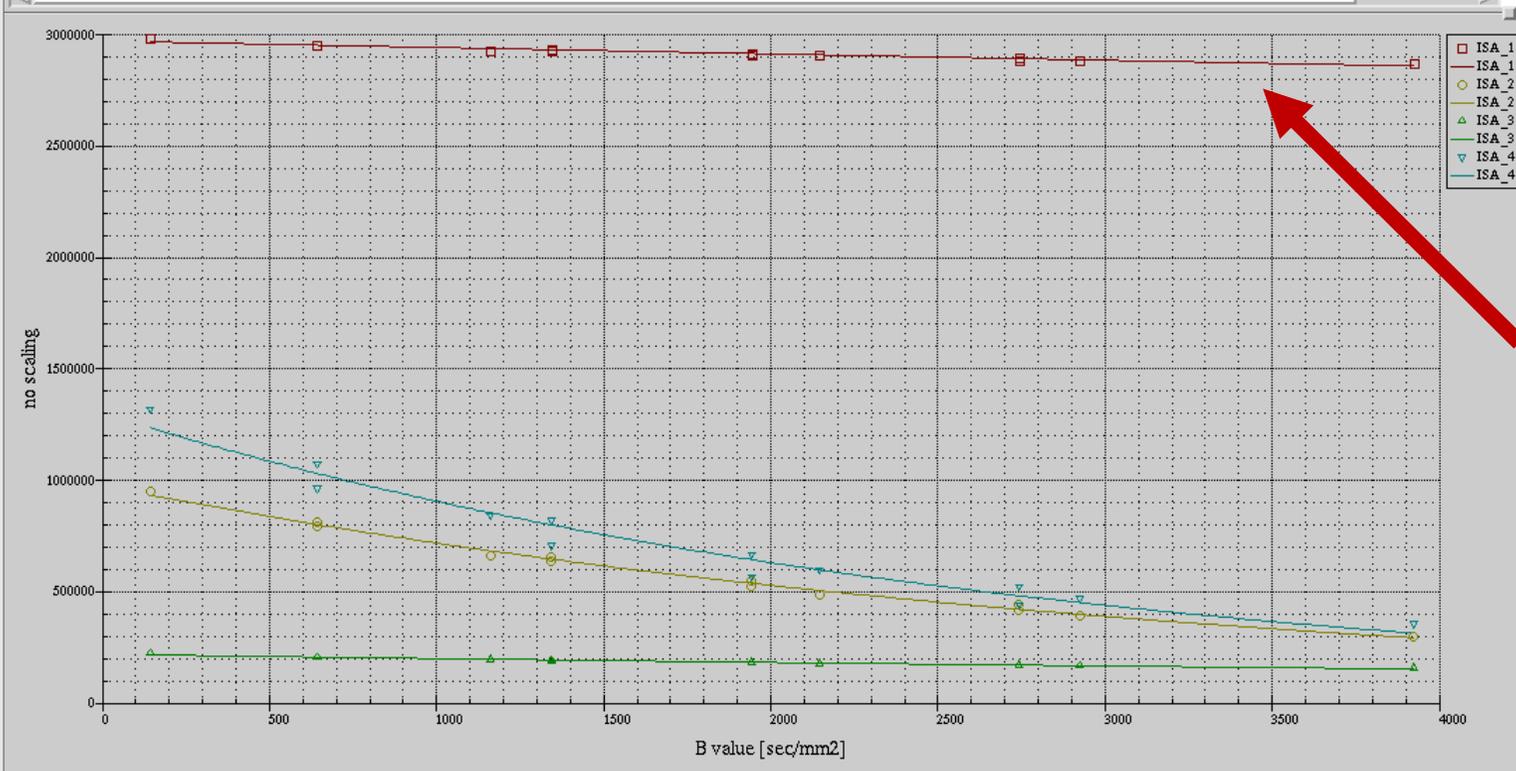
- Share screen con video di Andrea

Display Layout ROI

reas\_T (Pancreas\_T)

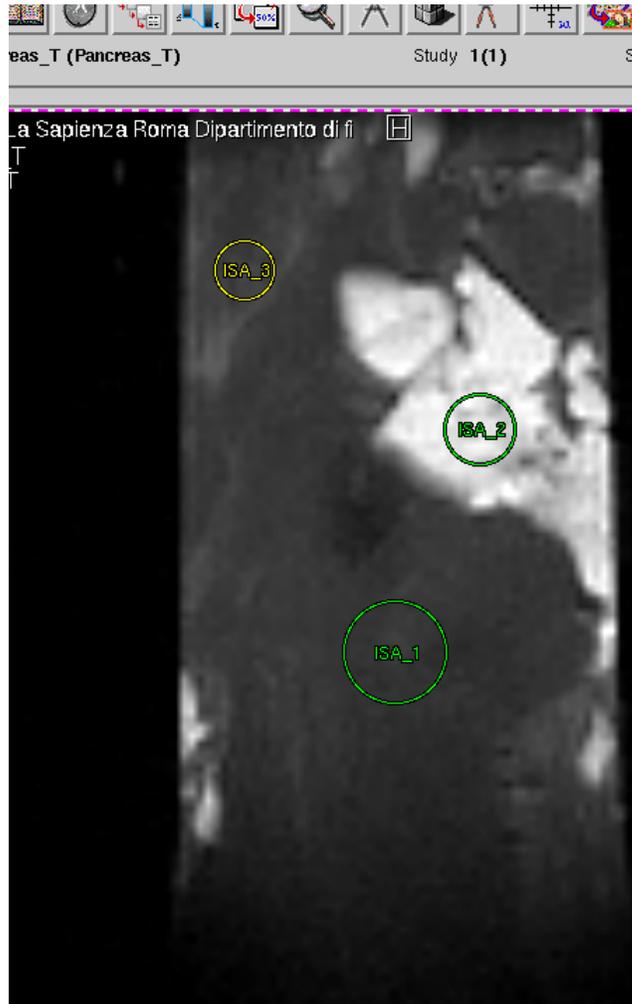


ROI name	ISA_1			ISA_2			ISA_3			ISA_4		
ROI area	1.2e+06 um2			1.89e+06 um2			1.95e+06 um2			1.95e+06 um2		
parameter	value	std dev	usage	value	std dev	usage	value	std dev	usage	value	std dev	usage
absolute bias	0	0	fixed	0	0	fixed	0	0	fixed	0	0	fixed
signal intensity	2.97167e+06	4648.59	varied	975804	12578.1	varied	218575	2244.13	varied	1.30114e+06	45314.3	varied
diffusion constant [mm2/sec]	9.83369e-06	7.41562e-07	varied	0.000306818	7.29619e-06	varied	9.08445e-05	4.9525e-06	varied	0.000362288	2.25919e-05	varied
std dev of the fit	8007.59			13912.9			3370.64			53607.1		
B value [sec/mm2]	mean	std dev	func	mean	std dev	func	mean	std dev	func	mean	std dev	func
142.87	2986054	204599	2967498	948927	101340	933953	224795	154220	215757	1319571	136311	12358

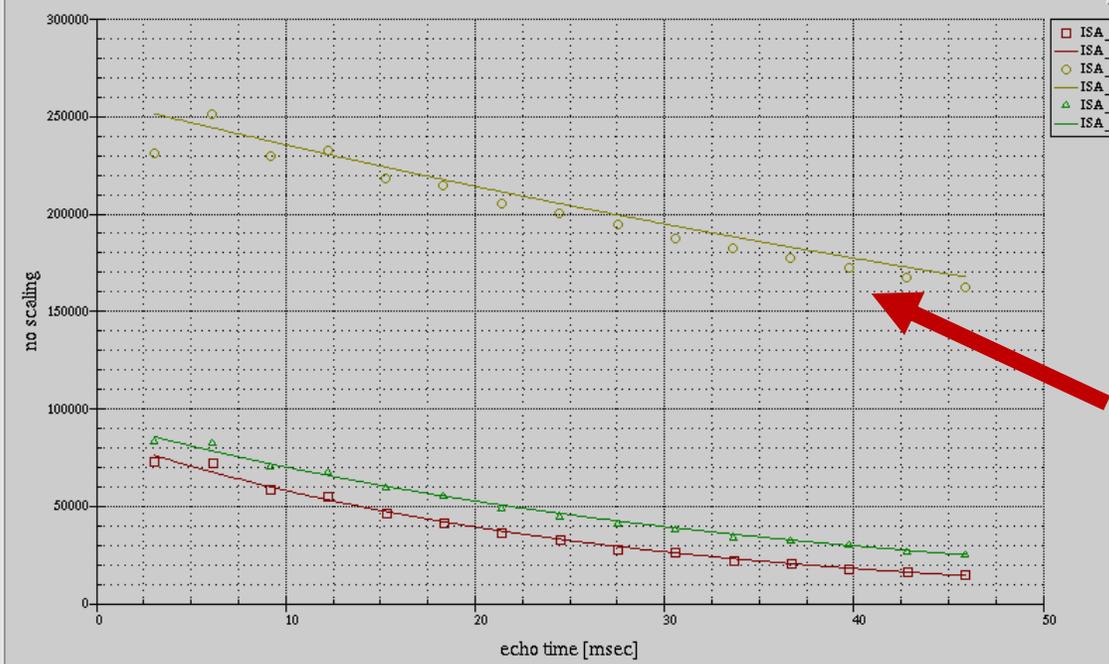


Diffusion using trace of B-Matrix (std dev weighted)

Il colore cambia poco →  
Il tumore ha D piccolo :  
Poco spazio, poca acqua  
tra le cellule, pochi vasi.

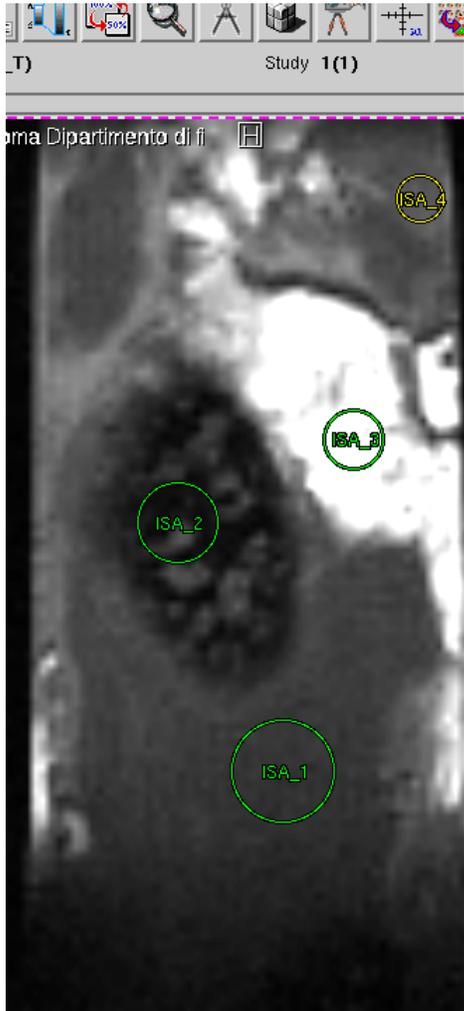


ROI name	ISA_1			ISA_2			ISA_3		
ROI area	0.0195 cm2			0.00961 cm2			0.00714 cm2		
parameter	value	std dev	usage	value	std dev	usage	value	std dev	usage
absolute bias	0	4425.37	varied	0	296431	varied	0	9441.36	varied
signal intensity	85861.3	3337.82	varied	258967	289992	varied	93534.4	8319.95	varied
T2 relaxation time [msec]	25.6816	3.12201	varied	105.742	153.112	varied	34.8705	6.42758	varied
std dev of the fit	1876.26			8013.06			2254.26		
echo time [msec]	mean	std dev	func	mean	std dev	func	mean	std dev	func
3.06	72979.0	4896.00	76225.7	231318	22940.5	251587	82863.2	4422.32	85683.7
6.11	72733.5	5168.48	67671.4	251178	21947.7	244418	82251.0	5743.25	78491.9

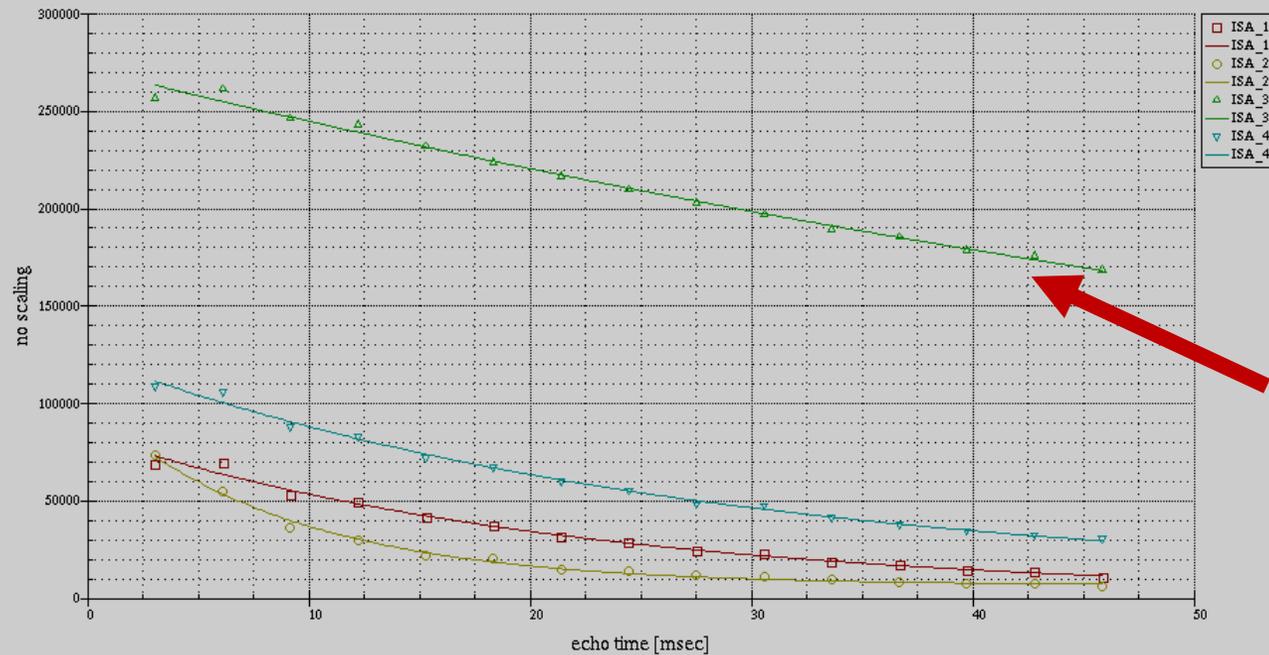


T2 relaxation:  $y = A + C * \exp(-t/T2)$  (std dev weighted)

Il colore cambia poco →  
 Il tumore ha T2 grande  
 (materia grigia ~ 90  
 Fegato ~ 40)



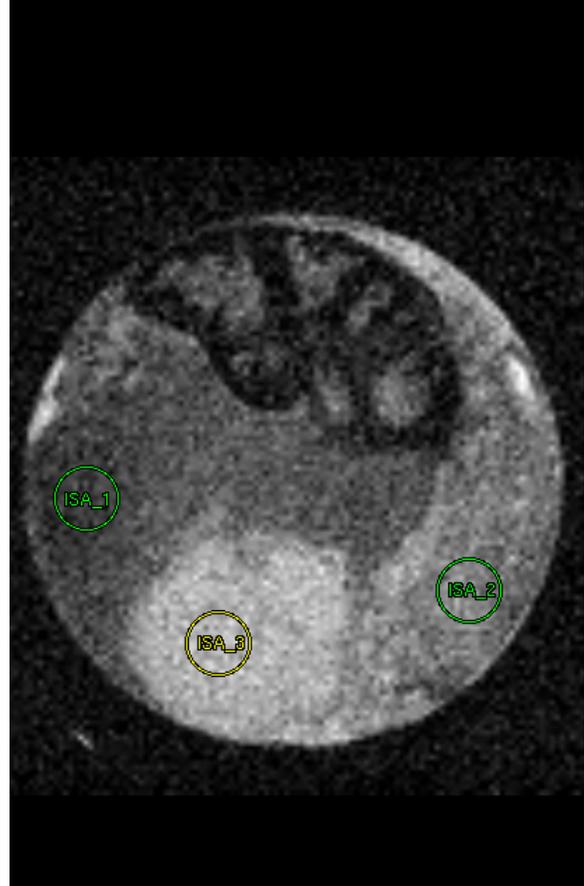
ROI name	ISA_1			ISA_2			ISA_3			ISA_4		
ROI area	0.0209 cm2			0.0133 cm2			0.00714 cm2			0.00412 cm2		
parameter	value	std dev	usage	value	std dev	usage	value	std dev	usage	value	std dev	usage
absolute bias	1618.67	3021.54	varied	6732.27	435.382	varied	3596.42	87526.1	varied	8087.27	7927.62	varied
signal intensity	82338.1	2347.31	varied	93149.9	3116.54	varied	268496	85334.8	varied	115765	6511.58	varied
T2 relaxation time [msec]	21.714	2.31575	varied	8.92282	0.425779	varied	93.9601	39.639	varied	27.1994	3.9101	varied
std dev of the fit	1678.94			1066.04			3018.09			2854.51		
echo time [msec]	mean	std dev	func	mean	std dev	func	mean	std dev	func	mean	std dev	func
3.06	68904.9	6503.29	73143.8	73740.6	16135.9	72861.1	256725	18497.1	263497	108665	5317.70	111546



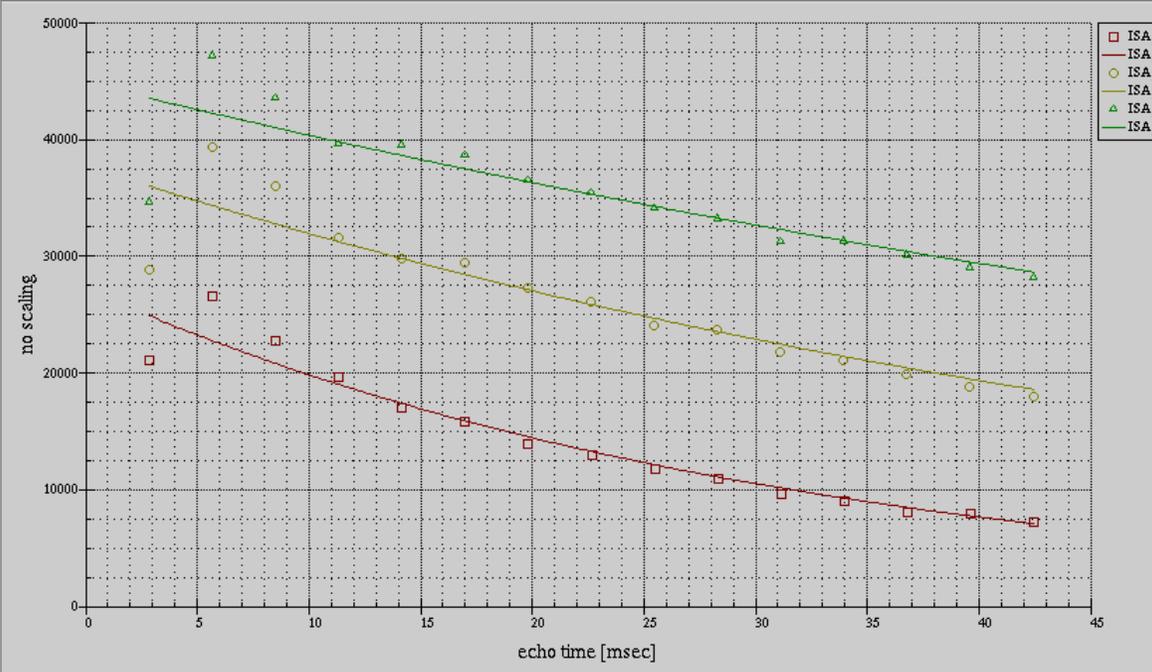
T2 relaxation:  $y=A+C*\exp(-t/T2)$  (std dev weighted)

Il colore cambia poco →  
 Il tumore ha T2 grande  
 (materia grigia ~ 90  
 Fegato ~ 40)

a Roma Dipartimento di fi



ROI name	ISA_1			ISA_2			ISA_3		
ROI area	5.04e+05 um2			5.94e+05 um2			5.55e+05 um2		
parameter	value	std dev	usage	value	std dev	usage	value	std dev	usage
absolute bias	0	6328.78	varied	0	36435.2	varied	0	100311	varied
signal intensity	27295.9	5251.77	varied	37795	34467.8	varied	44906.6	98110.7	varied
T2 relaxation time [msec]	31.4972	14.3309	varied	59.865	83.5441	varied	94.5051	267.384	varied
std dev of the fit	1638.41			2665.08			2825.79		
echo time [msec]	mean	std dev	func	mean	std dev	func	mean	std dev	func
2.83	21166.9	3893.74	24951.1	28806.8	4619.77	36050.5	34670.3	4439.27	43582.2
5.66	26678.0	4139.78	22808.5	39367.9	4931.97	34387.1	47215.3	4225.05	42297.4



T2 relaxation:  $y = A + C * \exp(-t/T2)$  (std dev weighted)

# Breve Update ai tempi del Covid-19

- Con apposite misure si può esaltare la compartimentalizzazione degli organi (scatole): questa informazione può aiutare il denoiser a interpretare il segnale rumoroso
- Abbiamo fatto misure a basso SNR protoniche variando il tempo d'echo. Da queste si può ricavare un dataset per testare denoiser semplice (solo informazione sul rumore)
- Mi sono messo a raccogliere il materiale per l'articolo. Dopo il problema antenna c'è stato il blocco per il corona virus. Non ditemi che sono pessimista

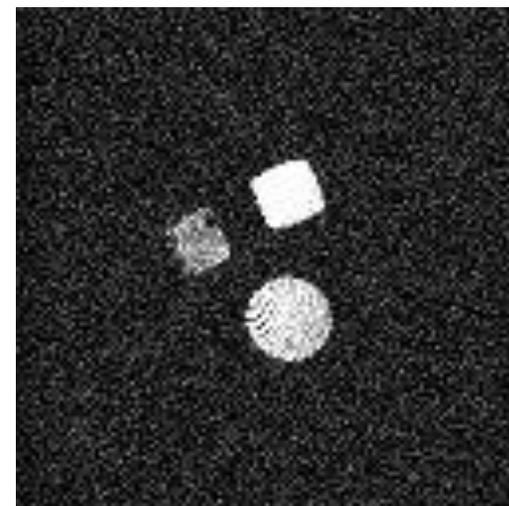
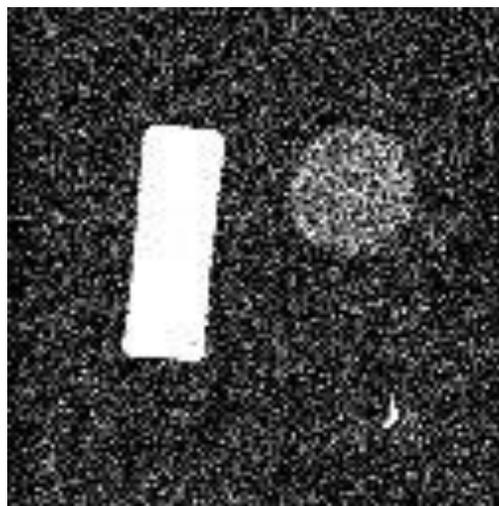
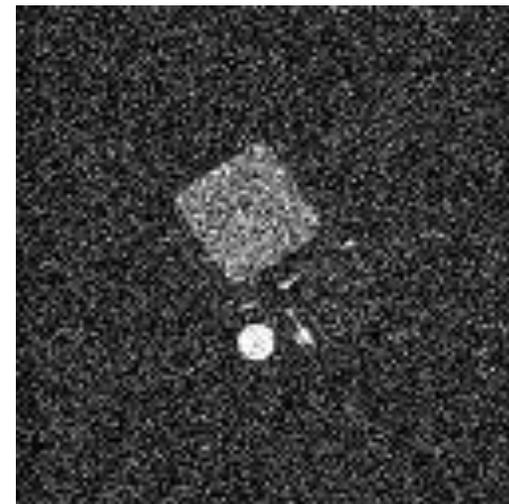
## Piccolo dataset di test

- 3 fantocchini
- Compartimenti riempiti di liquidi con T2 diverso
- Esperimenti a tempo d'echo lungo per ottenere basso SNR
- 10 acquisizioni per campione, dai 30 ai 50 echi per esperimento

Che ci si fa?

Andamento di SNR con il tempo d'echo. Fissato il materiale si possono fare misure a tempo d'echo giusto per ottenere dati a basso SNR con la sonda per il protone.

Segue analisi e commento



Share screen su SNR, Effetto del rumore,  
Correzioni

# Parte III: Esperimenti su F-Bpa

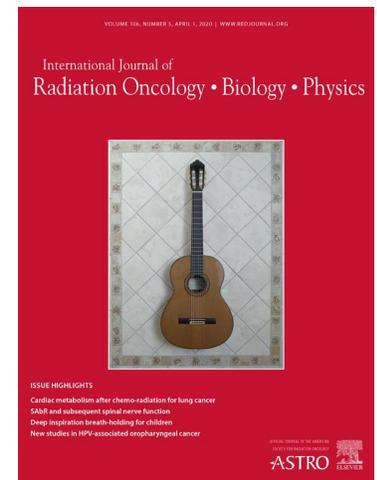
**Già presenti sulla rivista: anni 90**  
**“Coming of age!”**

DISCUSSION | [VOLUME 28, ISSUE 5, P1215-1216, MARCH 30, 1994](#)

## Boron neutron capture therapy: Finally come of age?

[Theodore L. Phillips, M.D.](#) 

DOI: [https://doi.org/10.1016/0360-3016\(94\)90496-0](https://doi.org/10.1016/0360-3016(94)90496-0)



In realtà non l’ho letto. Mi fa ridere perchè mia sorella è del ‘94 e ieri ha compiuto 26 anni

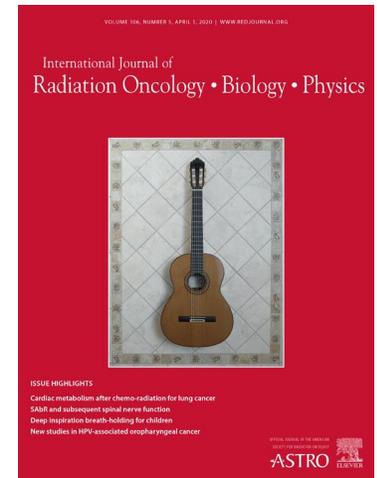
## Experimental Studies of Boronophenylalanine ( $^{10}\text{BPA}$ ) Biodistribution for the Individual Application of Boron Neutron Capture Therapy (BNCT) for Malignant Melanoma Treatment

[Marina Carpano, MSc](#) • [Marina Perona, PhD](#) • [Carla Rodriguez, MSc](#) • [Susana Nievas, MSc](#) • [Maria Olivera, MSc](#) • [Gustavo A. Santa Cruz, PhD](#) • [Daniel Brandizzi, PhD](#) • [Romulo Cabrini, PhD](#) • [Mario Pisarev, MD](#) • [Guillermo Juan Juvenal, PhD](#) • [Maria Alejandra Dagrosa, PhD](#)   • [Show less](#)

Published: June 04, 2015 • DOI: <https://doi.org/10.1016/j.ijrobp.2015.05.039> • 

- 2015
- BPA su Melanoma cells impiantate su topi
- Infrared radiance measure / in vitro Uptake su linee diverse

**Ci vogliono fare screening per identificare l'applicabilità di BNCT patient based**



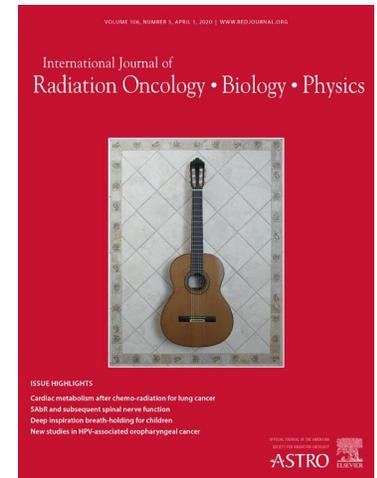
## Significance of Using a 10B-Carrier and Manipulating Intratumor Hypoxia in terms of Local Tumor Response and Lung Metastatic Potential in Boron Neutron Capture Therapy

S. Masunaga • Y. Sakurai • H. Tanaka • ... N. Kondo • A. Maruhashi • K. Ono • [Show all authors](#)

DOI: <https://doi.org/10.1016/j.ijrobp.2011.06.1237>

- 2011
- **Effetto misurato ex vivo**
- **BPA migliore di BSH**

**Riscontrato un effetto nella riduzione delle metastasi. Per labellare le cellule proliferanti si somministra BrdU per fare immunofluorescenza ex vivo**



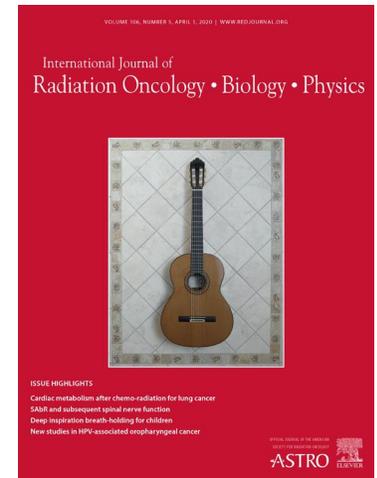
## Intra-arterial administration of sodium borocaptate (BSH)/lipiodol emulsion delivers B-10 to liver tumors highly selectively for boron neutron capture therapy: experimental studies in the rat liver model

Minoru Suzuki, M.D., Ph.D.   • Shinichiro Masunaga, M.D., Ph.D. • Yuko Kinashi, M.D., Ph.D. • ...  
Yasumasa Nishimura, M.D., Ph.D. • Akira Maruhashi, Ph.D. • Koji Ono, M.D., Ph.D. • [Show all authors](#)

DOI: <https://doi.org/10.1016/j.ijrobp.2003.12.018>

- 2004
- **BSH trasportato da lipiodol (carrier lipidico)**
- **Topi con melanoma (diverse linee) su cui viene somministrato BSH**
- **Concentrazione di boro rivelata con Neutron Capture Radiography**

**Accumulo selettivo nel fegato. Ci stanno dei riferimenti di rapport di concentrazione tumore/sano**



BIOLOGY CONTRIBUTION | VOLUME 72, ISSUE 2, P562-567, OCTOBER 01, 2008

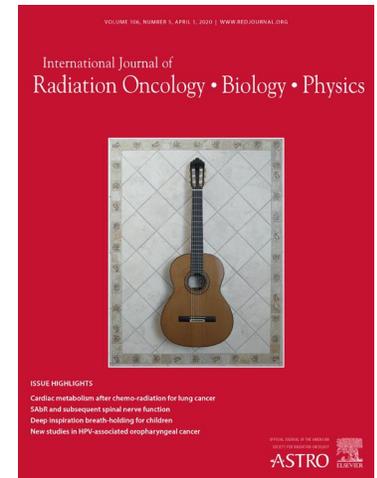
## L-DOPA Preloading Increases the Uptake of Borophenylalanine in C6 Glioma Rat Model: A New Strategy to Improve BNCT Efficacy

Silvia Capuani, Ph.D. •   • Tommaso Gili, Ph.D. • Marco Bozzali, M.D. • ... Bruno Maraviglia, Ph.D. •

Giuseppe Lazzarino, Ph.D. • Francesco S. Pastore, M.D. • [Show all authors](#)

DOI: <https://doi.org/10.1016/j.ijrobp.2008.06.1493>

- 2008
- **Questo lo conosciamo**

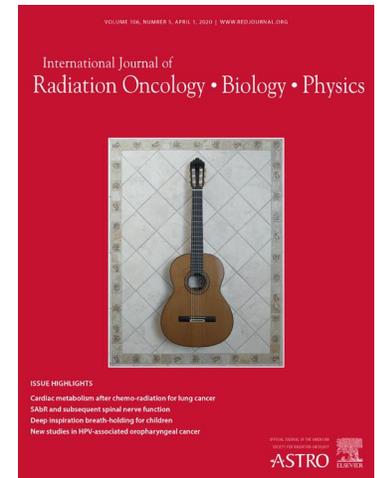


## Strategies for the design and synthesis of boronated nucleic acid and protein components as potential delivery agents for neutron capture therapy

Iwona M. Wyzlic, Ph.D.  • Werner Tjarks, DR.rer.nat. • Albert H. Soloway, Ph.D. •

Abul K.M. Anisuzzaman, Ph.D. • Feng-Guang Rong, Ph.D. • Rolf F. Barth, M.D.

DOI: [https://doi.org/10.1016/0360-3016\(94\)90495-2](https://doi.org/10.1016/0360-3016(94)90495-2)



- 1994
- **Necessità di carrier non tossici che riescano ad accumolare grandi quantità di boro per tempi lunghi**
- **BPA tra questi**

**Comparazione tra possibili carrier di Boro. Dobbiamo insistere sul fatto che F-BPA ha il vantaggio di poter essere Misurata in bio-distribuzione**

ORIGINAL CONTRIBUTION | VOLUME 11, ISSUE 4, P831-840, APRIL 01, 1985

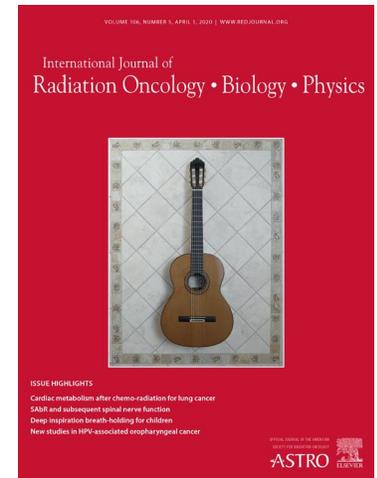
## Current status of $^{10}\text{B}$ -neutron capture therapy: Enhancement of tumor dose via beam filtration and dose rate, and the effects of these parameters on minimum boron content: A theoretical evaluation

R.G. Fairchild, Ph.D.  • V.P. Bond, M.D., Ph.D.

DOI: [https://doi.org/10.1016/0360-3016\(85\)90318-9](https://doi.org/10.1016/0360-3016(85)90318-9)

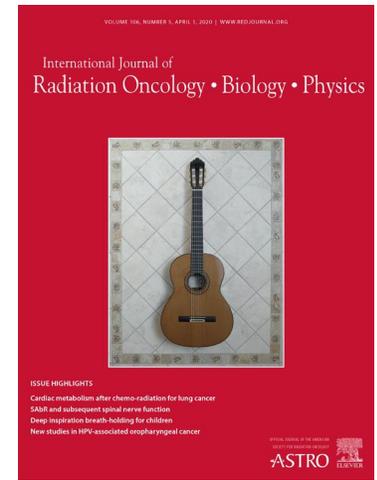
- 1985
- **8 composti sono testati per introdurre boro**
- **BPA-fructose è tra questi**

**F18 pet per verificare la bio distribuzione era già stato pensato**

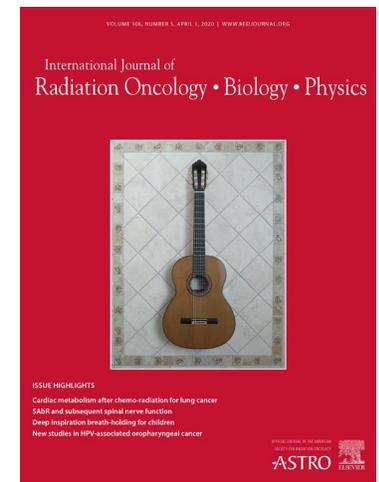


# Parte III: Esperimenti su F-Bpa

- Nuove speranze per BNCT → PNCT
  - Ma esperimenti con PNCT con F-BPA li hanno fatti?
- F-BPA come carrier di boro tollerato (qualcosa c'è) di cui è possibile misurare l' uptake e la bio distribuzione (in vivo, forse)
- Misure che confermano uptake su cellule particolarmente ostiche che sono modello di tumore noto come chemio/radio resistente
  - Attualmente solo le nostre: 1 concentrazione/ 1 tempo
- $^{19}\text{F}$  MNR come tecnica in vitro per selezionare carrier.
- Tante promesse su  $^{19}\text{F}$  MRI per verificare bio distribuzione in vivo (speriamo almeno ex vivo)



# Parte III: Esperimenti su F-Bpa



## Articles (Full- Length)

Manuscript  $\leq 5000$  words, tables and figures  $\leq 6$ , references  $\leq 50$

- Original laboratory and clinical investigations related to radiation oncology, radiation biology, and medical physics. Submissions are thoroughly reviewed for scientific originality, significance, relevance, and priority, and the topics must be of broad interest to the journal's readers. The Red Journal only accepts high-priority manuscripts that report cutting-edge science and that promise to have a strong impact on clinical practice.

## Letters (Short paper)

- Manuscript  $\leq 1500$  words, tables and figures  $\leq 6$ , references  $\leq 20$
- Like Scientific Articles, Scientific Letters focus on original laboratory and clinical investigations. The difference is that Scientific Letters are either more preliminary in nature or report a study that is of insufficient size to justify a full Scientific Article yet still has important implications for our field and its practice. that do not have the breadth to be a full-length scientific article.