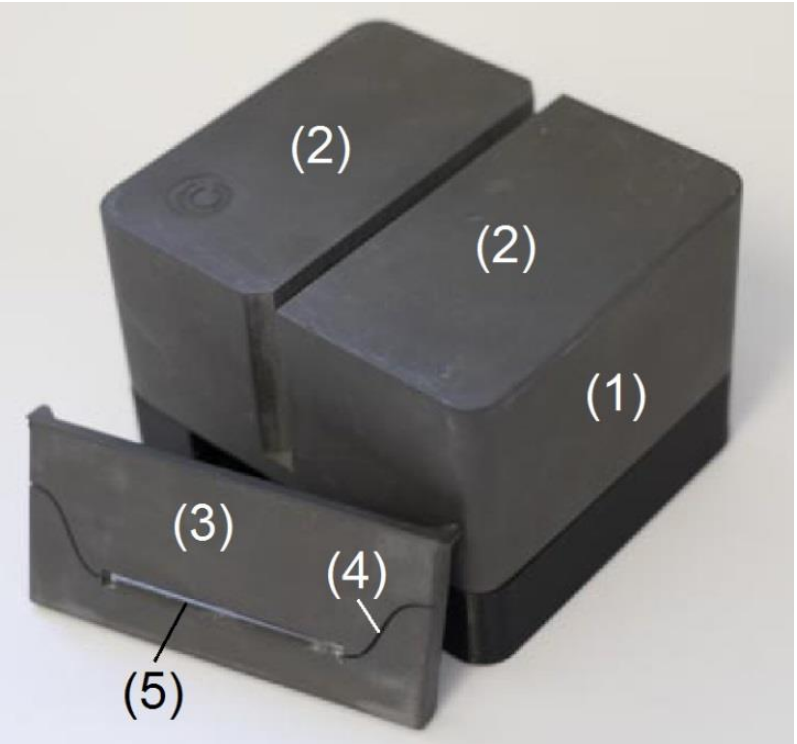
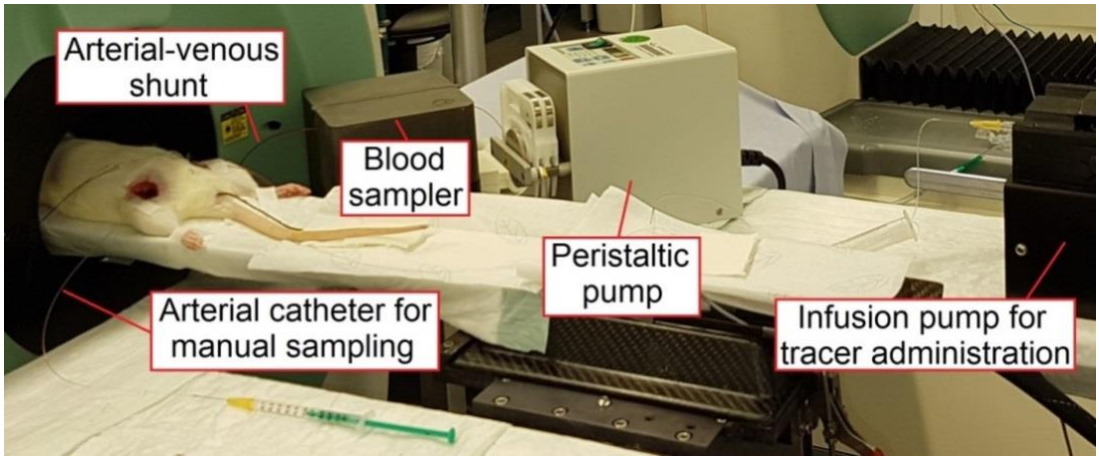


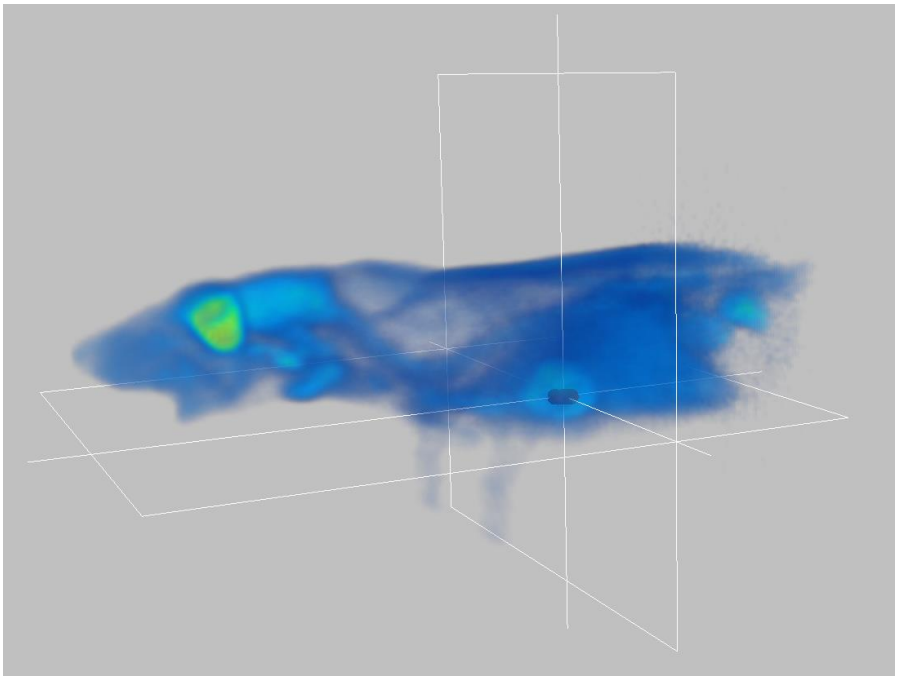
Supplemental Figure 1. Blood Sampler.

The 2.5 cm thick tungsten shielding (Tungsten Heavy Powder, San Diego, CA, USA) (1) has the density of 11 g/mm^3 and houses two LSO/APD detectors (2). They are separated with a removable cassette (3) made of the same material as the housing. The cassette has a groove for inserting the catheter (4) and a window (5) within which the activity is detected.

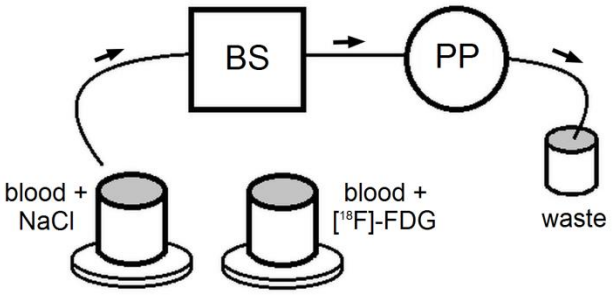
Each of the two APDs (S8664-1010, Hamamatsu, Japan) is characterized by the capacitance of 270 pF, the cut off frequency of 11 MHz, and the breakdown voltage of approximately 400 V. It is attached to a 3×4×5 cm^3 LSO block with a transparent silicone compound (RTV174). The LSO/APD detectors are orientated parallel to each other to provide a detection area of 4×5 cm^2. The crystals are molded into a housing made of a copper laminated composite material (FR-4) using the silicone compound previously combined with TiO_2 for an improved light collection. The compound also keeps the LSO blocks in a stable position which protects them from a mechanical damage.



sampler and the peristaltic pump, the blood in the shunt returns to the animal's bloodstream via the venous end which is inserted into the femoral vein. The PET tracer is administered via the tail vein catheter with an infusion pump. Blood samples are manually collected from the right femoral artery. The body temperature is controlled with a rectal probe and maintained with a heating pad placed beneath the animal.



Supplemental Figure 3. Left Ventricle VOI.
The VOI (24 mm^3) was drawn on the ^{18}F-FDG PET image and is shown at the cross-section of the coronal and horizontal planes. The time activity curve from this VOI was used to obtain the image-derived arterial input function (ID-AIF).

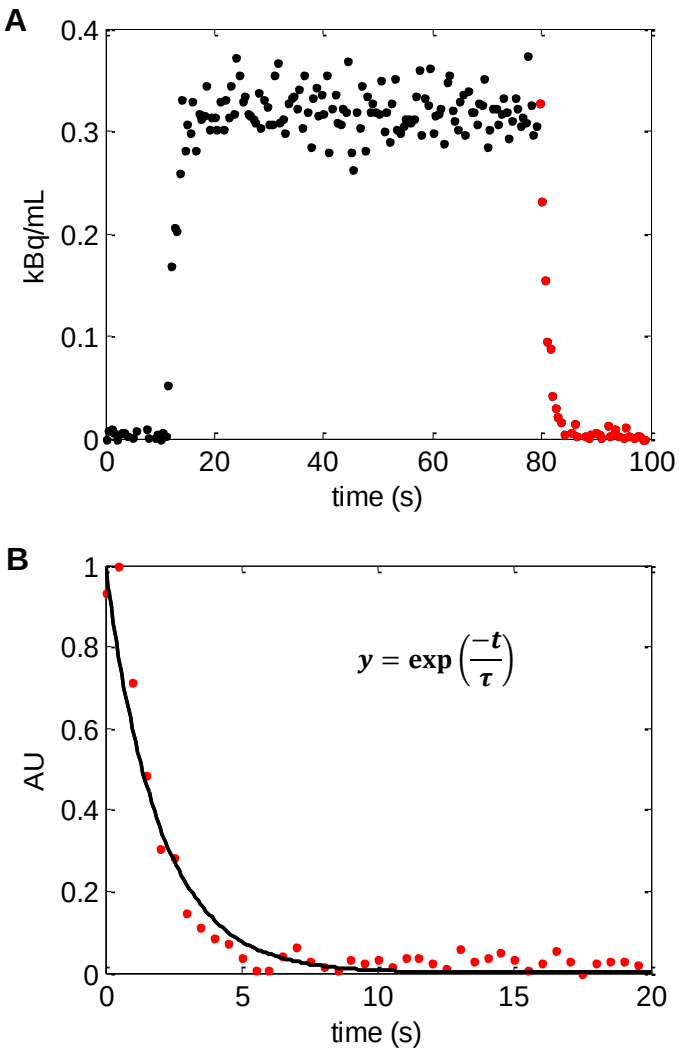


Supplemental Figure 4. Experimental Setup for the Measurement of the Dispersion.

The setup consisted of two cups with heparinized blood placed on magnetic stirring plates, the peristaltic pump (PP), the blood sampler (BS), and the catheter made of the same tubes which were later used in the *in vivo* measurements.

9.1 MBq of ^{18}F-FDG in 0.45 mL of normal saline was added to one of the cups and the same volume of normal saline to the second one. The pump was programmed as in the *in vivo* experiments. The "arterial" end of the tube was first dipped in the cup without the tracer to fill the entire length of the tube with blood. Then, the tube end was moved to the cup containing ^{18}F-FDG and kept there for approximately 1 min. This was followed by moving the tube end back to the first cup. Thus, a step function was recorded by the BS.

The pump was paused for about 2 s each time the cup was changed in order to avoid the air getting inside the tube. The entire procedure was repeated four times.

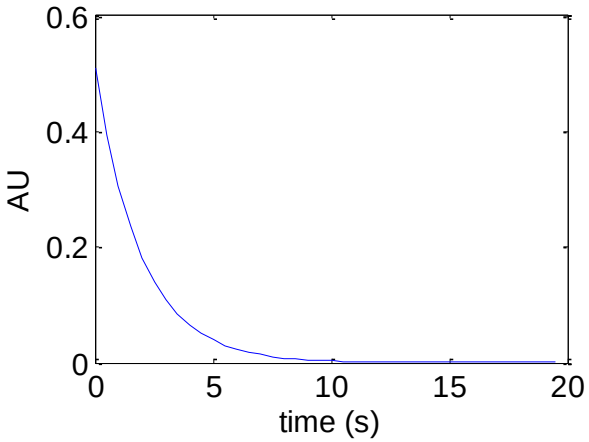


Supplemental Figure 5. Dispersion Factor.

A. An example step function recorded by the BS in the *in vitro* measurement after calibration and decay-correction.

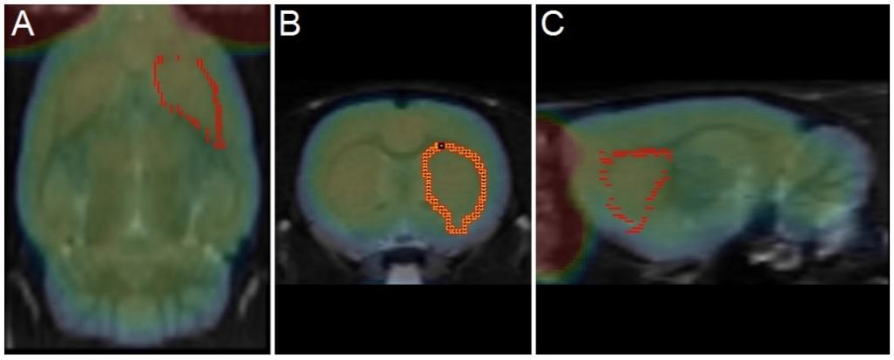
B. The decaying portion of the "step" was normalized to 1 and a monoexponential fit was applied to estimate the dispersion factor, τ, according to (*17*). *t* denotes time.

The mean τ value of four measurements was considered the dispersion factor of the system.



Supplemental Figure 6. The Normalized Impulse Response Function.

The normalized IRF was obtained with the mean dispersion factor, τ, and modelled as: $\boldsymbol{IRF} = \frac{1}{\tau}\exp\left(-\frac{t}{\tau}\right)$, according to (*17*). It was later used to deconvolve the fitted MS- and BS-TACs.



Supplemental Figure 7. The Right Striatum VOI.
The VOI is shown in the horizontal (**A**), coronal (**B**) and sagittal (**C**) plane. It was drawn on the MRI anatomical template provided in Pmod software, and copied onto the coregistered ^{18}F-FDG PET image to extract the TAC. The TAC was then used for kinetic modelling.

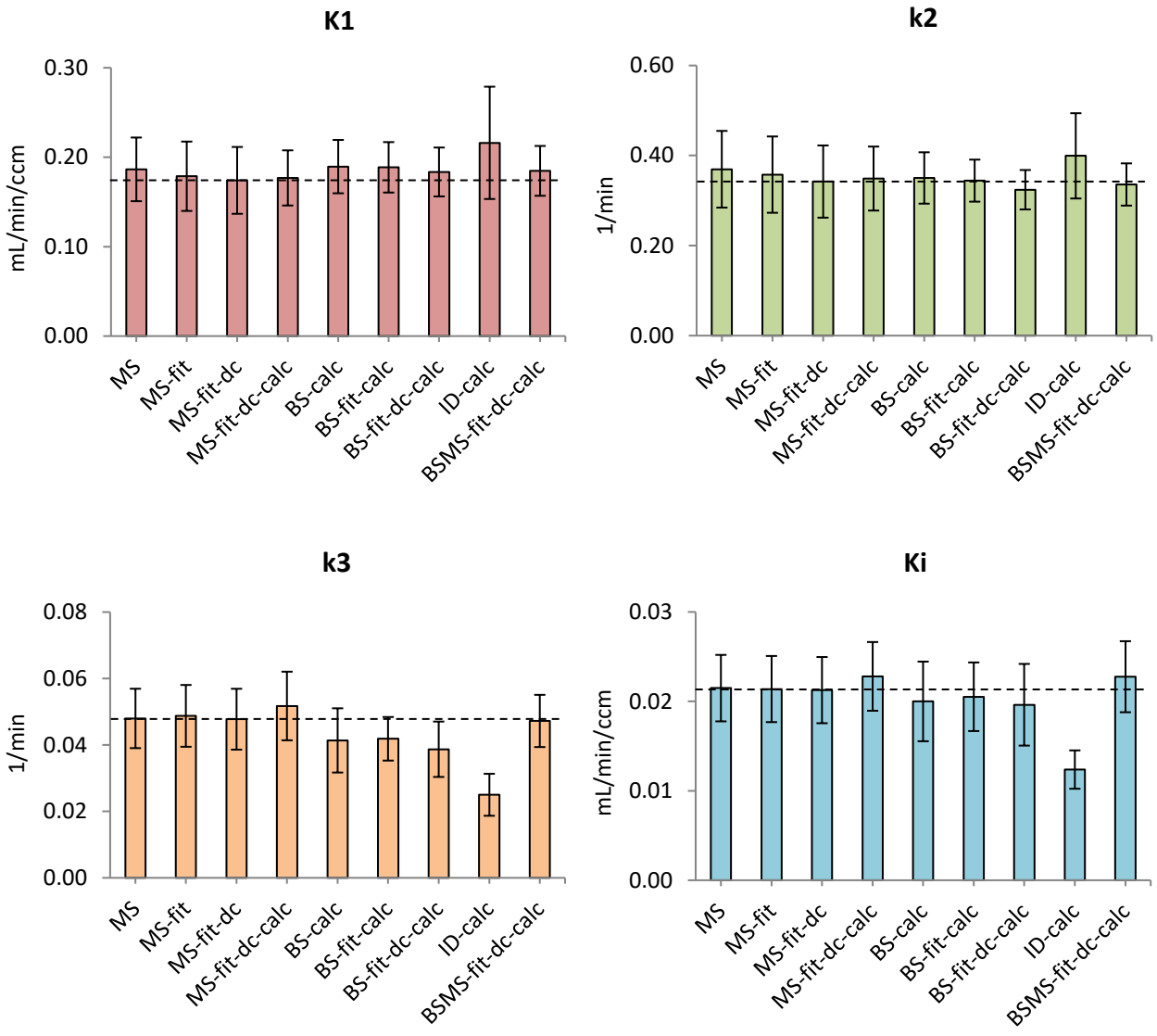
Supplemental Table 1. Dispersion Factor, τ.

It was estimated using a monoexponential fit to the decaying portion of the square step function (*17*) recorded by the BS *in vitro*. The measurement was repeated four times and the mean value was considered the dispersion factor of the system. The R^2 metric reflects the goodness of the fit.

Measurement	τ	R^2
1	1.51	0.97
2	1.96	0.95
3	2.43	0.93
4	1.86	0.95
Mean	**1.94**	
Sd	**0.38**	

Supplemental Table 2. Physiological Parameters.
The breathing rate and the temperature were checked seven times throughout the duration of the experiment. The mean ± sd of these records for each rat is presented.

Rat	1	2	3	4	5
Breathing rate (1/min)	55±6	47±7	58±6	42±7	44±13
Temperature (°C)	35.7±0.3	35.1±0.6	35.6±0.8	35.3±0.6	35.5±0.4



Supplemental Figure 8. Mean Kinetic Parameters.

The KPs were estimated using the AIF obtained in nine different ways (please, refer to the main text for explanation of the abbreviations). The bars represent mean ± sd of 5 rats. The AIF obtained from the fitted and dispersion-corrected manual samples (MS-fit-dc) was considered the reference approach (dashed line).

	MS				MS-fit				MS-fit-dc			
Rat	**K1**	**k2**	**k3**	**Ki**	**K1**	**k2**	**k3**	**Ki**	**K1**	**k2**	**k3**	**Ki**
1	0.139	0.256	0.044	0.020	0.123	0.245	0.045	0.019	0.120	0.236	0.044	0.019
2	0.182	0.374	0.049	0.021	0.181	0.370	0.054	0.023	0.175	0.352	0.053	0.023
3	0.171	0.343	0.035	0.016	0.170	0.331	0.035	0.016	0.166	0.318	0.034	0.016
4	0.232	0.493	0.059	0.025	0.230	0.481	0.059	0.025	0.224	0.459	0.058	0.025
5	0.208	0.381	0.052	0.025	0.190	0.361	0.051	0.024	0.185	0.347	0.050	0.023
average	**0.186**	**0.370**	**0.048**	**0.021**	**0.179**	**0.358**	**0.049**	**0.021**	**0.174**	**0.342**	**0.048**	**0.021**
sd	**0.036**	**0.085**	**0.009**	**0.004**	**0.039**	**0.085**	**0.009**	**0.004**	**0.037**	**0.080**	**0.009**	**0.004**
% diff from MS-fit-dc	6.9	8.2	0.0	0.0	2.9	4.7	2.1	0.0	0.0	0.0	0.0	0.0
	MS-fit-dc-calc				BS-calc				BS-fit-calc			
Rat	**K1**	**k2**	**k3**	**Ki**	**K1**	**k2**	**k3**	**Ki**	**K1**	**k2**	**k3**	**Ki**
1	0.136	0.255	0.045	0.021	0.152	0.284	0.034	0.016	0.154	0.300	0.033	0.015
2	0.183	0.382	0.057	0.024	0.180	0.329	0.042	0.020	0.177	0.300	0.038	0.020
3	0.166	0.316	0.037	0.017	0.180	0.331	0.029	0.015	0.182	0.363	0.041	0.019
4	0.221	0.445	0.062	0.027	0.232	0.437	0.053	0.025	0.229	0.411	0.050	0.025
5	0.178	0.348	0.057	0.025	0.203	0.370	0.048	0.024	0.201	0.348	0.046	0.024
average	**0.177**	**0.349**	**0.052**	**0.023**	**0.189**	**0.350**	**0.041**	**0.020**	**0.189**	**0.344**	**0.042**	**0.021**
sd	**0.031**	**0.071**	**0.010**	**0.004**	**0.030**	**0.057**	**0.010**	**0.004**	**0.028**	**0.047**	**0.007**	**0.004**
% diff from MS-fit-dc	1.7	2.0	8.3	9.5	8.6	2.3	-14.6	-4.8	8.6	0.6	-12.5	0.0
	BS-fit-dc-calc				ID-calc				BSMS-fit-dc-calc			
Rat	**K1**	**k2**	**k3**	**Ki**	**K1**	**k2**	**k3**	**Ki**	**K1**	**k2**	**k3**	**Ki**
1	0.150	0.288	0.033	0.015	0.208	0.348	0.029	0.016	0.150	0.288	0.047	0.021
2	0.172	0.285	0.037	0.020	0.194	0.320	0.022	0.013	0.174	0.307	0.049	0.024
3	0.177	0.322	0.029	0.015	0.221	0.392	0.019	0.010	0.178	0.334	0.035	0.017
4	0.223	0.393	0.049	0.025	0.315	0.562	0.021	0.011	0.225	0.411	0.057	0.027
5	0.196	0.332	0.045	0.023	0.143	0.375	0.034	0.012	0.197	0.339	0.048	0.025
average	**0.183**	**0.324**	**0.039**	**0.020**	**0.216**	**0.399**	**0.025**	**0.012**	**0.185**	**0.336**	**0.047**	**0.023**
sd	**0.027**	**0.044**	**0.008**	**0.005**	**0.063**	**0.095**	**0.006**	**0.002**	**0.028**	**0.047**	**0.008**	**0.004**
% diff from MS-fit-dc	5.2	-5.3	-18.8	-4.8	24.1	16.7	-47.9	-42.9	6.3	-1.8	-2.1	9.5

Supplemental Table 3. Individual Kinetic Parameters of Each Rat.

The KPs were estimated using the AIF obtained in nine different ways (please, refer to the main text for explanation of the abbreviations). The AIF obtained from the fitted and dispersion-corrected manual samples (MS-fit-dc) was considered the reference approach.