

## Double-Tracer Tissue Distribution Study of 3H-Thymidine and 18F-FDG in Experimental Inflammatory Tissue

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### III. 6. Double-Tracer Tissue Distribution Study of $^3\text{H}$ -Thymidine and $^{18}\text{F}$ -FDG in Experimental Inflammatory Tissue

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#### **Introduction**

We have reported that high accumulation of  $^{18}\text{F}$ -FDG was observed in the inner side of abscess wall consisting of inflammatory cells of neutrophils and macrophages, endothelial cells of young vessels and young fibroblasts<sup>1)</sup>. It is thought that  $^{18}\text{F}$ -FDG is utilized as energy source for the chemotaxis and phagocytosis of inflammatory cells and the proliferation of endothelial cells and fibroblasts. On the other hand,  $^3\text{H}$ -thymidine is an indicator of proliferation. In this study, we examined the distribution of  $^3\text{H}$ -thymidine ( $^3\text{H}$ -Thd) in the inflammatory tissue comparing with  $^{18}\text{F}$ -FDG by double-tracer tissue distribution study.

#### **Materials and Methods**

Male Donryu rats weighing about 100 g were used. To produce experimental inflammatory tissue, the rats were subcutaneously inoculated with 0.2 ml of turpentine oil in the left groin. Each rat was injected with a mixture of 740 kBq (20  $\mu\text{Ci}$ ) of  $^{18}\text{F}$ -FDG and 37 kBq (1  $\mu\text{Ci}$ ) of  $^3\text{H}$ -Thd through the tail vein at 1, 2, 4, 7, and 14 days postinoculation (n=5, each). Another five rats without inoculation were used as controls. Animals were analyzed 1 hour after injection of  $^{18}\text{F}$ -FDG and tissue samples were excised and weighed. The  $^{18}\text{F}$  radioactivity of the sample was counted immediately with a well-type NaI(Tl) autogamma counter, and the  $^3\text{H}$  radioactivity with liquid-scintillation counter a week later. Data were expressed as differential uptake ratio (DUR).

#### **Results and Discussion**

Table 1 summarizes the time-course of  $^{18}\text{F}$ -FDG and  $^3\text{H}$ -Thd uptakes in various tissue of rats in double-tracer tissue distribution. In blood, heart, liver and muscle, there were no

significant changes in  $^{18}\text{F}$ -FDG and  $^3\text{H}$ -Thd uptakes during this experimental period. In inflammatory tissue, however, significant changes were observed in both uptakes.  $^{18}\text{F}$ -FDG uptake increased progressively to a peak on day 4 after inoculation and then decreased.  $^3\text{H}$ -Thd uptake increased after inoculation. The uptakes after inoculation during day 1 to day 14 were almost constant and about twice times greater than that in control.

Inflammatory tissue produced by turpentine oil shows “abscess” formation<sup>2)</sup>. In this abscess wall, many inflammatory cells accumulate, and young endothelial cells of vessels and fibroblasts are observed. The result that higher uptake of  $^3\text{H}$ -Thd after inoculation may reflect the proliferation of endothelial cells and fibroblasts for tissue repair.

### References

- 1) Yamada S. et al., CYRIC Annual Report 1992, (1992) 2.
- 2) Yamada S. et al., J. Nucl. Med. **36** (1995) 1301.

Table 1. Time-course of  $^{18}\text{F}$ -FDG and  $^3\text{H}$ -Thd uptakes in double-tracer tissue distribution.

		Control	Day 1	Day 2	Day 4	Day 7	Day 14
<b>Blood</b>	$^{18}\text{F}$ -FDG	0.24 ± 0.05	0.25 ± 0.03	0.22 ± 0.06	0.24 ± 0.04	0.26 ± 0.06	0.17 ± 0.03
	$^3\text{H}$ -Thd	0.57 ± 0.08	0.55 ± 0.05	0.54 ± 0.11	0.54 ± 0.07	0.52 ± 0.11	0.53 ± 0.06
<b>Heart</b>	$^{18}\text{F}$ -FDG	5.09 ± 0.48	4.70 ± 0.86	5.31 ± 1.22	5.43 ± 1.43	6.68 ± 1.12	4.81 ± 0.68
	$^3\text{H}$ -Thd	0.81 ± 0.08	0.76 ± 0.06	0.78 ± 0.12	0.72 ± 0.21	0.82 ± 0.16	0.67 ± 0.17
<b>Liver</b>	$^{18}\text{F}$ -FDG	0.25 ± 0.06	0.28 ± 0.03	0.25 ± 0.05	0.28 ± 0.04	0.31 ± 0.05	0.21 ± 0.03
	$^3\text{H}$ -Thd	3.56 ± 0.63	3.61 ± 1.10	3.44 ± 1.15	3.65 ± 0.16	3.52 ± 1.48	2.91 ± 0.10
<b>Muscle</b>	$^{18}\text{F}$ -FDG	0.59 ± 0.15	0.53 ± 0.17	0.52 ± 0.16	0.57 ± 0.18	0.55 ± 0.13	0.60 ± 0.10
	$^3\text{H}$ -Thd	0.64 ± 0.06	0.52 ± 0.22	0.57 ± 0.20	0.67 ± 0.16	0.63 ± 0.21	0.66 ± 0.10
<b>Inflammation</b>	$^{18}\text{F}$ -FDG	0.41 ± 0.06	1.13 ± 0.26	1.26 ± 0.29	1.78 ± 0.32	1.18 ± 0.18	0.57 ± 0.19
	$^3\text{H}$ -Thd	0.47 ± 0.01	0.72 ± 0.22	0.89 ± 0.10	0.84 ± 0.03	0.74 ± 0.26	0.81 ± 0.39

Values are Mean ± SD (Differential Uptake Ratio) using 5 rats.