

THE MECHANISM OF  $^{99m}\text{Tc}$ -LABELED BILIARY IMAGING AGENTS  
—DIFFERENCE BETWEEN HIDA AND PI(PYRIDOXYLIDENE  
ISOLEUCINE)

Kenichi Kitani\*, Reiko Miura\*, Setsuko Kanai\*,  
Yukiko Minoda\*, Shinichiro Kawaguchi\*\*, Masahiro  
Iio\*\*, Reiko Chida\*\*, Yasuhito Sasaki\*\*\* and  
Kazuhiko Someya\*\*\*

\*First Laboratory of Clinical Physiology, Tokyo  
Metropolitan Institute of Gerontology, Tokyo, \*\*De-  
partment of Nuclear Medicine and Radiological  
Sciences, Tokyo Metropolitan Geriatric Hospital,  
Tokyo, \*\*\*3rd Department of Medicine, St. Marianna  
University School of Medicine, Kanagawa.

The purpose of the present study is to obtain in-  
formations on pharmacokinetic properties of Tc-PI  
(pyridoxylidene isoleucine) and Tc-HIDA in compari-  
son to BSP, the agent which has been studied in de-  
tail in the past 20 years.

Under pentobarbital anesthesia, male, SD rats  
(300g, 8-week-old) with bile duct cannulas were in-  
fused iv BSP solution (0.25mg/100g/min). Twenty  
minutes after the start of infusion,  $^{99m}\text{Tc}$  HIDA, or  
PI (100 — 200  $\mu\text{Ci}$ ) was injected iv and plasma clear-  
ance as well as biliary excretion of  $^{99m}\text{Tc}$  activity  
was monitored for the successive 60 minutes by meas-  
uring the specific activities of the plasma and bile  
samples.

Results: Twenty min after the start of BSP in-  
fusion, the biliary excretion rate of BSP reached a  
plateau (0.13 — 0.15mg/100g/min) which continued to  
be stable for the successive 30 min followed by a  
very gradual decline thereafter. Plasma BSP concen-  
tration continued to rise linearly during this peri-  
od and the rats given BSP infusion were thus con-  
firmed to have a Tm (transport maximum) condition  
during the isotope study. The biliary recovery of  
 $^{99m}\text{Tc}$  HIDA in 60 min after the injection (% of the  
dose) was  $33.6 \pm 10.0$  (n=8), while it was  $77.0 \pm 5.6$   
(n=6) in control rats, showing a marked depression in  
the biliary excretion of HIDA in BSP Tm state rats.  
The PI recovery in BSP Tm rats was also depressed  
( $51.2 \pm 5.8$ , n=10) compared with control study ( $78.3 \pm$   
 $7.2$ , n=11), but the extent of depression was milder  
than HIDA. On the other hand plasma clearance of  
HIDA was less delayed by BSP, compared with PI ac-  
tivity.

It was shown that PI is interfered more markedly  
at its hepatic uptake step, while HIDA is more  
strongly inhibited at its biliary excretion  
process, by BSP.

BASIC EVALUATION OF HEPATOBILIARY RADIOPHARMACEUTI-  
CALS:  $^{99m}\text{Tc}$ -PI,  $^{99m}\text{Tc}$ -HIDA,  $^{131}\text{I}$ -RB AND  $^{123}\text{I}$ -RB  
Isamu Narabayashi\*, Yasuhiko Ito\*, Nobuaki Ohtsuka\*,  
Akira Muranaka\*, Tsuneo Yokobayashi\*, Hideaki  
Terashima\*, Kazue Nagai\*, Hirosada Shigemoto\*\*,  
Katsunobu Konno\*\*\*, Michinobu Hashimoto\*\*\* and  
Akihisa Nishimura\*\*\*

\*Division of Nuclear Medicine, \*\*Department of  
Gastroenterologic Surgery, Kawasaki Medical School,  
Kurashiki, \*\*\*Kawasaki Paramedical College,  
Kurashiki.

This investigation was undertaken to assess the  
values of  $^{99m}\text{Tc}$ -PI,  $^{99m}\text{Tc}$ -HIDA,  $^{131}\text{I}$ -RB AND  $^{123}\text{I}$ -RB  
on rabbits.  $^{99m}\text{Tc}$ -labels were much preferable to  
 $^{131}\text{I}$ -RB for hepatobiliary imaging.

However, biliary excretion rates of  $^{99m}\text{Tc}$ -labels  
were less than that of  $^{131}\text{I}$ -RB because of greater  
urinary excretions. A comparative study on  $^{99m}\text{Tc}$ -  
agents and  $^{131}\text{I}$ -RB performed in rabbits with com-  
plete obstructive jaundice from a surgical ligation  
of the common bile duct showed that  $^{131}\text{I}$ -RB was  
superior to  $^{99m}\text{Tc}$ -agents for hyperbilirubinemia.

Therefore, rose bengal was labeled with  $^{123}\text{I}$   
instead of  $^{131}\text{I}$ .

$^{123}\text{I}$  is a lower gamma ray energy emitter more  
suitable for imaging and has a short half life of  
13 hours.

$^{123}\text{I}$ -RB was prepared using iodine exchange reac-  
tion between nonradioactive rose bengal and  $\text{Na}^{123}\text{I}$ .

Commercially obtained rose bengal was purified  
using Sephadex-25 column on gelfiltration. Radio-  
chemical purity of  $^{123}\text{I}$ -RB was examined by paper-  
chromatography. Biological distribution of  $^{123}\text{I}$ -RB  
in rabbits at 1 hour after intravenous injection  
indicated that the tracer was cleared from the blood  
to the liver, thereafter excreted into the small  
intestine through the common bile duct. Hepatic  
uptake and excretion of activity had been measured  
for 60 minutes using a scintillation camera in  
conjunction with a VTR system. There existed no  
significant difference relative to those of  $^{131}\text{I}$ -RB.

Serial scintigraphic images showed satisfactorily  
better images even in a rabbit with complete  
obstructive jaundice.