slice, the following results were obtained. Distributions of $^{203}$Hg-chlormerodrin and $^{203}$Hg-acetate in the kidneys were very similar and these agents were localized on renal cortex, especially on medullary rays. But the deposition of $^{99m}$Tc-DMSA was restricted within renal cortex except medullary rays.

**Chemical and Biological Studies on $^{99m}$Tc-DMSA Complex**

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$^{99m}$Tc-dimercaptosuccinate ($^{99m}$Tc-CMS) complex was prepared by electrochemical, electrolysis, SnCl$_2$ and NaBH$_4$·HCl methods. In all methods, less than 0.1% of free $^{99m}$TcO$_4$ was detected in the original preparation. The electrophoretic and paperchromatographic patterns of $^{99m}$Tc-DMSA was separated into two peaks. One peak was detected at nearly same spot as free DMS while the other peak remained at the origin. Kidney uptake was due principally to the $^{99m}$Tc-DMS complex which remained at the origin during the separation procedure. There were significant differences in organ distributions depending upon the methods and conditions of preparation. The highest renal concentration was achieved with SnCl$_2$ method at pH=2 (60% dose/g-organ), whereas, the lowest was with electrochemical method at pH=10 (1.9 % dose/g-organ), at 3 hr. after injection into mice.

The $^{99m}$Tc-DMS complex prepared by the electrochemical method at pH=10 was accumulated significantly by bone, which might be useful for bone scanning.

**Clinical Evaluation of Renal Imaging by $^{99m}$Tc-DMSA**


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$^{203}$Hg-Neohydrin was commonly in use as renal imaging agent. However, $^{203}$Hg-Neohydrin has drawbacks such as high exposure dose to the patient.

$^{99m}$Tc-DMSA study on clinical renal imaging was performed. Sixty three cases consisted of 33 males and 30 females from 12 to 89 years old (mean 57.9 y. o. were evaluated by this new radiopharmaceutical.

Pho/Gamma HP with parallel high resolution
and pinhole collimators and Graphic 5 scanner were used. The images were obtained at 1, 2, 3, 4, and 6 hours after intravenous injection of 2 to 10 mCi of $^{99m}$Tc-DMSA. In some cases, radioisotope angiograms were obtained after bolus injection of $^{99m}$Tc-DMSA.

In all cases, clear renal images were obtained up to 6 hours after injection. When the pinhole collimator was used and each kidney was enlarged to full crystal size, the detail of renal image was seen with more resolution than using parallel collimator or Graphic scanner.

Because this radiopharmaceutical accumulates in renal cortex and renal medulla demonstrates relatively cold area, therefore, normal variation of this new renal image was different from previous renal images. Normal renal image using $^{99m}$Tc-DMSA and pinhole collimator were classified into three patterns. In patients with chronic pyelonephritis, images demonstrated marked renal cortical atrophy. Renal infarction was also clearly depicted by the combination of $^{99m}$Tc-DMSA and pinhole collimator.

In conclusion, renal imaging by $^{99m}$Tc-DMSA combined with pinhole collimator was found to be the most useful method for renal imaging. Improved image served for the readings of normal renal structure, characteristic findings of the cases with pyelonephritis and space occupying lesions in polycystic kidney, renal infarction and etc.

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A New Excellent Renal Imaging Agent: $^{99m}$Tc-DMSA

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Recently $^{99m}$Tc-dimercaptosuccinic acid ($^{99m}$Tc-DMSA) has been developed for renal cortical imaging agent. Results of in vivo study in rats and the clinical evaluation of this new agent proved in kit form are presented.

The distribution of $^{99m}$Tc-DMSA and $^{203}$Hg-chlormerodrin in rats was measured by serial autopsies. The rats were sacrificed at 1, 3, 6 and 24 hours after intravenous injection of these agents and the specific activities in the various organs were measured with a well-type scintillation counter. The concentration of $^{99m}$Tc-DMSA was 20.3% of administered dose at 1 hour, 25.2% at 2 hours, 23.9% at 6 hours and 25.2% at 24 hours. That of $^{203}$Hg-chlormerodrin was 71.1% at 1 hour, 86.2% at 2 hours, 83.7% at 6 hours and 39.9% at 24 hours.

For clinical evaluation of this agent, 152 patients were studied. 44 patients out of them were studied with $^{203}$Hg-chlormerodrin. The $^{99m}$Tc-DMSA renal images were better than those with $^{203}$Hg-chlormerodrin in all of 44 patients.

For a posterior static imaging a dose of up to 2 mCi was used depending upon the age of the patient, and a scintiphoto was obtained at 1 or 2 hours after intravenous injection. 10 mCi of $^{99m}$Tc-DMSA was injected as a bolus to study the blood flow of the abdomen, and the data were registered in VTR for 5 minutes. Serial posterior