a diet containing 10g of salt a day or a free
diet (11g to 20g of salt a day). The whole
body counting was performed every day for
2 weeks by a plastic scintillator counter in a
steel room.

The \( ^{22}\text{Na} \) activities of serum samples were
counted by a low background \( \beta \)-spectro-meter.
Chemical sodium concentration of serum and
urine was measured by a flame photometer.
The biological half of \( ^{22}\text{Na} \) (Tb) and the
total exchangeable sodium (Nae) were calcu-
lated from these data. The effects of the
high salt loading or the administration of
some diuretic drugs, such as hydrochlorothia-
زيد, acetazolamide and anti-aldosteronic drug
were investigated for 1 week from 7th day
after \( ^{22}\text{Na} \) administration. Thereafter, the
patients were discharged from the hospital
and put on a free diet. The body counting
was done every 2 weeks for 3 months, and
then every month up to 11 months.

Some of the results were previously presen-
ted at the 6th annual meeting of this asso-
ciation. The further important findings
are as follows:
1. The patients with hypertension in the
late stage had a slower turnover than normal
or hypertensive patients in the early stage
both low and variable salt intake.
2. Tb and Nae in normal subjects under
free diet ranged 5.8 to 13.2 days with an
average 10.1 days, 2250 to 2400 g with an
average 2310 g, respectively. In these cases,
Tb is shorter and Nae is lower than those
data reported in western countries.
3. The effect of acetazolamide on the elimi-
nation of \( ^{22}\text{Na} \) in hypertensive patients re-
mained longer than that of hydrochlorothia-
زيد.
4. Anti-aldosteronic drug took no effect in
3 patients with essential hypertension.
5. The long term body retention curve was
devided into 2 exponential components. While
the Tb values were quite different each other
on the 1st phase, the leveling off points reach-
ed between the range 0.3-0.5% of adminis-
tered dose in all of the patients followed up
to 11 months, except for 1 case (15 years old,
girl). This 2nd phase has been explained to
be slowly exchanging compartment in bones
by several authors.

Studies on Copper Metabolism in Wilson’s Disease

T. Terao and K. Nakao
The Third Department of Internal Medicine, Faculty of Medicine,
University of Tokyo, Tokyo
T. Nagai, T. Inuma and T. Maruyama
National Institute of Radiological Sciences

Abnormality of copper metabolism has
been regarded as one of the most basic de-
fects in Wilson’s disease as reported by many
workers. Recently, the use of the radio-
isotopic copper has turned out to be very
helpful in the study of the disease and there
have been many reports by its use.

We have studied radiochemically on clinical
cases with Wilson’s disease in Japan, com-
paring them with those reported in American
and European countries.

Six cases of Wilson’s disease were studied
and the control group altogether consisted of
eight cases. Each case was given 1-4 mCi of
\( ^{64}\text{Cu} \) as cupric chloride by mouth. The spe-
cific activity was approximately 0.4-0.5 mCi/
mg Cu.

1) The measurement of radioactivity in
blood was done mainly by a well type scintil-
lation counter along with a low background
\( \beta \)-ray spectrometer, particularly the latter
being used for the later period of diminished
activity. The control group showed its peak
of radioactivity in plasma in one to three
hours after \( ^{64}\text{Cu} \) administration and the low-
est level in four to six hours. In Wilson’s
disease, the initial peak tended to be some-
what higher and slightly delayed than that
of normal, and in one of the cases the peak
is much delayed.
2) The second experiment we have done was to measure the uptake of $^{64}$Cu in certain areas of the body by the collimated scintillation counter. The areas aimed were those of the liver, head, mid-thigh and calf. There were some cases with Wilson's disease in which the uptake in the head, calf or thigh was exceedingly higher than those in controls. However, the uptake in the liver of patients with Wilson's disease was lower than controls.

3) The major portion of $^{64}$Cu was excreted into feces, but this varied considerably from subject to subject. In the cases of Wilson's disease, the excretion of $^{64}$Cu into urine showed the increase than normal. However, $^{64}$Cu excreted into feces did not differ significantly from those of controls.

3) We measured the remaining radioactivity in the body after $^{64}$Cu administration with plastic whole body counter. Of the given dose after one week, 14.5-16.5% was remained in the normal subjects, whereas in Wilson's disease, although the data were somewhat fluctuated, the remaining $^{64}$Cu was 12.3-17.1%.

5) Recent progression of neutron activation analysis enables us to measure the trace metals in hair and nails. We used methods to measure the copper in Wilson's disease. The copper in the hair of the Japanese was less than that reported in other countries. It varied considerably even in normal subjects. The copper in the hair of Wilson's disease was increased in some but normal in others. The copper in nails also showed a similar tendency.

Calcium-47 Kinetic Studies in Human Metabolic Bone Diseases

N. Yamauchi, S. Hayami and Y. Ishizuki

The First Department of Internal Medicine, Nagoya University School of Medicine, Nagoya

There are many reports of calcium kinetic studies using bone-seeking isotopes. But the results of the kinetic study was conflicting in several aspects and an accumulation of further data was required.

Calcium$^{47}$ kinetic studies were performed in one normal subject, one patient with hypothyroidism and two patients with hyperparathyroidism.

Calcium$^{47}$ was administered intravenously from a calibrated syringe, in a single dose of 40-50 $\mu$Ci, to each subject. Thereafter calcium$^{47}$ and stable calcium of serum, urine and stool were determined daily for 6 to 11 days. Calcium$^{47}$ was counted by well-typed scintillation counter and stable calcium was determined by Clark-Collip modification of the Kramer-Tisdall's method. The analysis of data was done by the method of Haeney and Whedon.

In a normal subject the size of miscible calcium pool, E, was 37 mg. Ca/kg., bone formation rate, BFR, 8.1 mg. Ca/kg./day, fractional rate of loss of isotope from miscible calcium pool, K, 0.234±0.50. In a patient with hypothyroidism E was 35 mg. Ca/kg., BFR 6.7 mg. Ca/kg./day, K 0.201±0.030. In one patient with hyperparathyroidism E, BFR and K were 32 mg. Ca/kg., 8.3 mg. Ca/kg./day and 0.306±0.006, respectively. In another patient with hyperparathyroidism these were 59 mg. Ca/kg., 7.6 mg. Ca/kg./day, 0.348±0.011, respectively.

E was increased in a patient with hyperparathyroidism and BFR was decreased in a patient with hypothyroidism. Furthermore, K seemed to be correlated to the abnormality of calcium turnover rate in metabolic bone diseases.