applied to the study of the regional difference of the response to $CO_2$.

Ten adult mongrel dogs were anesthetized with nembutal (25 mg/kg i.v.) and the chest was opened under artificial respiration. $^{131}I$ MAA (15 $\mu$Ci/kg) was injected into the left auricle. After 10 minutes of 5.5% $CO_2$ inhalation, $^{125}I$ MAA (15 $\mu$Ci/kg) was injected similarly in 4 dogs. Then animals were immediately sacrificed and the brain was taken out. The brain was separated into various regions macroscopically and radioactivity of the samples from these regions and also that of the samples from the cranial bone and muscle were measured using a well type scintillation counter with a pulse height analyzer, and it was expressed by relative percentage of radioactivity in unit weight. Since the amount of regionally carried MAA is proportional to the regional blood flow, percentage radioactivity of a region indicates regional blood flow. The mean radioactivity of a whole hemisphere was used as the standard indicating 100%. Before and after $CO_2$ inhalation, other standard was used. Assuming a condition, where total injected MAA was evenly distributed throughout the animal, the mean radioactivity per unit weight was calculated and was used as the standard.

Normal distribution of cerebral blood flow in 6 dogs was as follows: (Mean of a cerebral hemisphere 100.0). Cerebral cortex 97.3±7.5, cerebral white matter 52.1±13.2, thalamus 114.5±17.8, caudate nucleus 137.3±26.7, dura 88.3±33.7, fornix and corpus callosum 27.6±9.8, choroid plexus 2387.3±2060, cranial bone 18.1±14.8 and cranical muscle 18.6±12.0.

Distribution of cerebral blood flow before and during 5.5% $CO_2$ inhalation in 4 dogs was as follows: (Calculated mean when MAA was evenly distributed 100—100). Cerebral cortex 97.5±31.3—270.7±63.5, cerebral white matter 36.8±6.0—84.2±26.1, caudate nucleus 103.3±61.6—230.9±128.4, fornix and corpus callosum 25.5±7.1—40.2±22.5, dura 113.3±54.8—99.2±9.6, choroid plexus 1381±657—3555±2460, cranial bone 22.8±11.7—32.3±37.1, and cranical muscle 62.1±65.8—35.6±18.2.

These results are summarized as follows:

Cerebral cortex and basal ganglia were perfused with about 3 times as much blood as that perfused cerebral white matter, corpus callosum and fornix. After 10 minutes of 5.5% $CO_2$ inhalation, rate of increase in blood flow was not equal among various cerebral tissues. Rate of increase was highest in the cerebral cortex and was 178%. In caudate nucleus and white matter, it was 123% and 129% respectively. In fornix and corpus callosum, it was 58%. In chorioid plexus, flow rate per tissue weight was very high, however, owing to very small tissue mass, total blood perfusion was small. Bone and muscle were perfused with lower blood flow and after $CO_2$ inhalation, blood flow increased slightly or decreased.

## Body Potassium Concentration in Patients with Progressive Muscular Dystrophy and Their Family Members

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Human whole body counters have important clinical applications in the measurement of body potassium. Natural potassium contains $^{40}K$ which is natural radioisotope and has $1.25 \times 10^9$ years half life. Since $^{40}K$ emits 1.46 Mev gamma ray and it is present at a fixed percentage, potassium content can be calculated from the $^{40}K$ measurement with a whole body counter.

Up to the present whole body counters in

National Institute of Radiological Sciences have been used for the $^{40}K$ and $^{137}Cs$ measurement in more than 3,000 persons.

This report is presented as an approach to studying progressive muscular dystrophy. Similar work has been done by Blahd (V.A. Center at Los Angeles), followed by Kossman (Cornell Med. Center). Our effort were directed to studying the pathogenic process of Duchenne form muscular dystrophy. A large plastic scintillator type whole body counter was used because of its higher geometric efficiency and shorter counting time. Data analysis was performed on a Burroughs-5500 digital computer.

Body potassium concentration was determined in 51 patients with neuro-muscular diseases, including 42 Duchenne form, 2 limb-girdle form, 1 myotonic form, and 6 neurogenic atrophy, who were measured a total of 119 determinations, and in 43 unaffected family members. Normal volunteers comprised 150 healthy males and 82 healthy females were measured as controls of this study.

Patients with Duchenne form dystrophy have severe depressions of body potassium concentration, and its levels usually paralleled the severity of the disease and the length of the period attacked with the disease. A similar decrease in body potassium concentration was noted in female patients with limb-girdle form, but to a lesser degree. Potassium concentration in lean body mass determined by tritiated water dilution method was also reduced in 11 selected patients with Duchenne form. 17 patients with Duchenne form exhibited a decrease in total body potassium content and body potassium concentration with the course of one year. Long-term body retention of $^{86}Rb$ measured with the whole body counter showed shorter biological half life of rubidium in patients with Duchenne form. These results obtained may suggest that potassium leakage from the muscle cell might be a primary factor in the pathogenic process of the disease.

Remarkably reduced body potassium concentration were observed in about half of 28 female relatives, while slightly reduced concentrations were observed in only four of 15 male parents. In view of carrier types, total of five probable carriers and 11 of 15 possible carriers had moderate depressions of body potassium concentration. From the relationship between serum creatine phosphokinase levels and body potassium concentration, it was shown that reduced body potassium could be seen in some female relatives who had normal serum creatine phosphokinase levels. These results obtained suggest that this whole body couning method might be valuable as an indication of the gene carrier.

Thus, this method may assume a role in diagnosing progressive muscular dystrophy, even in its preclinical stage, and in predicting the inheritance of the disease.

## Studies on Sodium Metabolism in Patients with Hypertension Using $^{22}Na$ and Whole Body Counter

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The sodium metabolism in 7 normal subjects, 15 hypertensive patients and 5 patients with cachexic edema (varying in age 15 to 72) have been studied for 40 to 320 days after the administration of 10 $\mu$Ci of $^{22}Na$. Among 15 hypertensive patients, 6 were in the early stage and 5 in the late stage of essential hypertension, 2 had chronic nephritis and 2 were renovascular hypertension. All patients were hospitalized and received