

Basic research on neurotransmitter mapping for establishing objective nuclear medicine imaging of schizophrenic disorder

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1987 Fiscal Year Final Research Report Summary

Basic research on neurotransmitter mapping for establishing objective nuclear medicine imaging of schizophrenic disorder

Research Project

Project/Area Number

61440045

Research Category

Grant-in-Aid for General Scientific Research (A)

Allocation Type

Single-year Grants

Research Field

Radiation science

Research Institution

Kanazawa University

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Project Period (FY)

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Keywords

Schizophrenic disorder / neurotransmitter / autoradiography / image processing / mathematical model / ^{99m}Tc-labeled agent / ^{99m}Tc標識薬剤 / 向精神薬

Research Abstract

A fundamental study was performed on a quantitative measurement of brain receptor using an autoradiographic technique in rats. Highly qualified autoradiograms were obtained using six different ligands labeled with tritium after the investigation of appropriate incubation time and washing time, and of

presence or absence of saturation. In a comparative study in quantitation and manipulation among the following three systems for analyzing autoradiograms: 1) scanning densitometer, 2) drum scanner, 3) video digitizer system (VDS), the VDS system showed by far the most convenient manipulation without any significant differences in quantitation. Appropriate setting of conditions in the ligand-receptor interaction revealed the similarity of the hitherto discordant values for the maximum number of binding sites of the muscarinic acetylcholine receptor and equilibrium dissociation constant of its antagonist, H-quinuclidinyl benzylate, between in vitro receptor assay and receptor autoradiography in the conventional Scatchard analysis. It is said that ligand-muscarinic receptor complex shows a conformational change from low to high affinity form (isomerization). In this isomerization model four rate constants were estimated with the use of a newly developed mathematical equation. The validity of this new analysis was confirmed from the observation that the apparent equilibrium dissociation rate constant from these rate constants was in a good agreement with that from non-isomerization model. Schizophrenic model rats were developed either by administering methamphetamine or by injection of 6-OHDA to prefrontal cortex, of which cerebral blood flow and glucose metabolism were not significantly different from controls. Further investigations are being carried out on receptor changes in these models. Twenty to thirty percent decrease in the maximum number of binding sites of 5-HT₂ receptor was demonstrated in a part of frontal cortex after administering clomipramine in the receptor autoradiography. For single photon emission computed tomography, ^{99m}Tc-labeled chelating agent was developed which crosses the blood-brain barrier. A multi-tracer autoradiographic technique was also established for simultaneous evaluation of cerebral blood flow and its metabolism. ▲ Less

Research Products (13 results)

	All	Other
	All Publications (13 results)	
[Publications] 久田 欣一: 臨床科学. 22. 999-1004 (1986)		▼
[Publications] 森 厚文: 核医学. 23. 1585-1594 (1986)		▼
[Publications] 隅屋 寿: 金沢大学十全医学会雑誌. 96. 321-337 (1987)		▼
[Publications] Hiroshi Matsuda: J Cereb Blood Flow Metabol (Suppl). 7. 348 (1987)		▼
[Publications] 森 厚文: 核医学. 25. (1988)		▼
[Publications] 辻 志郎: 金沢大学十全医学会雑誌. 97. (1988)		▼
[Publications] 久田 欣一: "放射線医学大系特別巻6(ポジトロンCT)" 中山書店, (1988)		▼
[Publications] Kinichi Hisada: "Biological imaging using radioisotopes (2) receptor imaging" The Journal of Clinical Science. 22. 999-1004 (1986)		▼
[Publications] Hirofumi Mori: "Binding sites and subcellular distribution of N-isopropyl-p-(1-125) iodoamphetamine in the rat brain." Japanese Journal of Nuclear Medicine. 23. 1585-1594 (1986)		▼
[Publications] Hisashi Sumiya: "Studies on quantitative double-labeled autoradiography in the rat brain using N-isopropyl-p-(125-I)iodoamphetamine and 3-H-deoxyglucose" Journal of Jusen Medical Society. 96. 321-337 (1987)		▼
[Publications] Hiroshi Matsuda: "A new mathematical approach for two-step isomerization model of muscarinic antagonists" Journal of Cerebral Blood Flow and Metabolism (Supplement). 7. 348- (1987)		▼
[Publications] Hirofumi Mori: "Quantitative receptor autoradiography using (3-H)-quinuclidinyl benzilate binding in the rat brain - A comparison with radioreceptor assay -" Japanese Journal of Nuclear Medicine. 25. (1988)		▼
[Publications] Kinichi Hisada: Encyclopedia Radiologica, special issue VI (positron CT). Nakayama Shoten, (1988)		▼

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