

UNITED STATES DEPARTMENT OF JUSTICE  
DRUG ENFORCEMENT ADMINISTRATION

In the Matter of )  
 ) Docket No. .84-48  
MDMA SCHEDULING )  
 )  
\_\_\_\_\_ )

REBUTTAL TESTIMONY OF JOEL E. KLEINMAN, M.D., Ph.D.

I, Joel E. Kleinman make the following statement:

I am currently the Chief Resident in Neurology at George Washington University Hospital, Washington, D.C. and Chief of the Clinical Brain Studies Section for the National Institute of Mental Health at Saint Elizabeth's Hospital in Washington, D.C. I received my M.D. from the University of Chicago in 1973 and my Ph.D. in neuropharmacology from the University of Chicago in 1974. I am a Board certified psychiatrist. (A copy of my curriculum vitae is attached as Exhibit 1.)

I have reviewed the direct testimony submitted by Drs. Ingrasci, Downing, Strassman, Wolfson, Greer, Nichols and Lynch and the unpublished paper entitled, "Hallucinogenic Amphetamine Selectively Destroys Brain Serotonin Nerve Terminals: Neurochemical and Anatomical Evidence," by G. Ricaurte, G. Bryan, L. Strauss, L. Seiden and C. Schuster, which is listed as Government Document A-9.

It is my professional opinion that the studies described in the direct testimony of Drs. Downing and Greer have little or no scientific merit. I base that conclusion on the fact that (1) there were not adequate descriptions of the patients or subjects of the studies; (2) these were not blind or double blind studies: the purpose of using blind studies is to ensure that clinical ratings of effectiveness are not biased by the experimenter's expectations of the drug's action; (3) there were no objective outcome criteria: these criteria serve as measurement standards which allow the researcher to objectively test whether or not the drug significantly improves the patient's condition; (4) the studies appear to be heavily biased; and (5) the reports are almost entirely anecdotal and thus largely subjective in nature. Although these reports make interesting reading, their lack of scientific design, methodology and controls makes them scientifically unsound.

The individuals who conducted these psychiatric studies may be conscientious and concerned physicians, but they lack any serious academic or scientific standing in the psychiatric community. Moreover, their backgrounds as scientists and researchers are minimal.

I reviewed the study of MDA in rats conducted by G. Ricaurte, G. Bryan, L. Strauss, L. Seiden and C. Schuster,

L. Seiden and C. Schuster entitled "Hallucinogenic Amphetamine Selectively Destroys Brain Serotonin Terminals: Neurochemical and Anatomical Evidence." Since MDA and MDMA are similar in chemical structure as well as in their effects on the release of serotonin from brain synaptosomes, this study raises serious questions about the neurotoxic potential of MDMA. I would never administer MDMA to a human being unless further animal studies establish a lack of such neurotoxicity to brain serotonin neurons. It should be noted that the serotonergic systems in the brain are involved in the regulation of mood, emotion and sleep.

There would appear to be potential for abuse of the compound because the MDMA chemical structure is so similar to both MDA (Schedule I) and methamphetamine (Schedule II). In addition, studies referenced in the document "Schedule I Control Recommendation Under the CSA for 3,4-Methylenedioxymethamphetamine (MDMA)" suggest that MDA and MDMA share a number of pharmacological actions as studies in vivo in dogs and monkeys and in vitro as studied in synaptosomal preparations of rat brain.

Another issue of concern to me is that the MDMA being used in these studies is apparently being made clandestinely, i.e. in laboratories which are not licensed

or inspected by the government. There is little indication that the drug being given to the subjects is free from contaminants, or that the dose is accurately determined. In light of these purity issues, and following the lessons of MPTP (an impurity found in a clandestinely produced drug which produced permanent Parkinson's disease in drug takers), I find it distressing that a physician would deliberately administer a drug of unknown purity. Moreover, in Dr. Greer's case, I see no evidence that he possesses the necessary skills to ensure that the compound which he produced, is free from unwanted contaminants.

MDMA is an interesting but potentially dangerous compound, which should not be administered to humans without extensive further trials with animals.

In my experience the control of a substance in Schedule I does not impede legitimate research. In point of fact, an enormous amount of research has been conducted on marijuana and LSD, both of which are Schedule I substances.

I declare, under penalty of perjury, that the foregoing statement is true and correct.

Joel E Kleinman MD PhD  
Joel E. Kleinman, M.D., Ph.D.

Dated: 5/15/85

**CURRICULUM VITAE****NAME:** Joel E. Kleinman, M.D., Ph.D.**DATE AND PLACE OF BIRTH:** April 8, 1945; Alexandria, Louisiana**FAMILY STATUS:** Married, two children**EDUCATION:**

1966 B.S., Biochemistry, University of Chicago, Chicago, Illinois  
1973 M.D., University of Chicago Pritzker School of Medicine, Chicago, Illinois  
1974 Ph.D., Pharmacology, Department of Pharmacological and Physiological Sciences, University of Chicago, Chicago, Illinois

**EMPLOYMENT:**

1973-1974 Rotating Intern, San Francisco General Hospital, San Francisco, California; Clinical Fellow, University of California in San Francisco, San Francisco, California

1974-1976 Psychiatric Resident, Massachusetts Mental Health Center, Boston, Massachusetts; Clinical Fellow, Harvard Medical School, Boston, Massachusetts

1976-1978 Clinical Associate, Laboratory of Clinical Psychopharmacology, Division of Special Mental Health Research, Intramural Research Program, National Institute of Mental Health, Saint Elizabeths Hospital, Washington, D.C.

1978-1984 Staff Psychiatrist, Adult Psychiatry Branch (formerly Laboratory of Clinical Psychopharmacology; Division of Special Mental Health Research), Intramural Research Program, National Institute of Mental Health, Saint Elizabeths Hospital, Washington, D.C.

1984-Present Chief, Clinical Brain Studies Section, Neuropsychiatry Branch (formerly Adult Psychiatry Branch), National Institute of Mental Health, Saint Elizabeths Hospital, Washington, D.C.

**MILITARY SERVICE:**

1972-1973 Ensign, USPHS, Senior COSTEP  
1976-1978 Lt. Commander, USPHS  
1978-Present Commander, USPHS

## **OTHER CLINICAL EXPERIENCES:**

- 1976 Consultant, Paul A. Dever State School, Taunton, Massachusetts
- 1977-1983 Neuropsychiatric Consultant, District of Columbia Medical Examiner's Office, Washington, D.C.
- 1978-Present Private Practice of Psychiatry
- 1979-1981 Consultant, Montgomery County Department of Corrections and Rehabilitation, Rockville, Maryland
- 1979 Examiner, American Board of Psychiatry and Neurology
- 1980-1983 Assistant Clinical Professor, Department of Psychiatry and Behavioral Sciences, George Washington University School of Medicine
- 1983-Present Neurology Resident, George Washington University School of Medicine

## **SOCIETIES:**

Sigma XI  
American Association for the Advancement of Science  
American Psychiatric Association  
Washington Psychiatric Society  
Society for Biological Psychiatry

## **LICENSES:**

Diplomate of National Medical Board  
American Board of Psychiatry and Neurology  
State Medical Licensure: Maryland, California, District of Columbia

## **AWARDS:**

A.E. Bennett Award, 1981

## BIBLIOGRAPHY

- 1) Hoffman, P.C., Toon, R., Kleinman, J. and Heller, A.: The association of lesion-induced reductions in brain monoamines with alterations of striatal carbohydrate metabolism. J. Neurochem. 20:69-80, 1973.
- 2) The association of reduction in monoamines with carbohydrate metabolism in the brain. A dissertation submitted to the faculty of the Division of Biological Sciences and the Pritzker School of Medicine in candidacy for the Degree of Doctor of Philosophy. Department of Pharmacological and Physiological Sciences, 1974, 79 pages.
- 3) Davis, G.C., Bunney, W.E. Jr., DeFraitcs, E.G., Kleinman, J.E., van Kammen, D.P., Post, R.M. and Wyatt, R.J.: Intravenous naloxone administration in schizophrenia and affective illness. Science 197:74-76, 1977.
- 4) Kleinman, J.E., Gillin, J.C. and Wyatt, R.J.: A comparison of the phenomenology of hallucinogens and schizophrenia from some autobiographical accounts. Schizophrenia Bull. 3:560-586, 1977.
- 5) Carman, J.S., Gillin, J.C., Murphy, D.L., Weinberger, D.R., Kleinman, J.E., Bigelow, L.B. and Wyatt, R.J.: Effects of a selective inhibitor of type A monoamine oxidase—Lilly 51641—on behavior, sleep and circadian rhythms in depressed and schizophrenic patients. Comm. Psychopharmacol. 2:513-523, 1978.
- 6) Walker, R.W., Mandel, L.R., Kleinman, J.E., Gillin, J.C., Wyatt, R.J. and Vandenheuvel, W.J.A.: Improved selective ion monitoring mass-spectrometric assay for the determination of N,N-dimethyltryptamine in human blood utilizing capillary column gas chromatography. J. Chromatography 162:539-546, 1979.
- 7) Gillin, J.C., Kleinman, J.E., Nasrallah, H.A., Bigelow, L.B., Rogol, A., Luchins, D., Carman, J., Weinberger, D. and Wyatt, R.J.: Inhibition of dopamine synthesis in chronic schizophrenia: A follow-up study. In: Usdin, E., Kopin, I.J. and Barchas, J.D. (eds.): Catecholamines: Basic and Clinical Frontiers. New York, Pergamon Press, 1979, pp. 1839-1841.
- 8) Kleinman, J.E., Bridge, P., Karoum, F., Speciale, S., Staub, R., Zalcman, S., Gillin, J.C. and Wyatt, R.J.: Catecholamines and metabolites in the brains of psychotics and normals: Post-mortem studies. In: Usdin, E., Kopin, I.J. and Barchas, J.D. (eds.): Catecholamines: Basic and Clinical Frontiers. New York, Pergamon Press, 1979, pp. 1845-1847.
- 9) Bigelow, L.B., Zalcman, S., Kleinman, J.E., Weinberger, D., Luchins, D., Tallman, J., Karoum, F. and Wyatt, R.J.: Propranolol treatment of chronic schizophrenia: Clinical response, catecholamine metabolism and lymphocyte B-receptors. In: Usdin, E., Kopin, I.J. and Barchas, J.D. (eds.): Catecholamines: Basic and Clinical Frontiers. New York, Pergamon Press, 1979, pp. 1851-1853.

- 10) Kleinman, J.E., Potkin, S., Rogol, A., Buchsbaum, M.S., Murphy, D.L., Gillin, J.C., Nasrallah, H.A. and Wyatt, R.J.: A correlation between platelet monoamine oxidase activity and plasma prolactin concentrations in man. Science 206:479-481, 1979.
- 11) Davis, G.C., Bunney, W.E. Jr., Buchsbaum, M.S., DeFraites, E.G., Duncan, W., Gillin, J.C., van Kammen, D.P., Kleinman, J., Murphy, D.L., Post, R.M., Reis, V. and Wyatt, R.J.: Use of narcotic antagonists to study the role of endorphins in normals and psychiatric patients. In: Usdin, E., Bunney, W.E. Jr. and Kline, N.S. (eds.): Endorphins in Mental Health Research. New York, Oxford University Press, 1979, pp. 393-406.
- 12) Weinberger, D.R., Bigelow, L.B., Kleinman, J.E., Klein, S.T., Rosenblatt, J.E. and Wyatt, R.J.: Cerebral ventricular enlargement in chronic schizophrenia. Arch. Gen. Psychiatry 37:11-13, 1980.
- 13) Weinberger, D.R., Kleinman, J.E., Luchins, D.J., Bigelow, L.B. and Wyatt, R.J.: Cerebellar pathology in schizophrenia: A controlled postmortem study. Am. J. Psychiatry 137:359-361, 1980.
- 14) Freed, W.J., Kleinman, J.E., Karson, C.N., Potkin, S.G., Murphy, D.L. and Wyatt, R.J.: Eye-blink rates and platelet monoamine oxidase activity in chronic schizophrenic patients. Biol. Psychiatry 15:329-332, 1980.
- 15) Luchins, D.J., Weinberger, D.R., Kleinman, J.E., Neckers, L., Rosenblatt, J.E., Bigelow, L.B. and Wyatt, R.J.: Human leukocyte antigen A2 and psychopathology in chronic schizophrenia. Am. J. Psychiatry 137:499-500, 1980.
- 16) Kleinman, J.E., Bigelow, L.B., Rogol, A., Weinberger, D.R., Nasrallah, H.A., Wyatt, R.J. and Gillin, J.C.: A clinical trial of 7-hydroxychlorpromazine in chronic schizophrenia. In: Usdin, E., Eckert, H. and Forrest, I.S. (eds.): Phenothiazines and Structurally Related Drugs—Basic and Clinical Studies. New York, Elsevier North Holland Inc., 1980, pp. 275-278.
- 17) Kafka, M.S., van Kammen, D.P. and Kleinman, J.E.:  $\alpha$ -Adrenergic receptor function in schizophrenia. Psychopharmacology Bull., 16:91-94, 1980.
- 18) Kleinman, J.E., Bridge, P., Karoum, F., Speciale, S., Staub, R., Zalcmann, S., Gillin, J.C. and Wyatt, R.J.: Biochemical abnormalities in post-mortem brain. In: Baxter, C. and Melnechuk, T. (eds.): Perspectives in Schizophrenia Research. New York, Raven Press, 1980, pp. 227-233.
- 19) Rosenblatt, J.E., Pary, R., Bigelow, L.B., DeLisi, L.E., Wagner, R.L., Kleinman, J.E., Weinberger, D.R., Potkin, S.G., Shilling, D., Jeste, D.V., Alexander, P. and Wyatt, R.J.: Measurement of serum neuroleptic concentrations by radioreceptor assay: Concurrent assessment of clinical response and toxicity. Psychopharmacol. Bull., 16:78-80, 1980.
- 20) Karson, C.N., Staub, R.A., Kleinman, J.E. and Wyatt, R.J.: Blink rates and receptor supersensitivity. Neuropharmacology 20:91-93, 1981.



- 21) Rosenblatt, J.E., Pary, R.J., Bigelow, L.B., DeLisi, L.E., Wagner, R.L., Kleinman, J.E., Weinberger, D.R., Potkin, S.G., Shiling, D., Jeste, D.V., Alexander, P. and Wyatt, R.J.: Measurement of serum neuroleptic concentrations by radioreceptor assay: Concurrent assessment of clinical response and toxicity. In: Usdin, E., Bunney, W.E. Jr. and Davis, J.M. (eds.): Neuroreceptors—Basic and Clinical Aspects. England, John Wiley and Sons, 1981, pp. 165-188.
- 22) Kafka, M.S., van Kammen, D.P. and Kleinman, J.E.: The alpha adrenergic receptor in man: Normal function and pathology. In: Usdin, E., Bunney, W.E. Jr. and Davis, J.M. (eds.): Neuroreceptors—Basic and Clinical Aspects. England, John Wiley, and Sons, 1981, pp. 129-139.
- 23) Karson, C.N., Staub, R., Kleinman, J.E. and Wyatt, R.J.: Drug effect on blink rates in rhesus monkeys. Biol. Psychiatry 16:249-254, 1981.
- 24) Wyatt, R.J., Potkin, S.G., Kleinman, J.E., Weinberger, D.R., Luchins, D.J. and Jeste, D.V.: The schizophrenia syndrome: Examples of biological tools for subclassification. J. Nerv. Ment. Dis., 169:100-112, 1981.
- 25) Karson, C.N., Freed, W.J., Kleinman, J.E., Bigelow, L.B. and Wyatt, R.J.: Neuroleptics decrease blinking in schizophrenic subjects. Biol. Psychiatry 16:679-682, 1981.
- 26) Aulakh, G.S., Kleinman, J.E., Aulakh, H.S., Albrecht, P., Torrey, E.F. and Wyatt, R.J.: Search for cytomegalovirus in schizophrenic brain tissue. Proc. Soc. Exp. Biol. Med., 167:172-174, 1981.
- 27) Wyatt, R.J., Moja, E.A., Karoum, F., Stoff, D.M., Potkin, S.G. and Kleinman, J.E.: Phenylethylamine, dopamine and norepinephrine in schizophrenia. In: Corsini, G.U. and Gessa, G.L. (eds.): Apomorphine and Other Dopaminomimetics. New York, Raven Press, 1981, pp. 39-44.
- 28) Potkin, S.G., Weinberger, D., Kleinman, J., Bigelow, L., Bjornsson, T.D., Gillin, J.C., Nasrallah, H., Luchins, D., Fischer, S.H., Linnoila, M., Carman, J. and Wyatt, R.J.: Wheat gluten challenge in schizophrenic patients. Am. J. Psychiatry 138:1208-1211, 1981.
- 29) Lackovic, Z., Kleinman, J., Karoum, F. and Neff, N.H.: Dopamine and its metabolites in human peripheral nerves. Is there a widely distributed system of peripheral dopaminergic nerves? Life Sci., 29:917-922, 1981.
- 30) Freed, W.J., Karson, C.N., Kleinman, J.E. and Wyatt, R.J.: Increased spontaneous eye blinks in cerebellectomized rats. Biol. Psychiatry 16:789-793, 1981.
- 31) Kafka, M.S., van Kammen, D.P., Kleinman, J.E., Nurnberger, J.I., Siever, L.J., Uhde, T.W. and Polinsky, R.J.: Alpha-adrenergic receptor in schizophrenia, affective disorders and some neurological diseases. Commun. Psychopharmacol., 4:477-486, 1981.
- 32) Karson, C.N., Berman, K.F., Donnelly, E.F., Mendelson, W.B., Kleinman, J.E. and Wyatt, R.J.: Speaking, thinking and blinking. Psychiatry Res., 5:243-246, 1981.

- 33) Wyatt, R.J., Karoum, F., Stoff, D.M., Kleinman, J.E., Gillin, J.C., Jeste, D.V. and Potkin, S.G.: Monoamine oxidase, phenylethylamine, norepinephrine and schizophrenia. Clin. Genetics 19:437-442, 1981.
- 34) Jeste, D.V., Kleinman, J.E., Luchins, D.J., Potkin, S.G. and Weinberger, D.R.: Ex uno multi: Subtyping the schizophrenic syndrome. Biol. Psychiatry 17:199-222, 1982.
- 35) Kleinman, J.E., Karoum, F., Rosenblatt, J.E., Gillin, J.C., Hong, J., Bridge, T.P., Zalcman, S., Storch, F., Carmen, R. and Wyatt, R.J.: Postmortem neurochemical studies in chronic schizophrenia. In: Hanin, I. and Usdin, E. (eds.): Biological Markers in Psychiatry and Neurology. Oxford and New York, Pergamon Press, 1982, pp. 67-76.
- 36) Karson, C.N., Kleinman, J.E., Freed, W.J., Bigelow, L.B., Weinberger, D.R. and Wyatt, R.J.: Blink rates in schizophrenia. In: Hanin, I. and Usdin, E. (eds.): Biological Markers in Psychiatry and Neurology. Oxford and New York, Pergamon Press, 1982, pp. 339-345.
- 37) Kleinman, J.E., Karoum, F., Rosenblatt, J.E., Gillin, J.C., Hong, J., Bridge, T.P., Zalcman, S., Storch, F., Carmen, R. and Wyatt, R.J.: Catecholamines and peptides in postmortem schizophrenic brains. In: Perris, C., Jansson, B. and Struwe, G. (eds.): Biological Psychiatry, 1981. Development in Psychiatry, Vol. 5. Amsterdam, Elsevier, North-Holland, 1982, pp. 711-714.
- 38) Kafka, M.S., van Kammen, D.P. and Kleinman, J.E.: Alpha-adrenergic function in schizophrenia, affective disorders and some diseases of neural transmission. In: Perris, C., Jansson, B. and Struwe, G. (eds.): Biological Psychiatry, 1981. Developments in Psychiatry, Vol. 5. Amsterdam, North-Holland, 1982, pp. 691-694.
- 39) Wyatt, R.J., Cutler, N.R., DeLisi, L.E., Jeste, D.V., Kleinman, J.E., Luchins, D.J., Potkin, S.G. and Weinberger, D.R.: Chapter 12: Biochemical and morphological factors in the etiology of the schizophrenic disorders. In: Grinspoon, L. (ed.): Psychiatry, 1982, The American Psychiatric Association Annual Review. Washington, D.C., American Psychiatric Press Inc., 1982, pp. 112-153.
- 40) DeLisi, L.E., Freed, W.J., Gillin, J.C., Kleinman, J.E., Bigelow, L.B. and Wyatt, R.J.: P-chlorophenylalanine trials in schizophrenic patients. Biol. Psychiatry 17:471-477, 1982.
- 41) Kleinman, J.E., Weinberger, D.R., Rogol, A.D., Bigelow, L.B., Klein, S.T., Gillin, J.C. and Wyatt, R.J.: Relationships between plasma prolactin concentrations and psychopathology in chronic schizophrenia. Arch. Gen. Psychiatry 39:655-657, 1982.
- 42) Karson, C.N., Bigelow, L.B., Kleinman, J.E., Weinberger, D.R. and Wyatt, R.J.: Haloperidol induced changes in blink rates correlate with changes in BPRS score. Brit. J. Psychiatry 140:503-507, 1982.
- 43) Kleinman, J.E., Weinberger, D.R., Rogol, A., Shilling, D.J., Mendelson, W.B. and Wyatt, R.J.: Naloxone in chronic schizophrenic patients: Neuroendocrine and behavioral effects. Psychiatry Res. 7:1-7, 1982.

- 44) Jeste, D.V., Zalcman, S., Weinberger, D.R., Cutler, N.R., Bigelow, L.B., Kleinman, J.E., Rogol, A., Gillin, J.C. and Wyatt, R.J.: Apomorphine response and subtyping of schizophrenia. Prog. Neuro-Psychopharmacol. Biol. Psychiatry 7:83-88, 1983.
- 45) Karson, C.N., Kleinman, J.E., Berman, K.F., Phelps, B.H., Wise, C.D., DeLisi, L.E. and Jeste, D.V.: An inverse correlation between spontaneous eye-blink rate and platelet monoamine oxidase activity. Brit. J. Psychiatry 142:43-46, 1983.
- 46) Kleinman, J.E., Iadarola, M., Govoni, S., Hong, J., Gillin, J.C. and Wyatt, R.J.: Postmortem measurements of neuropeptides in human brain. Psychopharmacol. Bull., 19:375-377, 1983.
- 47) Memo, M., Kleinman, J.E. and Hanbauer, I.: Coupling of dopamine D1 recognition sites with adenylate cyclase in nuclei accumbens and caudatus of schizophrenics. Science 221:1304-1307, 1983.
- 48) Karson, C.N., Berman, K.F., Kleinman, J.E. and Wyatt, R.J.: Seasonal variation in human central dopamine activity. Psychiatry Res., 11:111-117, 1984.
- 49) Korpi, E.R., Kleinman, J.E., Costakos, D.T., Linnoila, M. and Wyatt, R.J.: Reduced haloperidol in the postmortem brains of haloperidol treated patients. Psychiatry Res., 11:259-269, 1984.
- 50) Kleinman, J.E.: Catecholamines in the brains of schizophrenic patients. In: Racagni, G., Paoletti, R. and Kielholz, P. (eds.): Clinical Neuropharmacology, Vol. 7. New York, Raven Press, 1984, pp. 912-913.
- 51) Kaufmann, C.A., Gillin, J.C., Hill, B., O'Laughlin, T., Phillips, I., Kleinman, J.E. and Wyatt, R.J.: Muscarinic binding in suicides. Psychiatry Res. 12:47-55, 1984.
- 52) Bridge, T.P., Kleinman, J.E., Karoum, F. and Wyatt, R.J.: Postmortem central catecholamines and antemortem cognitive impairment in elderly schizophrenics and controls. Neuropsychobiology (in press).
- 53) Bracha, H.S. and Kleinman, J.E.: Post-mortem studies in psychiatry. Psychiatr. Clin. North Am., (in press).
- 54) Kleinman, J.E., Reid, A., Lake, C.R. and Wyatt, R.J.: Studies of norepinephrine in schizophrenia. In: Lake, C.R. and Ziegler, M.G. (eds.): The Catecholamines in Psychiatric and Neurologic Disorders, Chapter 14. Baltimore, Maryland, Williams and Wilkins (in press).
- 55) Kleinman, J.E., Hong, J., Iadarola, M., Govoni, S. and Gillin, J.C.: Neuropeptides in human brains—postmortem studies. Prog. Neuro-Psychopharmacol., (in press).
- 56) Kleinman, J.E., Karson, C.N., Weinberger, D.R., Freed, W.J., Berman, K.F. and Wyatt, R.J.: Eye-blinking and cerebral ventricular size in chronic schizophrenic patients. Am. J. Psychiatry (in press).

- 57) Karson, C.N., Kleinman, J.E. and Wyatt, R.J.: Biochemical concepts of schizophrenia. In: Millon, T. and Klerman, G. (eds.): Contemporary Issues in Psychopathology. New York, The Guilford Press (in press).
- 58) Kleinman, J.E., Karoum, F., Bridge, T.P., Zalcman, S. and Wyatt, R.J.: Post-mortem measurements of catecholamines in brains of schizophrenic patients. Arch. Gen. Psychiatry (in preparation).
- 59) Govoni, S., Kleinman, J., Harsing, L.G. and Yang, H.-Y.T.: On the decrease of endogenous met-enkephalin-like immunoreactivity in pituitaries of heroin addicts. Peptides (in preparation).
- 60) Morihisa, J.M., Kleinman, J.E., Weinberger, D.R., Veldhuis, J., Rogol, A.D. and Wyatt R.J.: LH secretion in chronic schizophrenia and response to treatment. Am. J. Psychiatry (in preparation).
- 61) Korpi, E.R., Kleinman, J.E., Goodman, S.I., Phillips, I., DeLisi, L.E., Linnoila, M. and Wyatt, R.J.: Serotonin and 5-hydroxyindoleacetic acid concentrations in different brain regions of suicide victims: Comparison with chronic schizophrenic subjects with or without suicide as cause of death. Arch. Gen. Psychiatry (in preparation).

## ABSTRACTS AND LETTERS

- 1) Hoffman, P., Kleinman, J., Milgrom, C. and Dubois, K.P.: The metabolism of p,p-sulfonyl-bis-formanilide (DFD). Fed. Proc., 26:568, 1967.
- 2) Kleinman, J.E., Nasrallah, H.A., Bigelow, L.B., Rogol, A., Zalzman, S., Wyatt, R.J. and Gillin, J.C.: 7-OH CPZ: An active metabolite of chlorpromazine. New Research Abstracts, No. NR 29, American Psychiatric Association, 1978.
- 3) Wyatt, R.J., Gillin, J.C., Kleinman, J.E., Barchas, J. and Snyder, S.: Brain chemistry and schizophrenia. 11th CINP Congress, Vienna, 1978.
- 4) Gottlieb, S., Alt, F., Golden, B. and Kleinman, J.: A statistical analysis of suicide factors for the Washington, D.C. population. Abstract WPB 2.4. The Institute of Management Science/Operations Research Society of America, 1979.
- 5) Shiling, D.J., Bigelow, L.B., Kleinman, J.E., Soverow, G., Keisling, R., Rosenblatt, J., Bridge, T., Rogol, A., Murphy, D., Gillin, J.C. and Wyatt, R.J.: Prediction of drug response in schizophrenia. New Research Abstracts, No. 2. American Psychiatric Association, 1979.
- 6) Kleinman, J.E., Weinberger, D.R., Shiling, D.J., Rogol, A., Mendelson, W.B., Davis, G.C. and Wyatt, R.J.: Interactions between naloxone and phenothiazines in chronic schizophrenics. Abstract #122, 4th International Symposium on Phenothiazines and Related Drugs, 1979.
- 7) Shiling, D., Bigelow, L.B., Kleinman, J.E., Soverow, G., Keisling, B., Rosenblatt, J.E., Rogol, A., Murphy, D.L., Bridge, T.P., Perel, J., Klein, S.T. and Wyatt, R.J.: Biological correlates of haloperidol treatment of schizophrenia. Abstract, 4th International Symposium on Phenothiazines and Related Drugs, 1979.
- 8) Weinberger, D.R., Bigelow, L.B., Kleinman, J.E., Rosenblatt, J.E. and Wyatt, R.J.: Cerebral ventricular size and response to neuroleptic treatment in chronic schizophrenics. Abstract, 4th International Symposium on Phenothiazines and Related Drugs, 1979.
- 9) Kleinman, J.E., Weinberger, D.R., Rogol, A., Bigelow, L.B., Karson, C., Freed, W., Potkin, S., Bridge, T.P., Wise, C.D., DeLisi, L., Klein, S.T., Gillin, J.C. and Wyatt, R.J.: Cerebral ventricles and dopamine in schizophrenia. New Research Abstracts, American Psychiatric Association, 1980, p. 8.
- 10) Phelps, B.H., Bridge, T.P., Kleinman, J.E., Potkin, S., Wise, C.D., Mayer, R.J. and Wyatt, R.J.: Antigenically active monoamine oxidase protein in human liver. A comparison of levels in controls versus schizophrenics. Abstracts of ASBC, 1980.
- 11) Weinberger, D.R., Luchins, D.J., Kleinman, J.E. and Wyatt, R.J.: The hippocampus in schizophrenia: A controlled postmortem study. Abstract, Society of Biological Psychiatry Annual Meeting, 1980.

- 12) Bigelow, L.B., Zalcman, S., Kleinman, J.E., Weinberger, D.R., Luchins, D.J., Klein, S.T. and Wyatt, R.J.: Propranolol treatment of chronic schizophrenia: A controlled study. Abstract, Society of Biological Psychiatry, 1980, p. 66.
- 13) Nasrallah, H.A., Kleinman, J.E., Weinberger, D.R., Gillin, J.C. and Wyatt, R.J.: Cerebral ventricular enlargement and dopamine synthesis inhibition in chronic schizophrenia. Letter, Arch. Gen. Psychiatry 37:1427, 1980.
- 14) Lazkovic, Z., Relja, M., Kleinman, J. and Neff, N.H.: Is there dopaminergic innervation of the reproductive system? 12th Annual Meeting of the American Society of Neurochemistry, 1981.
- 15) Govoni, S., Harsing, L., Stine, S., Kleinman, J. and Costa, E.: Modification of pituitary opioid-like peptides in addicts. 12th Annual Meeting of the American Society for Neurochemistry, 1981.
- 16) Kleinman, J.E., Karoum, F., Rosenblatt, J.E., Bridge, T.P., Zalcman, S., Gillin, J.C. and Wyatt, R.J.: Catecholamines in post-mortem human brains. Syllabus and Scientific Proceedings in Summary Forum, No. 16C, American Psychiatric Association, 1981.
- 17) Gillin, J.C., Kleinman, J.E., Hong, J.S., Storch, F.I., Bridge, T.P., Zalcman, S., Costa, E. and Wyatt, R.J.: Peptides in postmortem human brain. Syllabus and Scientific Proceedings in Summary Forum, FNo. 16D, American Psychiatric Association, 1981.
- 18) Weinberger, D.R., Luchins, D.J., Kleinman, J.E., Morihisa, J.M. and Wyatt, R.J.: The Yakovlev Collection: A resource for psychiatry, Syllabus and Scientific Proceedings in Summary Forum, No. 16E, American Psychiatric Association, 1981.
- 19) Kleinman, J.E., Weinberger, D.R., Rogol, A., Bigelow, L.B., Karson, C.N., Freed, W.J., DeLisi, L.E., Potkin, S.G., Bridge, T.P., Wise, C.D., Klein, S.T., Gillin, J.C. and Wyatt, R.J.: Cerebral ventricles and dopamine in schizophrenia. Syllabus and Scientific Proceedings in Summary Forum, No. 35F, American Psychiatric Association, 1981.
- 20) Kafka, M.S., van Kammen, D.P. and Kleinman, J.: Alpha-adrenergic receptors in clinical psychiatry. Syllabus and Scientific Proceedings in Summary Forum, No. 36E, American Psychiatric Association, 1981.
- 21) Jeste, D.V., Zalcman, S., Weinberger, D.R., Bigelow, L.B., Rogol, A., Wyatt, R.J., Kleinman, J.E. and Gillin, J.C.: Apomorphine response and subtyping of schizophrenia. Syllabus and Scientific Proceedings in Summary Forum, No. 79D, American Psychiatric Association, 1981.
- 22) Hexum, T.D., Kleinman, J.E., Yang, H-YT. and Costa, E.: Age-related changes in the enkephalin-like peptide content of human adrenal glands. 8th International Congress of Pharmacology, 1981.
- 23) Kleinman, J.E., Govoni, S., Memo, M., Hanbauer, I. and Wyatt, R.J.: Cholecystokinin and calmodulin in schizophrenic brains. Abstract, Society of Biological Psychiatry, 1982, p. 98.

- 24) Kleinman, J.E., Memo, M., Hanbauer, I. and Wyatt, R.J.: Adenylyl cyclase activity in schizophrenic brains. Abstract, New Research, American Psychiatric Association, No. NR5, 1982.
- 25) Karson, C.N., Freed, W.J., Kleinman, J.E., Weinberger, D.R., Berman, K.F., Bigelow, L.B. and Wyatt, R.J.: Blink rates in schizophrenia. Syllabus and Scientific Proceedings in Summary Forum, No. 83B, American Psychiatric Association, 1982.
- 26) Church, A.C., Kleinman, J.E. and Wyatt, R.J.: Immunocytochemical localization of D-2 binding sites in the rodent forebrain. Society of Neuroscience, 1982.
- 27) Memo, M., Kleinman, J.E. and Hanbauer, I.: Neurochemical correlates of schizophrenia: Role of Na-F stimulated adenylate cyclase in dopamine-rich brain areas. Abstract, 6th European Neuroscience Congress, 1982.
- 28) Korpi, E.R., Goodman, S., DeLisi, L.E., Wyatt, R.J. and Kleinman, J.E.: Serotonin in brains of suicide victims and schizophrenics. Abstract No. 175, 14th Annual Meeting of the American Society for Neurochemistry, 1983, p. 172.
- 29) Berman, K.F., Workman, R., Kleinman, J.E. and Wyatt, R.J.: Renin, aldosterone and angiotensin II in schizophrenic patients. Abstract, Society of Biological Psychiatry, 1983, p. 62.
- 30) Kaufmann, C.A., Gillin, J.C., O'Laughlin, T. and Kleinman, J.E.: Muscarinic binding in suicides. Abstract, New Research, American Psychiatric Association, No. NR66, 1983.
- 31) Bridge, T.P., Kleinman, J.E. and Karoum, F.: Post-mortem central catecholamines and dementia. Abstract, New Research, American Psychiatry Association, No. NR125, 1983.
- 32) Kleinman, J.E., Karoum, F. and Wyatt, R.J.: Norepinephrine in postmortem schizophrenic brains. Syllabus and Scientific Proceedings in Summary Forum, American Psychiatric Association, 1983.
- 33) Church, A.C., Kleinman, J.E. and Wyatt, R.J.: Dopamine receptors: Electron microscopic localization in mouse corpus striatum. Society of Neuroscience, 1983.
- 34) Korpi, E.R., Goodman, S.I., Wyatt, R.J. and Kleinman, J.E.: Concentrations of serotonin and 5-hydroxyindoleacetic acid in different postmortem brain areas of chronic schizophrenic patients and suicide victims. Abstract, J. Neurochem. 41:S103, 1983.
- 35) Ko, G.N., Kafka, M.S. and Kleinman, J.E.: Human postmortem  $\alpha$ 2-adrenergic receptor sites in schizophrenia. Abstract, Society of Biological Society, 1984, p. 135.

- 36) Asher, D.M., Kaufmann, C.A., Kleinman, J.E., Weinberger, D., Gibbs, C.J. and Gajdusek, C.: Attempts to transmit schizophrenia to animals. Syllabus and Scientific Proceedings in Summary Forum, No. 38C, American Psychiatric Association, 1984.
- 37) Kirch, D., Shelton, R., Fan, K.-J., Kanhouwa, S., Kleinman, J. and Wyatt, R.J.: Nucleus basalis neuron loss in schizophrenia. Abstract, New Research, American Psychiatric Association, No. NR143, 1984.
- 38) Bridge, T.P., Kleinman, J.E., Karoum, F. and Wyatt, R.J.: Postmortem central catecholamines, dementia, and depression in elderly schizophrenics and controls. Book of Abstracts, Collegium Internationale Neuro-Psychopharmacologicum 14th CINP Congress, NO. P-300, 1984, p. 615.