AD NUMBER

AD462898

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; Apr 1965. Other requests shall be referred to US Army Biological Laboratories, Ft Detrick, Frederick, MD 21701.

AUTHORITY

BDRL, D/A ltr, 28 Sep 1971

AD

TECHNICAL MANUSCRIPT 220

ULTRAMICROANALYSIS OF SELECTED BLOOD COMPONENTS OF NORMAL MACACA MULATTA

462898

APRIL 1963

UNITED STATES ARMY
BIOLOGICAL LABORATORIES
FORT DETRICK

PAGES _____

ARE

MISSING

IN

ORIGINAL

DOCUMENT

U.S. ARMY BIOLOGICAL LABORATORIES
Fort Detrick, Frederick, Maryland

TECHNICAL MANUSCRIPT 220

ULTRAMICROANALYSIS OF SELECTED BLOOD COMPONENTS OF NORMAL MACACA MULATTA

John J. Petery

Aerobiology Division
DIRECTORATE OF BIOLOGICAL RESEARCH

Project 1C522301A080

April 1965

ACKNOWLEDGMENTS

The author would like to thank Capt. Keithl Kraner USAF, VC, and Capt. Charles J. Parshall USA, VC, of the Armed Forces Institute of Pathology for permission to use their unpublished data.

ABSTRACT

Plasma from the blood of 212 Macaca mulatta (rhesus) monkeys was tested for eleven chemical components by ultramicroanalysis. Results are tabulated and discussed.

In conducting the research reported herein, the investigator adhered to "Principles of Laboratory Animal Care" as established by the National Society for Medical Research.

ULTRAMICROANALYSIS OF SELECTED BLOOD COMPONENTS OF NORMAL MACACA MULATTA

Relatively little information is available on the blood chemistry of rhesus monkeys. Several reports have been published on this subject, but the studies were limited in scope and based on a small number of animals.[1-4]* In studies in which monkeys are experimentally infected or treated, established normal values for the blood components assume practical importance. Changes in the blood chemistry patterns of infected animals from these values may be discerned as a result of the experiments. The purpose of this study, therefore, was to establish baseline values for selected chemical components of the blood of presumably healthy rhesus monkeys by ultramicroanalytical methods. Ultramicroanalyses involves microliter volumes, and the methods are those in which the volume of serum or plasma to be analysed is 1 to 50 microliters.[5-7]

Heparinized blood samples were obtained by removing 0.5 ml of blood from the veins of each of 212 rhesus monkeys. These animals ranged in weight from 4 to 7 pounds, and were determined to be tuberculin-negative, free of diarrhea, and in good physical condition. Their diet consisted of water and Purina Monkey Chow fed ad libitum.

The Beckman Spinco Model 150 ultramicroanalytical system was used to obtain all blood chemistry data. The procedures found in the Beckman Spinco Instruction Manual[8] were employed to make the following determinations: bilirubin (total), calcium, chloride, cholesterol, creatinine, glucose, phosphorus, total protein, albumin, urea nitrogen, and uric acid. All ultramicroanalyses of the 11 selected components were carried out with only 0.19 ml of plasma.

The results of the ultramicroanalysis of plasma for 11 blood components are shown in Table 1.

In general, the results listed are approximately the same as those of Kraner and Parshall.** These workers carried out ultramicroanalyses on 89 rhesus monkeys, testing for 6 of the 11 blood components listed in Table 1 by the same type of system. Results are shown in Table 2. Their ranges were narrower than those reported in this study, but the mean values were comparable in all determinations except those of calcium. The probable reason for this discrepancy is the indistinct endpoint of the assay employed. This discrepancy has been mentioned by O'Brien et al.[9] and Knights et al.[10]

---

* Kraner, K., and C.J. Parshall. Personal communication.

** Unpublished data. See Acknowledgments.

TABLE 1. CONCENTRATION OF SELECTED CHEMICAL COMPONENTS OF NORMAL RHESUS MONKEY PLASMA

Number Monkeys Tested	Component		Mean Value	Standard Deviation	Range Lower	Range Upper
188	Bilirubin	(mg %)	0.36	0.21	0.10	0.90
198	Calcium	(mEq/liter)	4.86	0.81	3.00	6.86
190	Chloride	(mEq/liter)	108.29	10.30	89.33	129.40
176	Cholesterol	(mg %)	161.71	37.80	91.60	245.25
170	Creatinine	(mg %)	1.41	0.31	0.80	2.32
180[a]	Glucose	(mg %)	61.80	17.10	30.25	108.30
166	Phosphorus	(mg %)	5.00	0.95	3.06	7.31
189	Total Protein	(gm %)	6.33	0.68	4.20	7.98
189	Albumin	(gm %)	4.43	0.95	2.41	5.84
179	Urea Nitrogen	(mg %)	22.38	6.53	10.00	41.18
185	Uric Acid	(mg %)	0.88	0.41	0.42	1.93

a. Fasting.

TABLE 2. DATA OBTAINED FROM KRAMER AND PARSHALL ON THE PLASMA FROM 89 RHESUS MONKEYS[a]

Component		Mean Value	Range Lower	Range Upper
Calcium	(mEq/liter)	6.35	5.0	8.85
Chloride	(mEq/liter)	111.8	100.0	127.0
Cholesterol	(mg %)	166.9	140.0	207.0
Phosphorus	(mg %)	4.59	3.2	6.2
Total Protein	(gm %)	6.16	4.9	7.3
Uric Acid	(mg %)	1.196	0.76	1.8

a. Unpublished data used with permission of workers.

Comparison of data from this study with those reported in the literature is of limited value,[1-4] because the data in those reports are based on an insufficient number of animals and the use of macroanalytical techniques.

In this writer's experience, the time required to perform these ultramicroanalytical techniques is about the same as that required by macrotechniques. The advantage of the ultramicroanalysis is that a number of examinations, necessitating repeated bleedings, can be performed on a single monkey without altering chemical blood values. The analyses for the 11 chemical blood components reported herein required only 190 microliters of plasma.

LITERATURE CITED

1. Asatiani, V.S., T.P. Pichkhaya, and A.K. Ageeva. 1959. The blood chemistry of lower monkeys. Bull. Exp. Biol. Med 47:203-206.

2. Lee, C.C., R.G. Herrmann, and R.O. Froman. 1959. Serum, bile and liver total cholesterol of laboratory animals, toads and frogs. Proc. Soc. Exp. Biol. Med. 102:542-544.

3. Spector, W.S. 1956. Handbook of biological data, p. 53. The National Research Council, Washington, D.C.

4. White, R.J., C.S. MacCarty, J.H. Grindlay, and J.L. Bollman. 1960. Hematocrit readings and values of plasma electrolytes in the rhesus monkey. Proc. Staff Meetings, Mayo Clinic. 35:114-117.

5. Sanz, M.C. 1957. Ultramicro methods and standardization of equipment. Clin. Chem. 3:406.

6. Sanz, M.C. 1957. New ultramicro methods in biochemistry. J. Physiol. 49:372.

7. Sanz, M.C. 1959. The physical-chemical basis of, and new developments in, instruments in the field of quantitative ultramicroanalysis. Chima 13:192.

8. Technical Bulletin, Instruction Manual. Beckman Spinco Model 150 Ultramicro Analytical System. Spinco Division, Beckman Instruments, Inc. Stanford Industrial Park, Palo Alto, California.

9. O'Brien, D., F. Ibbott, and A. Pinfield. 1961. Critical evaluation of a new ultramicro system for routine clinical chemistry procedures. Clin. Chem. 7:521-535.

10. Knights, E.M., J. Ploompuu, and J.L. Whitehouse. 1961. Developments in ultramicro chemistry. Amer. J. Clin. Path. 36:203-211.

DISTRIBUTION LIST

ADDRESSEE	NUMBER OF COPIES
Assistant Scientific Director Building 812	1
Directorate of Biological Research Building 560	1
Directorate of Development Building 824	1
Directorate of Industrial Health & Safety Building 550	1
Chief, Medical Bacteriology Division Building 560	1
Chief, Munitions Development Division Building 321	1
Chief, Program Coordination Office Building 812	1
Chief, Aerobiology Division Building 459	10
Chief, Physical Sciences Division Building 568	2
Chief, Process Development Division Building 469	1
Chief, Technical Evaluation Division Building 568	1
Chief, Virus & Rickettsia Division Building 539	1
Chief, Biomathematics Division Building 1422	1
Documents, Technical Library Building 426	2
Test Chamber Branch Technical Evaluation Division Building 1412	1

ADDRESSEE	NUMBER OF COPIES
Technical Releases Branch Technical Information Division Building 426	10
Editorial Branch Building 816	1
Assistant Director/Biological Engineering Building 722	1
Liaison Representative/Animal Disease Investigations Building 1301	1
U.S. Public Health Service Liaison Office Building 1301	4
Commanding Officer U.S. Naval Unit Building 125	3
Commanding General U.S. Army Edgewood Arsenal ATTN: SMUEA-CS Edgewood Arsenal, Maryland, 21010	1
Commanding General U.S. Army Edgewood Arsenal ATTN: SMUEA-CS-O Edgewood Arsenal, Maryland, 21010	1
Commanding Officer U.S. Army Chemical Research & Development Laboratories ATTN: Librarian Edgewood Arsenal, Maryland, 21010	2
Commanding General U.S. Army Munitions Command ATTN: AMSMU-SS-CS Dover, New Jersey, 07801	1
Commanding General U.S. Army Munitions Command ATTN: AMSMU-RE-R Dover, New Jersey, 07801	1

ADDRESSEE	NUMBER OF COPIES
Commanding General Deseret Test Center ATTN: Technical Library Fort Douglas, Utah, 84113	2
Commanding General U.S. Army Materiel Command Research Division, AMCRD-RC R&D Directorate Washington, D.C., 20315	1
Asst. Chief of Staff/Force Operations Department of the Army ATTN: Technical Coordinator (B) CBR&N Directorate The Pentagon Washington 25, D.C.	1
Defense Documentation Center Cameron Station Alexandria, Virginia, 22314	20
Detachment 4, RTD (ATCB) Eglin Air Force Base, Florida, 32542	1
APGC (PGBAP-1) Eglin Air Force Base, Florida, 32542	1
AFRSTA, Hq. USAF ATTN: Mr. C.R. Nixon, Jr. Washington, D.C., 20330	1
Officer-in-Charge FTD Library Building 828, Area A Wright-Patterson Air Force Base, Ohio, 45433	1
Commander (Code 4036) Naval Ordnance Test Station China Lake, California, 93557	1
Commanding Officer and Director U.S. Naval Applied Science Laboratory Naval Base, Code 9440 Brooklyn, New York, 11251	1

ADDRESSEE	NUMBER OF COPIES
U.S. Army Medical R&D Command Office of the Surgeon General ATTN: MEDDH-C Main Navy Building, Room 2526 Washington, D.C., 20315	1
Commandant USACmlGen & Sch, ATTN: Bio Br Fort McClellan, Alabama, 36205	2
U.S. Army Standardization Group - Canada Office, Senior Standardization Rep. c/o Director of Equipment Policy Canadian Army Headquarters Ottawa 4, Canada	1
Munitions/TW Defence Research Staff British Embassy 3100 Massachusetts Avenue, N. W. Washington 8, D.C.	3
Canadian Liaison Office (CBR) Building 5101 Edgewood Arsenal, Maryland, 21010	3
Australian Embassy ATTN: Lt. Col. P.D. Yonge Australian Army Staff (W) 2001 Connecticut Avenue, N.W. Washington 7, D.C.	2
University of Pennsylvania Institute for Cooperative Research Project Summit 3634 Walnut Street Philadelphia, Pennsylvania, 19104	1
Chief, Animal Farm Building 1021	1

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)

U.S. Army Biological Laboratories
Fort Detrick, Frederick, Maryland, 21701

2a REPORT SECURITY CLASSIFICATION

Unclassified

2b GROUP

3 REPORT TITLE

ULTRAMICROANALYSIS OF SELECTED BLOOD COMPONENTS OF NORMAL MACACA MULATTA

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

5 AUTHOR(S) (Last name, first name, initial)

Petery, John J.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
April 1965	12	10

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b PROJECT NO. 1C522301A080	Technical Manuscript 220
c	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d	

10. AVAILABILITY/LIMITATION NOTICES

Qualified requestors may obtain copies of this report from DDC.
Foreign announcement and dissemination of this report by DDC is not authorized.

11 SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	U.S. Army Biological Laboratories Fort Detrick, Frederick, Maryland, 21701

13 ABSTRACT

Plasma from the blood of 212 Macaca mulatta (rhesus) monkeys was tested for eleven chemical components by ultramicroanalysis. Results are tabulated and discussed.

DD