

of the fluorescent staining, including inhibition and absorption tests, are described. 4) Preliminary results with *Blastomyces dermatitidis* and *Histoplasma capsulatum* conjugates are reported.

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1. Lodder, J., Kreger-van Rij, N. J. W., *The Yeasts, a Taxonomic Study*, Amsterdam, North-Holland Publishing Co., 1952, p713.

2. Conant, N. F., Smith, D. T., Baker, R. D., Callaway, J. L., Martin, D. S., *Manual of Clinical Mycology*, 2nd Ed., Philadelphia, W. B. Saunders Co., 1954, p456.

3. Tsuchiya, T., Miyasaki, F., Fukuzawa, Y., *Jap. J. Exp. Med.*, 1955, v25, 15.

4. Jonsen, J., *Serological Studies in Genus Candida*, Oslo, Akademisk Trykningssentral-Blindern, 1955, p129.

5. Coons, A. H., Kaplan, M. H., *J. Exp. Med.*, 1950, v91, 1.

6. Goldman, M., *Am. J. Hyg.*, 1953, v58, 319.

7. Benham, R. W., *J. Infect. Dis.*, 1931, v49, 183.

8. Moody, M. D., Goldman, M., Thomason, B. M., *J. Bact.*, 1956, v72, 357.

9. Goldman, M., *J. Exp. Med.*, 1957, v105, 557.

10. Wickerham, L. J., *J. Am. Med. Assn.*, 1957, v165, 47.

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## Tyrosine, Iodide, and Human Serum Lipoproteins.\* (23850)

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Thyroid active substances such as desiccated thyroid(1,2), thyroxine(3) and l-triiodothyronine(4) have all been shown to have a profound effect on human serum lipoprotein concentrations.

Since tyrosine and inorganic iodine are the only 2 known precursors required for thyroidal synthesis of thyroxine, the effect of administration of tyrosine and of iodide on human serum lipoproteins has been investigated.

*Tyrosine study; methods.* Serial blood samples were obtained from a group of 16 male hospitalized chronic schizophrenic patients, judged by routine laboratory tests and a physical examination to be free of other disease. None of these patients had received any medication or electroshock therapy for several weeks to months before initiation of the present study. Eleven of these patients, ranging in age from 31-47 years, received a daily dose of 30 g of tyrosine suspended in

glass of water daily for 18 weeks; the remaining 5 patients, ranging in age from 29-48 years, served as a control group receiving no medication. Five blood samples were obtained in all patients during a 6 month interval preceding tyrosine administration, to serve as a base line, 7 samples were drawn during the 18-week period of tyrosine intake and 3 samples in a 6-week period following the last dose of tyrosine. Serum lipoprotein(5) and total serum cholesterol analyses(6) were done on all blood samples and body weight, blood pressure and pulse rate were recorded for each patient at the time of venipuncture.

*Results* of complete low density serum lipoprotein analyses and of cholesterol determinations in 240 blood samples and of body weight, blood pressure and pulse rate data are summarized in a greatly condensed manner in Table I. Analysis of all the data shows that a daily dose of 30 g of tyrosine, estimated to be approximately equivalent to 8-10 fold the normal dietary intake(7), has no effect on

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TABLE I. Effect of Tyrosine\* on Serum Lipoprotein and Total Serum Cholesterol Concentrations and on Body Weight, Blood Pressure and Pulse Rate.

|      | Serum lipoprotein concentrations: mg/100 ml of serum |     |                      |    |                       |     |                        |    | Total serum cholesterol, mg/100 ml |     |
|------|------------------------------------------------------|-----|----------------------|----|-----------------------|-----|------------------------|----|------------------------------------|-----|
|      | S <sub>r</sub> 0-12                                  |     | S <sub>r</sub> 12-20 |    | S <sub>r</sub> 20-100 |     | S <sub>r</sub> 100-400 |    | P                                  | C   |
|      | P†                                                   | C†  | P                    | C  | P                     | C   | P                      | C  |                                    |     |
| Pre‡ | 306                                                  | 372 | 28                   | 38 | 71                    | 89  | 34                     | 51 | 206                                | 238 |
| On§  | 289                                                  | 367 | 27                   | 34 | 74                    | 103 | 31                     | 77 | 192                                | 230 |
| Off  | 282                                                  | 374 | 25                   | 39 | 67                    | 103 | 34                     | 55 | 186                                | 232 |

  

|     | Body wt |     | Systolic B.P. |     | Diastolic B.P. |    | Pulse rate |    |
|-----|---------|-----|---------------|-----|----------------|----|------------|----|
|     | P       | C   | P             | C   | P              | C  | P          | C  |
| Pre | 146     | 150 | 133           | 133 | 81             | 85 | 96         | 83 |
| On  | 146     | 152 | 139           | 144 | 86             | 86 | 98         | 90 |
| Off | 149     | 155 | 135           | 137 | 83             | 83 | 94         | 85 |

\* 30 g/day.

† P = patients, C = controls.

‡ All "pre" values represent mean of 5 samples

§ " "on" " " " " 7

|| " "off" " " " " 3

obtained in each of 5 control and 11 treated patients.

serum lipoproteins, body weight, blood pressure and pulse rate. No side effects such as nausea, vomiting, diarrhea or other untoward reactions occurred nor was there any consistent effect on psychiatric status.

*Iodide study; methods.* The effect of oral intake of potassium iodide on serum lipoprotein concentrations was studied in 5 ambulatory office patients followed for several years because of associated illness. Two patients had a diagnosis of xanthoma tuberosum, one xanthoma tendinosum, one CVA with hypertension and one myocardial infarction. Each patient received a daily dose of 30 mg of potassium iodide for a period varying from 10 to 36 weeks during which 5 to 15 blood sam-

ples were obtained for serum lipoprotein and cholesterol analyses. Mean value for serum lipoprotein and cholesterol concentrations before and during potassium iodide administration are collected in Table II.

*Results.* The data show that potassium iodide does not produce any consistent changes in serum lipoprotein distribution or in cholesterol concentration in the patients studied. The only apparently significant changes observed occurred in the S<sub>r</sub>100-400 concentrations and in total serum cholesterol levels in one patient with a diagnosis of xanthoma tuberosum. Previous experience, however, has shown that the S<sub>r</sub>100-400 concentrations in

TABLE II. Effect of Potassium Iodide on Serum Lipoprotein and Total Serum Cholesterol Concentrations.

|           |                          | Serum lipoprotein conc., mg/100 ml<br>serum |                                   |                                    |                                     | Cholesterol,<br>mg/100 ml | Diagnosis      | Age, sex |
|-----------|--------------------------|---------------------------------------------|-----------------------------------|------------------------------------|-------------------------------------|---------------------------|----------------|----------|
|           | Time<br>interval<br>(wk) | S <sub>r</sub> <sup>o</sup> 0-12            | S <sub>r</sub> <sup>o</sup> 12-20 | S <sub>r</sub> <sup>o</sup> 20-100 | S <sub>r</sub> <sup>o</sup> 100-400 |                           |                |          |
| Off ( 2)* |                          | 96                                          | 70                                | 525                                | 801                                 | 604                       | Xanthoma       | 47 ♂     |
| On ( 9)   | 16                       | 110                                         | 89                                | 582                                | 488                                 | 417                       | tuberosum      |          |
| Off ( 2)  |                          | 141                                         | 107                               | 361                                | 34                                  | 268                       | Xanthoma       | 41 ♀     |
| On ( 8)   | 14                       | 154                                         | 121                               | 355                                | 51                                  | 270                       | tuberosum      |          |
| Off ( 4)  |                          | 439                                         | 30                                | 58                                 | 20                                  | 247                       | CVA, hyper-    | 64 ♂     |
| On (13)   | 36                       | 450                                         | 40                                | 68                                 | 24                                  | 259                       | tension        |          |
| Off ( 7)  |                          | 356                                         | 38                                | 71                                 | 22                                  | 223                       | Myocardial in- | 55 ♂     |
| On (15)   | 35                       | 343                                         | 42                                | 67                                 | 16                                  | 223                       | farction (old) |          |
| Off ( 7)  |                          | 1135                                        | 118                               | 44                                 | 0                                   | 618                       | Xanthoma       | 52 ♀     |
| On ( 5)   | 10                       | 1071                                        | 106                               | 36                                 | 0                                   | 567                       | tendinosum     |          |

\* All lipoprotein and cholesterol data represent mean values derived from number of blood samples indicated in parentheses.

patients with xanthoma tuberosum is frequently extremely labile so that no special significance can be attributed to these changes seen in only one of 2 patients and based on limited data.

*Conclusions and summary.* 1) Tyrosine and potassium iodide do not have any effect on serum lipoprotein and total serum cholesterol concentrations. 2) These findings indicate that in clinically euthyroid patients neither substance appears to be a limiting factor in thyroidal synthesis of thyroid hormones from tyrosine and iodide.

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1. Strisower, B., Gofman, J. W., Galioni, E. F., Almada, A. A., Simon, A., *Metab.*, 1954, v3, 218.
2. Strisower, B., Gofman, J. W., Galioni, E. F., Rubinger, J., O'Brien, J. W., Simon, A., *J. Clin. Endocrinol. Metab.*, 1955, v15, 73.
3. Strisower, B., Elmlinger, P., Gofman, J. W., deLalla, O., in press.
4. Strisower, E. H., Gofman, J. W., Strisower, B., deLalla, O., in press.
5. deLalla, O., Gofman, J. W., in Glick, D., *Methods of Biochemical Analysis*, New York, 1954, 1.
6. Colman, D. M., McPhee, A., *Am. J. Clin. Path.*, 1956, v26, 181.
7. Allison, J. B., *Borden's Rev. Nut. Research*, 1953, v14, 69.

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## Histoplasmin-Latex Agglutination Test. II. Results with Human Sera.\* (23851)

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Previous studies from this laboratory(1,2) have shown that polystyrene latex particles sensitized with histoplasmin can be used in a simple tube agglutination technic to detect antibody against *Histoplasma capsulatum* of infected or immunized animals. The latex particles were employed in a manner similar to that utilized in the collodion agglutination test for histoplasmosis(3-5). The purpose of the present report is to compare agglutination test results obtained with latex and collodion particles in the presence of human sera.

*Materials and methods.* Procedures used in preparation of materials and in performance of histoplasmin-latex agglutination tests were described in detail previously(2). In brief, a suspension of latex particles<sup>†</sup> is mixed with the previously-determined optimal dilution of histoplasmin, and kept at room temperature 1-2 hours. This antigen is then added to serial 2-fold dilutions of serum.

After incubation for 2 hours at room temperature, test tubes are centrifuged at 2000 rpm for 5 minutes, and read after gentle flicking or tapping of the tubes. Reactions are graded from 1+ to 4+, depending on size of agglutinated particles and opacity of the supernatant, as in any agglutination reaction. In previous work with animal sera(2), agglutinations were read with the aid of a concave microscope mirror. This practice has been discontinued, however, and in the present study all tests were read by gross examination of the tube held in front of an appropriately shaded light (Fig. 1). The technic of the histoplasmin-collodion agglutination test has been described previously(3).

*Results with random human sera.* To obtain information as to specificity of the histoplasmin-latex test, and the frequency with which so-called "normal" human serum samples would yield detectable reactions, the test was performed on 204 random specimens originally submitted to the Ohio Department of Health Laboratory for routine syphilis serol-

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<sup>†</sup> Dow Chemical Co., Midland, Mich.