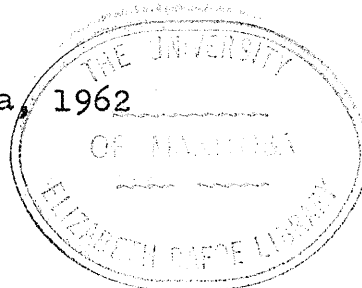


AN INVESTIGATION OF THE NORMAL VALUES, INHERENT VARIABILITY
AND THERMALLY INDUCED ALTERATIONS IN THE PLASMA
PROTEINS OF THE GOLDFISH, Carassius auratus.

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ABSTRACT

The present investigation was undertaken with a dual purpose in mind. First, to determine the normal range of total protein content, and the variability in the electrophoretic patterns of the goldfish, Carassius auratus, and secondly, to investigate thermally induced alterations in the plasma proteins.

Two hundred goldfish were divided into equal lots and acclimated to 5°, 12°, 20°, and 30°C for a minimum of twenty-six days. Plasma samples were taken and total protein determinations made. Fractional separation was carried out using the vertical starch-gel procedure. Relative and absolute concentrations of each of the electrophoretic fractions were determined at the four test temperatures. Each fraction was characterized by a mean mobility and mean size and several fractions related to their human counterparts.

Although goldfish plasma proteins did not fit in with the evolutionary patterns postulated with respect to the complexity of protein fractions, they did concur in protein concentration and the nature of the fractions present. That is, fractions with the mobility of human gamma-globulins were absent, albumin was found only a minor constituent, and lipoproteins formed by far the largest portion of the plasma proteins.

Variations in the abundancies of individual fractions as well as total protein were considerable within each group

as well as between groups. In general, total protein and globulin decreased as the temperature increased, while albumin and the complexity of the patterns increased. The significance of the normal levels, and the thermally induced alterations, were discussed with regard to physiological significance.

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TABLE OF CONTENTS

	PAGE
INTRODUCTION.....	1
LITERATURE REVIEW.....	4
1. CHARACTERIZATION OF THE PLASMA PROTEINS.....	4
a. Albumin.....	9
b. Alpha ₁ -globulin.....	9
c. Alpha ₂ -globulin.....	11
d. Beta-globulin.....	12
e. Gamma-globulins.....	12
2. FUNCTIONS OF THE PLASMA PROTEINS.....	13
a. Viscosity Effects.....	15
b. Reserve of Body Protein.....	16
c. Hydrostatic and Osmotic Relationships.....	17
d. Transport Mechanisms.....	19
e. Blood Coagulation.....	20
f. Circulating Antibodies.....	20
g. Buffering Capacity of the Plasma Proteins.....	21
3. VERTEBRATE PLASMA PROTEINS WITH PARTICULAR REFERENCE TO THOSE OF THE FISHES.....	22
a. The Plasma Proteins of the Higher Verte- brates.....	24
b. The Plasma Proteins of Fishes.....	32
4. ALTERATIONS IN THE PLASMA PROTEINS.....	42
MATERIALS AND METHODS.....	46
1. EXPERIMENTAL ANIMALS.....	46
2. AQUARIA AND CONDITIONS OF ACCLIMATION.....	46

TABLE OF CONTENTS CONTINUED

	PAGE
3. METHOD OF PLASMA COLLECTION.....	47
4. ELECTROPHORETIC TECHNIQUE.....	49
a. General Discussion.....	49
b. Dimensions of the Apparatus.....	52
c. Composition and Preparation of the Gels.....	53
d. Introduction of the Sample.....	55
e. Electrical Connections.....	56
f. Conditions of Electrophoresis.....	58
5. DETECTION OF THE PROTEINS.....	60
a. Slicing and Staining.....	60
b. Destaining of Stained Gels.....	60
6. SCANNING OF STAINED ELECTROPHORETIC STRIPS.....	61
7. ANALYSIS OF ABSORBANCY CURVE OF ELECTROPHEROGRAM.....	63
a. Measurements.....	63
b. Calculations.....	66
8. PHOTOGRAPHIC TECHNIQUE.....	66
9. IDENTIFICATION OF THE PLASMA PROTEINS.....	67
a. Lipoproteins.....	67
b. Haptoglobins.....	67
10. TOTAL PROTEIN DETERMINATION.....	68
RESULTS.....	69
1. TOTAL PLASMA PROTEIN.....	70
2. ELECTROPHORETIC ANALYSIS OF THE PLASMA PROTEINS..	71

TABLE OF CONTENTS CONTINUED

	PAGE
a. Total Area Under the Curve.....	79
b. The Individual Fractions.....	80
3. IDENTIFICATION OF PLASMA PROTEINS.....	108
DISCUSSION.....	114
1. VALUE OF TOTAL PLASMA PROTEIN.....	114
2. SIGNIFICANCE OF THE TOTAL PLASMA PROTEIN LEVEL...	114
3. ELECTROPHORETIC PATTERN.....	115
a. Gamma-globulins.....	116
b. Haptoglobins.....	117
c. Lipoproteins.....	118
d. Albumin and Albumin/Globulin Ratio.....	119
4. FUNCTIONAL SIGNIFICANCE OF THE PLASMA PROTEIN LEVELS IN THE GOLDFISH.....	121
5. THERMOLABILITY OF THE PLASMA PROTEINS.....	122
a. Temperature Induced Changes in the Plasma Proteins of Animals Other Than Fish.....	122
b. Thermally Induced Alterations in the Plasma Proteins of Fish.....	124
6. POSSIBLE PHYSIOLOGICAL SIGNIFICANCE OF THE THER- MALLY INDUCED ALTERATIONS IN THE PLASMA PROTEINS OF THE GOLDFISH.....	125
SUMMARY AND CONCLUSIONS.....	131
ADDENDA.....	132
BIBLIOGRAPHY.....	134
APPENDIX.....	

LIST OF FIGURES

FIGURE		PAGE
1.	Typical electrophoretic pattern obtained from normal human plasma by paper electrophoresis.....	8
2.	A comparison in diagrammatic form of the zones of human plasma proteins separated by filter paper electrophoresis and one-dimensional starch-gel electrophoresis with the zones separated by combined filter paper and starch-gel electrophoresis.....	10
3	Subdivisions of the various electrophoretic fractions of Tiselius indicating the main function of each.....	14
4	The experimental arrangement for vertical starch-gel electrophoresis.....	57
5	Electrophoretic pattern of goldfish plasma following staining and destaining.....	62
6	Absorbancy curve of electropherogram of <u>Carras- ius auratus</u> plasma protein.....	64
7	Variation in total protein with temperature..	72
8	Possible variation in the electropherograms obtained at 5°C.....	74
9	Variation in fraction abundance with temperature.....	77
10	Photographic comparison of the electrophoretic pattern of goldfish and human plasma.....	78
11	Variation in the total area under the electrophoretic curve with temperature.....	81
12	Curve showing all typical peaks at average size.....	82
13	Variation in total plasma protein, relative, and absolute amounts of fraction 2 with temperature.....	88
14	Variation in total plasma protein, relative, and absolute amounts of fraction 3 with temperature.....	89

LIST OF FIGURES CONTINUED

FIGURE		PAGE
15	Variation in total plasma protein, relative, and absolute amounts of fraction 4 with temperature.....	90
16	Variation in total plasma protein, relative, and absolute amounts of fraction 5 with temperature.....	91
17	Variation in total plasma protein, relative, and absolute amounts of fraction 6 with temperature.....	92
18	Variation in total plasma protein, relative, and absolute amounts of fraction 7 with temperature.....	93
19	Variation in total plasma protein, relative, and absolute amounts of fraction 8 with temperature.....	94
20	Variation in total plasma protein, relative, and absolute amounts of fraction 9 with temperature.....	95
21	Variation in total plasma protein, relative, and absolute amounts of fraction 11 with temperature.....	96
22	Variation in total plasma protein, relative, and absolute amounts of fraction 14 with temperature.....	97
23	Variation in total plasma protein, relative, and absolute amounts of fraction 16 with temperature.....	98
24	Variation in total plasma protein, relative, and absolute amounts of fraction 18 with temperature.....	99
25	Variation in total plasma protein, relative, and absolute amounts of fraction 20 with temperature.....	100
26	Variation in total plasma protein, relative percent of total protein contributed by all globulins, and the ratio of albumin to globulin with temperature.....	101

LIST OF FIGURES CONTINUED

FIGURE		PAGE
27	A comparison in diagrammatic form of the zones appearing in starch-gel when stained for haptoglobins, lipoproteins, and plasma proteins of the goldfish with the zones separated from human plasma and purified human albumin.....	110
28	Photographic comparison of plasma patterns of three goldfish, human, and purified human albumin.....	111
29	Haptoglobins of the goldfish compared to those of a human with haptoglobin type 2-1.....	112

LIST OF TABLES

TABLE		PAGE
I	Total plasma protein and albumin to globulin ratios at various levels of the vertebrate phyla.....	25
II	A summary of the proteins in fish plasma and serum.....	33
III	Analysis of control serum showing inherent variation in the technique.....	51
IV	Composition of starch-gels for the various lots of starch used.....	53
V	Test animals, general data showing acclimation times, sample sizes, mean weight and weight ranges.....	69
VI	Total protein as a function of temperature...	70
VII	Summary of the number of fractions resolved from all fish tested.....	73
VIII	Occurance and mobilities of the plasma proteins of the goldfish.....	76
IX	Differences and significance of differences between the mean total area under the curve at different acclimation temperatures.....	79
X	Mean absolute amount and percent contribution to the total area under the curve of each fraction.....	83
XI	Relationship between relative and absolute amounts of each fraction to temperature...	86

LIST OF APPENDIX TABLES

TABLE		PAGE
1	5°C Acclimated goldfish-Total plasma protein and general data.....	151
2	12°C Acclimated goldfish-Total plasma protein and general data.....	153
3	20°C Acclimated goldfish-Total plasma protein and general data.....	155
4	30°C Acclimated goldfish-Total plasma protein and general data.....	157
5	Mean size and migration distance, absolute amount, and percent occurrence of non-typical fractions.....	159
6	5°C Acclimated goldfish-Electrophoretic data.	160
7	12°C Acclimated goldfish-Electrophoretic data.	168
8	20°C Acclimated goldfish-Electrophoretic data.	176
9	30°C Acclimated goldfish-Electrophoretic data.	184
10	Summary of all electrophoretic data for all samples.....	192

INTRODUCTION

The present investigation was undertaken with the aim of examining several aspects of plasma proteins of the goldfish, Carassius auratus.

(1) The establishment of normal values for total plasma protein, and following electrophoretic separation, estimation of the normal relative and absolute amounts of the resolved protein fractions.

(2) The determination of thermally induced alterations in the plasma protein values.

(3) To investigate the possibility of utilizing electrophoretic separation of plasma proteins as an index of physiological state with regard to thermal environment.

Despite the copious literature available concerning the thermal relations of fishes (Brett, 1941-52; Fry, Brett, and Clawson, 1942; Fry, Hart, and Walker, 1946; Fry, 1947; Hart, 1947-52; Black, 1953; McCauley, 1958; Kanungo and Prosser, 1959; Hoar, 1962), and the phylogenetic significance of their plasma and serum protein patterns (Lepkoysky, 1929; Drilhon, 1954a; Drilhon, Fine, and Daulous, 1958; Drilhon, 1959; Sulya, Box, and Gunter, 1960; Buecker, 1961), few workers have examined the effect of temperature on the blood proteins (Saito, 1957c; Sorvachev, 1957; Meisner and Hickman, 1962).

Studies on environmental control of protein metabolism have in the past been limited, and have sometimes involved