

Electrophoresis as an Aid in Detecting Pathological Conditions in Wild Mammals 1

Authors: PAYNE, J. A., MARTIN, G. D., STORY, J. D., and COSGROVE, G. E.

Source: Bulletin of the Wildlife Disease Association, 3(1) : 21-22

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-3.1.21>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Electrophoresis as an Aid in Detecting Pathological Conditions in Wild Mammals¹

J. A. PAYNE², G. D. MARTIN³, J. D. STORY and G. E. COSGROVE

*Radiation Ecology Section, Health Physics Division, and Biology Division,
Oak Ridge National Laboratory, Oak Ridge, Tennessee*

Received for publication 13 October, 1966

ABSTRACT

Changes in the electrophoretic distribution of plasma proteins were noted in wild animals with a variety of parasitic and infectious diseases. This technique may be useful in screening for disease before death or sacrifice of animals.

INTRODUCTION

Alterations in the electrophoretic distributions of plasma and serum proteins have been described in various animals both in spontaneous diseases^{2 3 5} and in the screening of experimental animals¹. The alterations in normal plasma protein distribution following disease are largely nonspecific consisting of an increase in the globulin fractions and a decrease in the albumin component.

During studies of the plasma protein patterns of wild mammals of the USAEC Oak Ridge Reservation, electrophoretic patterns of some diseased mammals differed markedly from the normal distribution for the particular species. Further studies were carried out to determine the disease present, the plasma protein pattern, and the possible relationship between the two.

MATERIALS AND METHODS

Blood coagulation was prevented by EDTA, and 6-12 μ l samples of plasma were analyzed for proteins using the Spinco Model R paper electrophoresis system, staining with brom-

phenol blue, and scan-tracing the protein fractions with a Spinco Model R Analytrol. Calculations of protein fractions and albumin-to-globulin ratios (A/G) were made from the scan-tracing of each sample.

RESULTS AND DISCUSSION

The effects of several pathological conditions upon plasma protein distribution are summarized in Table 1. With the exception of the fox with uncomplicated rabies, all of the diseased animals showed a marked depression in the A/G. This is the result of concurrent albumin decrease and variable increases in α_1 , β_1 , and β_2 globulins. In myiasis and mite infestations of rabbits and skunks, where the number of parasites was high, inflammation with serous exudate was observed and involved approximately two to twenty percent of the hosts' total body surface area. Increased vascular permeability associated with the inflammatory process may have resulted in some loss of albumin from the circulation. Inflammation was associated with the response to *Cuterebra* infestation in chip-

¹ Research sponsored by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation.

² Present Address: Department of Entomology and Zoology, Clemson University, Clemson, South Carolina.

³ Present Address: Bowman Gray School of Medicine, Winston Salem, North Carolina.

munks and white-footed mice where purulent exudate and/or abscess formation was observed. The presence of pneumonia with the associated extensive tissue involvement in one rabid fox may account for the depression in A/G in this animal when compared to the one with rabies alone.

Since variations in plasma protein patterns appear to accompany many abnor-

mal conditions, the use of this technique in experimental and wild animals is worthwhile. The small size of the blood serum sample (.006 - .012 ml) required and the relative simplicity of the procedure make it suitable for establishing basic blood parameters and detecting responses of the host to injurious agents in a wide range of pathological conditions.

Table 1. Percent plasma protein distribution in wild mammals with and without disease.

Species	Common name	Number animals	Disease				
			Globulins				
Albumin	α_1	α_2	β_1	β_2	γ	A/G	
<i>Oryctolagus cuniculus</i>	(domestic rabbit), five animals, no disease.						
61.8±1.77*	7.2±0.21	5.8±0.25	8.8±0.60		16.4±1.31	1.640±0.122	
<i>O. cuniculus</i>	five animals, caliphorid myiasis and acarine mange.						
53.4±0.75	7.9±0.39	6.7±0.45	8.6±0.54		23.3±0.70	1.154±0.057	
<i>Tamias striatus</i>	(eastern chipmunk), seven animals, no disease.						
23.6±1.06	9.5±1.69	18.8±2.48	8.2±0.71	15.1±3.05	10.0±2.68	0.656±0.098	
<i>T. striatus</i>	two animals, myiasis, <i>Cuterebra</i> sp.						
13.8±2.95	12.9±3.15	16.9±1.80	10.3±2.7	20.5±1.10	17.5±5.70	0.284±0.075	
<i>Peromyscus leucopus</i>	(white-footed mouse) fifteen animals, no disease.						
47.4±1.0	8.9±0.7	10.7±1.0	21.3±0.6		11.8±0.8	0.899±0.034	
<i>P. leucopus</i>	thirteen animals, myiasis, <i>Cuterebra angustifrons</i> **						
32.9±1.5	8.2±0.5	15.6±1.0	32.0±1.5		11.3±0.9	0.490±0.032	
<i>Sigmodon hispidus</i>	(Cotton rat) two animals, no disease.						
43.9±0.54	22.3±1.03		13.8±0.62		19.9±0.96	0.805±0.001	
<i>S. hispidus</i>	two animals, filariasis, <i>Litomosoides</i> sp.						
36.9±1.31	27.2±0.85		19.2±1.72		16.8±0.40	0.585±0.035	
<i>Urocyon cinereoargenteus</i>	(gray fox), one animal, no disease.						
37.4	5.0	6.8	13.9	22.9	14.0	0.597	
<i>U. cinereoargenteus</i>	one animal, rabies.						
37.5	13.6	7.8	28.0	6.5	6.6	0.600	
<i>U. cinereoargenteus</i>	one animal, rabies and pneumonia						
30.2	9.4	5.7	20.8	25.3	8.6	0.433	
<i>Mephitis mephitis</i>	(striped skunk), five animals, no disease.						
38.7±0.04	16.7±0.02		13.3±0.02	17.7±0.008	13.2±0.02	0.658±0.107	
<i>M. mephitis</i>	one animal, acarine mange.						
22.2	16.7		20.4	27.6	13.1	0.285	

* Mean \pm standard error of the mean.

** Data from Payne *et al.*⁴

NOTE: Pre-albumin determinations for normal chipmunks were 14.8 \pm 3.04, and for diseased chipmunks, 8.1 \pm 0.937.

LITERATURE CITED

1. ALLEN, R. C. and D. F. WATSON. 1958. Paper electrophoretic analysis of rabbit serum as an aid in the selection of experimental rabbits. *Amer. J. Veter. Res.* 19 (73): 1001-1003.
2. BENEX, J. and R. DESCHEINS. 1961. Electrophoretic aspects of blood serum proteins in *W. bancrofti* filariase. *Bull. Soc. Pathol. Exot.* 52 (6): 932-935.
3. FITZGERALD, P. R. 1964. Deviations in serum proteins associated with *Eimeria bovis* infection in calves. *J. Parasitol.* 50 (1): 42-48.
4. PAYNE, J. A., P. B. DUNAWAY, G. D. MARTIN and J. D. STORY. 1965. Effects of *Cuterebra angustifrons* on plasma proteins of *Peromyscus leucopus*. *J. Parasitol.* 51 (6): 1004-1008.
5. YOON, CHAI H. 1961. Electrophoretic analysis of the serum proteins of neurological mutations in mice. *Science* 134: 1009-1010.