



FACTORS AFFECTING PHAGOCYTOSIS OF BACTERIA  
BY AMOEBAE.

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by

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## TABLE OF CONTENTS.

	Page
CHAPTER I. INTRODUCTION AND A SURVEY OF LITERATURE ON FACTORS AFFECTING PHAGOCYTOSIS AND INTRACELLULAR KILLING IN MAMMALIAN PHAGOCYTES AND IN AMOEBAE, AND ON MECHANISMS OF FOOD SELECTION IN AMOEBAE.	
Chemotactic movement of protozoa and mammalian phagocytes.....	2
Factors affecting phagocytosis.....	10
Intracellular killing of bacteria and degradation of ingested materials.....	18
Factors affecting intracellular killing	26
Choice of food in <u>Amoeba proteus</u> .....	31
Choice of food in soil amoebae.....	34
Possible mechanisms of food selection by soil amoebae.....	37
CHAPTER II. MATERIALS AND METHODS.	
Washing of glassware.....	46
Culturing of <u>Amoeba proteus</u> and soil amoebae.....	46
Bacterial strains.....	50
Opsonisation of bacteria.....	57
Preparation of lytic phage P <sub>22</sub> .....	58
Inoculation of <u>Amoeba proteus</u> by a microinjection technique.....	60
Cytochemical determination of acid phosphatase.....	66
Electron microscopy.....	67
Effect of mammalian serum on the phagocytosis of salmonellae by <u>Amoeba proteus</u> .....	68

	Page
Determination of acceptability of bacteria as food for soil amoebae.....	73
Demonstration of chemotaxis in soil amoebae.....	75
Selective phagocytosis of edible bacteria in colonies of mixed cultures by soil amoebae.....	76
Phagocytosis of bacteria by soil amoebae.....	79
Killing of a bacterium by a single amoeba.....	81
Determination of growth rates of amoebae feeding on colonies of different bacteria.....	82
 <b>CHAPTER III. FACTORS AFFECTING THE ABILITY OF <u>AMOEBA PROTEUS</u> TO KILL SALMONELLAE INTRODUCED DIRECTLY INTO THE CYTOPLASM BY MEANS OF A MICRO-INJECTION TECHNIQUE.</b>	
Effect of serum antibody on intracellular killing.....	86
Effect of complement on intracellular killing.....	88
Influence of the nucleus on intracellular killing.....	90
Cytochemical determination of acid phosphatase in nucleate and enucleate amoebae; and in whole amoebae after micro-injection.....	92
Electron microscopic studies of <u>Amoeba proteus</u> after micro-injection.....	96
Discussion.....	100
 <b>CHAPTER IV. FACTORS AFFECTING THE ABILITY OF <u>AMOEBA PROTEUS</u> TO PHAGOCYTOSE AND KILL INGESTED SALMONELLAE.</b>	
Effect of mammalian opsonin on phagocytosis.....	105

	Page
Influence of temperature on intra-cellular killing.....	108
Use of phage P <sub>22</sub> to eliminate extra-cellular <u>Salmonella typhimurium</u> from amoeba suspension.....	109
Intracellular killing by <u>Amoeba proteus</u> of <u>Salmonella enteritidis</u> phagocytosed together with heat killed tetrahymenae.....	115
Discussion.....	117
 CHAPTER V. EFFECT OF PREVIOUS EXPERIENCE TO BACTERIAL SUBSTRATE ON THE ABILITY OF <u>AMOEBA PROTEUS</u> TO PHAGOCYTOSE AND KILL SALMONELLAE.	
Intracellular killing of <u>Salmonella enteritidis</u> injected into the cytoplasm of 'immunised' <u>Amoeba proteus</u> ...	123
Phagocytosis of <u>Salmonella typhimurium</u> by 'experienced' <u>Amoeba proteus</u> ...	127
Intracellular killing of phagocytosed <u>Salmonella typhimurium</u> by 'experienced' <u>Amoeba proteus</u> .....	128
Discussion.....	129
 CHAPTER VI. SELECTION OF BACTERIAL FOOD BY SOIL AMOEBAE.	
Selection of suitable species of soil amoebae and bacteria for the study of food selection in soil amoebae.....	134
Chemotaxis studies.....	136
Selective phagocytosis of edible bacteria in colonies of mixed cultures...	146
Intracellular killing of phagocytosed bacteria by soil amoebae.....	150

	Page
Killing of a single bacterium by a single amoeba.....	151
Measurement of growth rates of <u>Hartmannella astronyxis</u> feeding on colonies of different bac- terial species.....	153
Studies on the mechanisms of bacterial agglutination on the surface of soil amoebae.....	154
CHAPTER VII. DISCUSSION.....	164
REFERENCES.....	183

ABSTRACT.

Survival of salmonellae in the cytoplasm and in the vacuole of Amoeba proteus was measured after the bacteria were introduced into the cells by means of a micro-injection technique, or after they had been phagocytosed naturally. It was shown that amoebae were able to kill these bacteria under either condition, but the rate of killing was faster after natural phagocytosis. Mammalian opsonins did not enhance bactericidal effectiveness in either situation, but the additional presence of complement significantly reduced their survival rate after micro-injection.

Influence of the nucleus on killing of bacteria in the cytoplasm of Amoeba proteus was investigated. It was shown that the nuclear half exerted significantly greater bactericidal effect than the cytoplasmic half when the cells were challenged at 24 hours after cutting, but not when they were challenged at 2 hours after cutting: this was attributed to the effect of starvation and the changes associated with cellular regeneration.

The location of bacteria or bacterial spores injected into the cytoplasm of Amoeba proteus was determined electronmicroscopically after various periods of time and the evidence for de novo formation of vacuolar membranes around the injected bacteria or spores is presented.

Attempts to induce more efficient bactericidal ability in Amoeba proteus, either by repeated injections of bac-

teria into the cytoplasm or by prolonged exposure of amoebae to bacterial substrates, were not successful.

Selection of bacterial food by soil amoebae was studied. At the level of food seeking, it was demonstrated that some edible bacteria were able to attract amoebae chemotactically, whereas inedible organisms failed to be so. After treatment with mammalian antibody, however, the inedible bacteria became chemotactic. In general, chemotactic principles were associated only with living bacterial cells since chemotaxis was lost after the bacteria were killed. Many species of soil amoebae were shown to respond to the same chemotactic stimuli.

At the level of ingestion, soil amoebae were able to feed preferentially on edible bacteria which were present together with inedible organisms in a mixed colony. The mechanisms whereby this was achieved are discussed.

The killing rate of edible and inedible bacteria was comparable, provided that the number of bacteria ingested per amoeba was not too great. On the contrary, killing of inedible bacteria proceeded at a slower rate if the organisms were ingested in large numbers.

The factors affecting chemotaxis, adherence, phagocytosis and intracellular killing of Gram negative bacteria by amoebae are discussed by comparison with existing knowledge of these same phenomena as found in mammalian phagocytes.