

Extra-Renal Factors in the Distribution of Sodium and
Chloride in the Body Fluids.

by W. J. O'Connor.

Thesis presented for the degree of M.D. in the University
of Adelaide, January, 1938.

CONTENTS.

Introduction	1
<u>I. The Physico-chemical forces in Salt and Water distribution.</u>	
Anatomical subdivision of body water	2
Relationship between blood, interstitial fluid and lymph	2
Relationship between tissue cells and interstitial fluid	7
<u>II. Salt and Water Distribution in Nephrectomised Rabbits.</u>	
Nature of the Experiments	12
Results of the injection of sodium chloride and bicarbonate	13
Results of the injection of sodium chloride alone	14
Results of the injection of water	16
Extra-renal regulation of ionic concentrations	19
Experiments on Rats	24
<u>III. Storage of Sodium.</u>	
Definition	28
Evidence for the existence of a salt storage	28
Site of sodium storage	31
Function of a sodium storage	34
Summary and conclusions	38
References	39

INTRODUCTION.



The literature on the metabolism of salt and water contains many observations on the renal excretion of these substances, both under normal conditions, and in the diuresis which results from their administration. Frequently, blood analyses have also been made, and although such experiments have given much valuable information on the rate of excretion of salt and water, there is no agreement on the nature of the blood changes which occur. In most instances the urinary excretion is quantitatively inadequate to account for the observed changes in blood composition, and so extra-renal factors must be postulated in discussing the results of such experiments. In the experiments on which this thesis is based, doses of salt or water of the order of those used in diuresis experiments were administered to nephrectomised animals, and changes in blood concentrations were followed for two hours. By this means it was hoped to study the nature of the extra-renal factors which, presumably, are involved in orthodox diuresis experiments.

During the two years this work has been in progress, fundamental experiments on the internal salt and water metabolism have been reported from America and it is now possible to present evidence demonstrating the nature of the physico-chemical forces involved in the problem. This has been reviewed by Peters (1935), who was unable to find any evidence of an extra-renal regulation of the salt and water metabolism. In his opinion, the distribution of the ions in the body fluids is governed solely by certain physico-chemical principles and is not under the control of the body. However, the results of the experiments on the nephrectomised rabbit cannot be so explained and some regulatory processes must be postulated.

In this thesis it is proposed to examine the nature of these physico-chemical principles, to consider the results of the nephrectomy experiments in relation to these and to draw conclusions regarding the nature of these extra-renal regulatory processes.