

**PHOSPHORUS IN FUNCTIONAL  
DISORDERS OF THE NERVOUS  
SYSTEM, INDUCED BY OVERWORK  
AND OTHER INFLUENCES  
INCIDENTAL TO MODERN LIFE**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649281978

Phosphorus in functional disorders of the nervous system, induced by overwork and other influences incidental to modern life by E. A. Kirby

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**E. A. KIRBY**

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# PHOSPHORUS

IN

FUNCTIONAL DISORDERS

OF THE

NERVOUS SYSTEM,

INDUCED BY

—OVER-WORK—

AND OTHER INFLUENCES INCIDENTAL TO

MODERN LIFE.

With Formulæ and Treatment.

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*Compiled from Monograph by E. A. Kirby, M.D., Member of the  
Royal College of Surgeons; Prof. J. A. Thompson, Physician  
to the City Dispensary, London,*

AND FROM OTHER AUTHORS.

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PUBLISHED BY

WILLIAM R. WARNER & CO.

CHEMISTS,

PHILADELPHIA, PENNA.

1878.

Some Pills for  
Cough

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## INTRODUCTION.

THE following pages consist, for the most part, of contributions on the use of Phosphorus in its elementary state by various prominent authors. Their experience in the employment of this potent agent has been of so gratifying a character, as to confirm the general impression of the profession that in certain affections,—those of the nervous system especially—it is one of the most valuable remedies which modern therapeutics has developed and perfected. Until a comparatively recent date, Phosphorus was but little prescribed by the practitioner, and even so distinguished a writer as Pereira declared, not many years since, that in England it was but rarely employed, and that it would be unnecessary, therefore, to enter minutely into an account of its uses. The physician, even though anxious to prescribe it in cases in which it would seem to be indicated, was timid, lest from its faulty or imperfect pharmaceutical preparation, it might, by its dangerous chemical characteristics, produce violent irritation or inflammation. It remained for the skillful pharmacist to place it in such a palatable and innocuous shape for administration, that in medicinal doses it could be prescribed with perfect safety and with undoubted assurance that its full therapeutic value might be realized. Such a desirable consummation was effected in 1870 by the introduction to the profession of the pillular form by WM. R. WARNER & Co., as the most reliable and convenient method of administering it. It may be unhesitatingly asserted that such a discovery has been the means of gaining for this remedy a very conspicuous position in the materia medica of the present day, inspiring confidence in the place of distrust, and offering the long coveted opportunity of testing to the full extent its efficacy in some of those painful and other diseases, in which the nervous system plays so important a part. The experience of private and hospital practice has confirmed the general verdict of the profession in favor of this form of administration of Phosphorus, and the columns of the medical journals

of this and other countries contain numerous recent contributions to the same purport. When thus administered, properly protected from all deleterious chemical changes, it is as safe a remedy as any other that may be prescribed by the physician, whilst it exhibits specific therapeutic qualities which belong to no other agent. Not a single case has been reported in which injurious effects have resulted from the use of Phosphorus pills, made by the perfected method discovered and applied by Wm. R. WARNER & Co. It is very generally acknowledged that sugar, from its preservative qualities, especially as a preventive of oxidation, is the best coating material for this substance. It would be safe, perhaps, to assert that the poisonous qualities which were formerly ascribed to this article were almost wholly due to the imperfection of its method of preparation. It is for the physician, after choosing judiciously the cases in which its use would appear to be indicated, to administer it in that form in which its potency may be most usefully developed, without attendant disturbance or irritation, of the digestive organs more particularly. This pilular form fulfils all these conditions perfectly, and should, therefore, supersede all others for administering it.

The practical value of Phosphorus as a therapeutic agent will be considered in the following pages as it exists normally in the human subject, in its applicability to the cure of disease, and especially in those various disordered conditions consequent upon *OVERWORK*, which are characteristic of modern civilization. Indeed it is to this great bane of modern life, which exhausts the vital energies of thousands of useful and valuable citizens, that Phosphorus is called upon to display its almost antidotal power in renovating nerve-tissue or giving tone to the shattered system. Its proper mode of administration and dose will also be discussed, and illustrative cases cited to substantiate its claims upon the attention of the practitioner.



# PHOSPHORUS.

## ITS PHYSIOLOGICAL AND PATHOLOGICAL RELATIONS, REMEDIAL VALUE, MEDICINAL PROPERTIES, AND THERAPEUTIC USES.

PHYSIOLOGY furnishes us with a rational explanation of the remedial value of Phosphorus; and it further explains the pathological conditions or morbid states of the system under which it may be administered with advantage. But to many the testimony of clinical experience and the deductions of carefully-conducted experiments are more satisfactory than any theory based upon physiological data, however reasonable it may appear. Many persons think, with Professor Stillé, that "simple experience forms the only crucible in which a therapeutical fact or doctrine can be fairly tried; and whatever sustains this test may be accepted as a real and permanent addition to our therapeutical resources." While thoroughly endorsing this opinion, a brief *résumé* of the physiological chemistry of Phosphorus will assist us in estimating its value in medicine.

Phosphorus, it is well known, is a normal constituent of the blood, and a never-failing ingredient in all the more important tissues and fluids of the body. It is a very important constituent of nerve tissue, and is found especially abundant (nearly two per cent.) in the great nerve centres.\*

\* The following, according to L'Héritier, is the chemical constitution of the nervous matter, and the relative proportion of its different constituents in individuals of different classes:—

	Infants.	Youths.	Adults.	Aged Persons.	Idiots.
Water . . . . .	82.79	74.26	72.51	73.85	70.93
Albumen . . . . .	7.00	10.20	9.40	8.65	8.40
Fat . . . . .	3.45	5.30	6.10	4.32	5.00
Osmazone and Salts . . . . .	5.96	8.59	10.19	12.18	14.42
Phosphorus . . . . .	0.80	1.65	1.80	1.00	0.85

It is a significant fact that it is found in all animal and vegetable juices, and occurs as phosphates in the mineral kingdom, in which form it is used to increase the fertility of the soil.

It will be remarked that the amount of *Phosphorus* is the greatest at the period of greatest mental vigor; and that in infancy, old age, and idiocy the proportion is not above half that which is present during the adolescent and adult periods.

According to Professor BORSARELLI (*Medical Times and Gazette*, Aug. 31, 1861, p. 229.) the quantity of Phosphorus in the brain of man varies from 1.352 to 1.790, the medium being triple the amount assigned to this organ by Persoz and Operrmann.

In common with *iron, sulphur, and lime*, and other inorganic elements, Phosphorus is a very important alimentary principle, and whenever its supply is not in proportion to the needs of the economy, deterioration of nervous tissue and nervous force is an inevitable consequence.

These inorganic elements enter into the composition of the organs by which the conversion of latent into active force is effected. The cerebro-spinal system,—the brain and spinal cord and the nerves directly connected with these centres ;—and the nerves of organic life, (the ganglionic system), which preside over, regulates, and controls the functions relating to nutrition and secretion,—are consequently structurally enfeebled whenever their supply is abnormally defective.

Our knowledge of the chemical constitution of the nervous system is confessedly unsatisfactory ; it is known however that nerve substance proper contains the following proximate principles, viz., protagon, neurine, fatty matters combined with phosphorus, and bases combined with peculiar fatty acids.

Protagon  $C_{118} H_{241} O_{23} N_4 P$  was discovered and described by Lieberich in 1865, and it is to this principle that the solidity of the brain is thought to be due. It is interesting to know that quite recently three classes of phosphorized bodies have been discovered in the brain, viz., kephalius, myelius, and lecithius, containing glycero-phosphoric acid as a proximate nucleus.

It would appear, therefore, that the presence of Phosphorus in its normal proportion is necessary to the structural integrity of these important nervous centres,—to their growth and development in the young, as well as to their maintenance and perfection in adolescence ; and it follows that the evolution of nervous force is mainly dependent upon nutrition, and that it is liable to be exalted or diminished in proportion as this process is perfectly or imperfectly performed. Dr. Flint observes: “When new organic matter is appropriated by the tissues to supply the place of that which has become effete, the mineral substances are deposited with them ; and the organic principles, as they become effete or are transformed into excrementitious substances and discharged from the body, are always thrown off in connection with the mineral substances which enter into their composition. This constant discharge of inorganic principles, forming as they do an essential part of the organism, *necessitates* their introduction with the food in order to maintain the normal constitution of the parts. As these principles are as necessary to the proper constitution of the body as any other, they must be considered as belonging to the class of *alimentary* substances. This conclusion is inevitable if alimen-

tation be regarded as the supply of material for the regeneration of the organism."

We know that every part of the organism is constantly undergoing physiological decay and repair, and this molecular change is a necessary and inevitable condition of life. When, therefore, the balance is lost, and the destructive process from any cause (defective supply of new material, or over exercise of functions) is in excess of that of repair, the organism falls into decay.

It is essential to the condition which we call HEALTH that waste of tissue be duly compensated by the appropriation of new material; and if this process fail, we have, as an inevitable consequence, not only structural deterioration of the organs themselves, but their functions become first weakened, then perverted, or imperfectly performed, and finally completely arrested.

In precisely the same sense that common salt is an alimentary substance, Phosphorus also is food; and it is a notable physiological fact, that those animal and vegetable substances which are richest in this element best sustain brain work, renovate nerve tissue, and restore nervous energy when enfeebled by disease or temporarily depressed by excessive activity.

We have seen that functional activity of the nervous system produces disintegration, and waste of nervous matter; and it does appear that there is an especial relation between the quantity of Phosphorus oxidized and the amount of force expended and nerve tissue destroyed.

Stepping from physiology into the domain of pathology, we find that disease destroys life by using up too rapidly the supply of nerve force. We discover evidence of the fact that excessive activity of the nervous system increases the waste of Phosphorus; and whenever the elimination is increased, *nervous force is always reduced*, nutrition impaired, the nerve centres are damaged, functional disease induced, and life prematurely destroyed.

In inflammatory diseases of the brain there is reason to believe that an unusually rapid disintegration of tissue takes place, a marked increase of the alkaline phosphates in the urine being always present. It is also a fact, and one well known to brain-workers, as well as to physicians, that laborious mental work, especially if coupled with worry and anxiety, is constantly accompanied with an increased excretion of the Phosphorus compounds.

This devitalization and unusual waste takes place at the expense of the element, and unless it be compensated as sometimes it is, instinctively as it were, by an increased consumption of phosphorized food, the nervous centres, temporarily lose power, and a state of lowered vitality (*nervous*