Anatomy, physiology, and pathology of the supra-renal capsules / by J. Thompson Darby ... ; presented as a thesis for graduation at the University of Pennsylvania ... April 19, 1858.

ANATOMY, PHYSIOLOGY,

AND

PATHOLOGY

OF THE

SUPRA-RENAL CAPSULES.

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PRESENTED AS A THESIS FOR GRADUATION AT THE UNIVERSITY OF PENNSYLVANIA, AND READ BEFORE THE BIOLOGICAL DEPARTMENT OF THE ACADEMY OF NATURAL SCIENCES, APRIL 19, 1858.

CHARLESTON, S. C.
JAMES AND WILLIAMS, PRINTERS,
16 STATE-STREET.

1859.

SUPRA-RENAL CAPSULES.

Of the numerous organs composing the human organism, none have met with such neglect as the Supra Renal Capsules.

The earliest writers of Medicine, from disadvantages of necroscopic observations, were only able to give a sciolous account of these organs, and for this reason, for many ages, all knowledge of these glands was vague. Even after the prejudices of nations had passed concerning the study of Anatomy, it appears that those who followed directed their attention to other organs of more vital import in the economy. Thus we perceive in the old works little more than visionary speculations advanced relative to the functions of these organs.

In works of more modern date, little more is said, and the ideas given, equally speculative in many respects, appear to be based upon antecedent opinions. It has been only at a very recent period, that the now innovating spirit of science has thrown aside these older ideas, and in bringing forth new endeavors to show that these glands hitherto neglected, occupy no insignificant position among the many which compose the organism.

Our science is now too far advanced to leave aught untried. The anatomist, physiologist and pathologist are now on the alert, and with their handmaids, chemistry, the microscope, and scalpel, may soon reveal the functions of the bodies.

The influence exerted by these organs, in the opinion of the ancients, is interesting for its peculiarity. Thus Hippocrates, Galen, Aetius, Aretius, Rufus of Ephesus, and others, considered that there was a thick black acrid fluid or humor, which was secreted by certain glands, productive of hypo-

chondriasis, mania, and similar diseases. Among these, it was the opinion of some that this humor was generated by the Supra Renal Capsules, and with others by the pancreas.

It appears that much later, Caspar Bartholinus followed the similar opinion, for the name atrabiliary was given to these organs, as furnishing this black bile, or atrabilia.

This opinion was for many years entertained by his successors. At a later date, and even at the present time, some believe that these bodies are concerned in lymphosis, and others think an important part in fœtal life is exerted by them. Various opinions have, in later years, been given by Krause, Ecker, Nagel, Kölliker, Wagner, Frey Müller, Cuvier, and others. More recently Addison, Hutchinson, Sequard, Gratiolet, Andral, Trousseau and Taylor. It is due to Dr. Addison, however, that so much attention is now drawn to this subject, as he first pointed out, in a publication, in 1855, the pathalogical condition of several cases, pathognomic of Supra Renal Capsular disease.

It is my object from these many opinions to record facts, and bring forward the most plausible theories resulting from investigations in anatomy, physiology and pathology.

First, the anatomy of these parts will be given, called by anatomists, Glandular Supra-Renales, seu Renes Succenturiati, seu Atrabilariae, Supra-Renal Capsules, consisting of two bodies generally in the vertebrata, and altogether absent in the invertebrata; classed with the spleen, thyroid, and thymus, or ductless glands. They have been also called the "vascular glands," on account of being so rich in blood-vessels. This unmeaning term should no longer be adopted, particularly in respect to the Supra-Renal Capsules, as it is now known that the blood-vessels are not more abundant than the nerves and ganlia which abound in these bodies.

The use of these bodies being as yet not understood, the classification is difficult, and hence the term, "anonymous glands" (Leidy) is better suited. In mammalia these bodies resemble each other in structure, (Frey.) They differ, however, in number, form, size, and situation. Thus, in man, the left Capsule is larger than the right, higher up, longer, and

more oblong in shape. At times on the inner edge or imbedded in the surface, are small round bodies, the so called Accessory-Capsules.

(Martini mentions that in a dissection he found no Capsules, and the kidneys united into one body situated at the promontory of the sacrum.)

This difference in form, size and situation, is more variable in the lower order of vertebrata. In the mammalia, the situation is usually constant. In the rodentia, they are quite large. In the Guinea pig, (Cavia Cobaia) the Capsules are triangularly pyramidal, and bear the ratio in weight to the kidney of 1: 3.2. In the rabbit they are flattened ovoids, and are in weight to the kidneys, as 1: 49.8. Among the carnivora, those of the dog are cylindrical, thick and dense in structure. In the cat somewhat flattened ovals. Among the pachydermata, the pig's are found to be in form prismoidal; in the horse, the shape is that of man. The ruminantia present other forms as in the sheep, they are cylindroid; in the ox, crescentic. These examples, with others, will show that the form and size vary. In the negress they are larger than in the white, and negro.* (Meckel.)

In the monkey, the resemblance to those of man is very close, though larger, (Cuvier.) The weight of the capsule in the seal is to the kidney as 1: 150. (Cuvier.)

The elephant has elongated capsules, conoidal, divided into two lobes, according to the same naturalist. Their size in birds is small in comparison to the weight of body, varying much in shape; in cetaceans the same is the case; in insectivoria as the mole, they are found to be triangular. (Frey.)

Little is known concerning these bodies in reptilia. Ecker and Nagel found small, long, lobulated capsules in the sauriaus. In the ophidia the capsules are lobulated and highly vascular. (Retzius.) Among fishes, Retzius and Ecker agree that the capsules vary in size, situation and form, more than the higher order of vertebrata. Frey corroborates this state-

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* I have not found this difference.

ment, and has found in the pike several capsules surrounding the kidney.

In man, the capsules are two triangular bodies, fitting on the superior portion of the kidneys, and resembling a cocked hat. Both look inwards towards the spinal column ; the right, opposite the middle of the tenth dorsal vertebra, in contact with the vena cava ; the left, opposite the cartilage, between the ninth and tenth dorsal vertebræ, and touching the aorta. The right has on its anterior surface the liver, its posterior surface the diaphragm ; the left has on its anterior surface the pancreas and spleen, its posterior surface is in contact with the diaphragm. Their inner borders are in relation to the splanchnic nerve, and semilunar ganglia. The inferior border is convex, thin, looking inwards and backwards. The base rests upon the kidney, on its superior, inner part is concave, having a groove for the passage of vessels. These bodies are surrounded with fat, and covered by a fibrous investment, which adheres closely to the proper substance of the organ, and entering, forms furrows on the anterior and superior surface. It is united to the kidney by loose connective tissue. In the interior of the organ is found a space, in shape resembling the organ, filled with a black, dirty red, pultaceous mass, the result of cadaverous decomposition or degeneration from disease. The capsule on the right kidney measures from an inch to an inch and a half in length ; in height, from three-fourths to an inch, and in thickness from two to three lines. The left capsule measures in length from an inch and a fourth to an inch and three-fourths ; in height from half an inch to three-fourths, and in thickness from three to four lines. I found the weight in several, was from one drachm to two drachms and a half, varying with the age. The capsule is composed of two structures, a cortical and a medullary. The cortical is easily separable from the medullary, and presents two portions, an external yellowish red, and an internal brown border. It is readily torn, and to the eye appears striated. The microscope has revealed this striation to consist of elongated cells, one above the other, with longitudinal, transverse and oblique stroma of connective tissue, thus forming com-

partments of larger or smaller dimensions. These compartments, filled with granular substance, are again, by delicate dissepiments made up into sub-compartments, called by Ecker *gland follicles*, surrounded by structureless membrane, and having within granules, cells and nuclei.

Kölliker does not corroborate this statement, upon which Frey appears to agree with Ecker, but states that he has only found in the *cortical cylinders* (as called by him,) angular cells, isolated from the sub-compartments by alkalies or pressure, free from structureless membrane or ovisac, as stated by Ecker, but having the same connective tissue, which encloses the compartments, from which the cell was expressed. He says that in the minor portion of the cortical layer, he has found *follicles*, which he considers *enlarged cells*, containing no nuclei, or granules, but filled with oil. The cells he states contain nitrogenous granules, with fat granules in the external cortical portion; in the brown internal portion of the cortex, the cells are filled with pigment granules. This difference of the contents in cells composing the external and internal cortical portion, accounts for the color of each. The medullary portion is found to vary. In those examined by myself, some presented a dark venous appearance, in others it is of a lighter hue, and with more or less consistence. In persons killed by accident, this portion is grayish white (Wilks); in those long dead, it is more soft and of a reddish brown or black color. The components of this portion are supposed by some to be similar to the cortical. It is more clear under the microscope, containing fewer fat and pigment granules; trabeculæ from the connective tissue pervade it and divide it into minute compartments. The cells within contain a nucleus, with nucleoli, and resemble the nerve cells, (Kölliker). As yet no excretory duct has been found.

Vessels.—Three arteries supply these bodies generally; the arteria supra-renalis superior is from the inferior phrenic; it is often absent. The arteria supra-renalis media, from the aorta, is the largest, and is, as examinations prove, constant. The arteria supra-renalis inferior, is from the renal, and is seldom absent. These arteries take two courses after

reaching the capsules. On the surface you can see distributed as many as twenty, (Kölliker,) and of these, some after coming along the cortical surface send down twigs which ramify into the dissepiments made by stroma of connective tissue, thus surrounding the "cortical cylinders" with a capillary coat; the others run immediately at right angles to the medullary portion, where, forming minute ramifications, they return again to the cortical portion according to Nagel and Frey, and these, anastomosing with those which ramify in the cortical portion, cause the medullary substance to be less vascular than the cortical.

Veins.—These vessels are supposed to take origin in the central portion of the medullary substance, coursing to the surface, uniting in one larger vein, running in the fossa at the base of the capsule, to empty, on the right side, into the vena cava, and on the left, into the emulgent vein. This is not always the case, though stated by Nagel as such; for in the capsules examined, often and generally it may be said, two or three veins run off from the capsule corresponding in their course to the arteries supplying the organ. *Lymphatics.*—"These vessels are large and numerous, and terminate in the lumbar glands (Wilson)." This statement is not correct, for in fact little is known concerning them. Arnold asserts that he found superficial and deep seated ones. Ecker denies this, by saying that he only found the superficial, and Kölliker agrees that these even are few, having seen in his examinations a few small trunks.

Nerves.—No organs known are so liberally supplied with nerves; as many as thirty-three trunks, (Kölliker) have been counted. They come from the cœliac and renal plexuses, and the semilunar ganglia; and from the pneumogastric, and phrenic, according to Bergmann. Connected with the sympathetic they have ganglia especially apparent on the inner and lower border of the organ, (Kölliker). They can be traced no farther than the medullary portion, and appear to belong entirely to that portion.

2d. The physiology of these organs is involved in so many hypotheses, that it is with hesitation that any one could select any one opinion as descriptive of their true function.

Pathology in the last few years, has to a certain extent opened for the physiologist, a way in which he does not grope so blindly as those who wrote prior to the monograph of Addison. Physiological facts have been also deduced from many vivisections, performed especially among the French physiologists, principally Messieurs Sequard, Gratiolet, and Phillipeaux. There has been much dispute concerning the development of these organs; some asserting that they are parts of the Wolffian bodies, while others deny this statement, and state that they come from a separate blastema formed from the germinal lamella. These bodies to the tenth week are much larger than the kidneys. Gradually, from that time, they diminish, until becoming equal in size to the kidneys, they remain in this ratio to the third month; (Kölliker,) decreasing from this time, they are found at the sixth month to be in ratio to the kidneys as 2: 5, in the mature embryo, 1 : 8 (Meckel), as found by myself 1 : 10, and in the adult varying from 1 : 16 to 40. In those examined, the diminution noticed by some at the period of very old age, has not been so perceptible, no greater variations occurring between the adult and aged, than between adults.

In mammalia this greater proportion in embryonic life between the kidneys and these organs, does not exist, the ratio being the same at all periods, (Frey). It has been supposed from the large size in the embryonic state in man, that these glands exerted an important influence in the formative process of the embryo, but according to Frey the fact of the "gland vesicles" being unformed, when in this enlarged condition, and only being fully matured after the tenth week, when they are gradually becoming equal in size to the kidney, while the organ has remained at rest and is diminished in ratio to the weight of the kidney, would seem to contradict this supposition. Ecker gives an opinion that the supra-renal capsules and other "vascular glands," take from the blood a part, which is afterwards secreted by these glands in a modified condition, rich in protein and fat, to be again taken up by the circulation for the benefit of the nutritive process. Frey disagrees in this opinion, but Carpenter appears to follow Ecker. It is reasonable to suppose with

Carpenter that the blood conveyed to these organs, undergoes some change for the purposes of the economy. As the *anonymous glands* have no excretory duct to convey their secretions to particular organs, it is again taken up by the blood and carried through the systemic circulation. The spleen* is an exception among the so-called "vascular glands," as it empties its blood into the portal vein, to be distributed through the liver, before entering the vena cava. The blood entering the *anonymous glands* passes out in a purified condition, into the systemic circulation, passing only through the depurating organs, the lungs. These organs cannot exert any peculiar influence upon these changed products in their passage, nor can these products afford any pabulum for respiration on account of the small amount of fat contained in these organs during their functional activity; (Carpenter) so it must be for nutritive processes either of the system or of the blood itself. From the size of the *anonymous glands* in early life, when there is greatest need for the nutrive functions, we should infer that they played an important part in this process when these glands are greatest. The Thyroid and Thymus diminishing, when the call for nutritive material for formative processes is less, would go to show that they do exert this nutritive influence, as in the case of over-driven lambs, the diminution of the thymus is great, but plentiful nutriment being afforded, it is gradually re-distended to the natural size, (Carpenter).

The supra-renal capsules do not diminish in this formative period, but still hold their influence, and for this reason, act more as modifiers of the blood itself, but less than the thyroid and thymus in assimilating albuminoid plasma for formative operations.

Cuvier supposed that the functions of the capsules and kidneys were the same, but the difference in structure and tissues, together with the absence of an excretory duct, and the quantity of urine being normal when these organs are

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* The spleen should no longer be classed with the supra-renal, thymus, and thyroid glands, or anonymous glands.

ablated in lower animals, would be sufficient to show that the physiological distinction is marked and dissimilar. So also in the hypothesis of Meckel, who supposed that they were intimately connected with the sexual function; we have never seen any communication with the organs of generation by absorbents or other modes, to serve to draw a conclusion that they act in this particular, any more than the kidneys. On this point, Nagel has proved that there exists no such relation. In a mechanical point of view, the gravid uterus may exert some influence on these bodies, by pressure, thus, by congesting these organs as is the case with the kidneys in gestation, preventing their functional activity in modifying the blood, occasioning a deposit of pigment in different portions of the body in pregnant women.*

In the embryo of three months as found by Ecker and Kölliker, there exists a cortical and medullary portion, with cells and fibres, colossal nuclei, with nucleoli, fat molecules, but no nerves. These molecules resist the strongest chemical reagents. Kölliker regards the cortical and medullary portions as physiologically distinct.

The cortical he says, may be classed with the so-called blood vascular glands, but the medullary, as an apparatus of the nervous system, in which the cellular element and nervous plexus exert a similar action, as they do in the grey nerve substance, or as entirely distinct.

In researches made by Leydig on the supra-renals of mammalia and amphibia, two different kinds of cells were found; those composing the cortical portion in mammalia, corresponding to the yellow granular, striped portion found in fishes and amphibia, whilst the medullary portion in the mammalian organ corresponds to the ganglionic cells in the

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* Dr. Taylor of New York, originated this view, but denies that it is from mechanical pressure, as the kidney becomes congested even in the first week or at two months, when congestion of these organs could not take place from pressure of the uterus. The kidneys becoming congested, would, from close proximity, cause the congestion of the capsules. So to my mind, it is mechanical and not from any peculiar relation existing between the functions of the two organs.— *Vide, N. Y. Journal of Medicine, September*, 1856.

sympathetic ganglia. These views of Kölliker and Leydig, serve to strengthen the statements made first by Bergmann, of the connection between these organs and the nervous system. He thought that they bore the same relation to the ganglia of the sympathetic system, as the pineal body does to the brain. It is true that these bodies are subject to calcareous deposits, as found in the pineal body. In brainless monsters also, there is generally an absence of the supra-renal capsules, going to show a relation between these organs and the nervous system.

Moreover, in wounds of the spinal column, these organs are congested, and become hypertrophied as found in animals. The experiments made upon animals, will also prove that such a relation does exist. In animals from which the capsules have been removed, changes take place in the economy, showing the important part exerted upon the nervous and vascular systems. In experiments performed upon ten animals, it was found that the sensibility was increased, when one or both capsules were removed; temperature of body was diminished; great debility, independent of that caused by the operation; digestion ceased; the appetite was lost or greatly diminished; respiration slower previous to death, but temporarily increased immediately after the operation; secretion from the kidneys remained normal; convulsions of the tetanic and epileptic character in the last stages, prior to death, and the animals died asphyxiated or from syncope; a rolling movement resembling that seen when the encephalon is wounded, and contraction of the pupil.* These effects exhibited by ablation of the capsules, on animal or organic life, have been to a greater extent and more minutely drawn out, by Brown Sequard. In 90 experiments made by him, the mean period of survival in 51 rabbits, was a little over 9 hours, the minimum $5\frac{1}{2}$, and the maximum $14\frac{1}{2}$. In grown dogs and cats, the mean was 14 hours, and in guinea pigs, the same.

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* I have noticed that this rolling movement is towards the side, opposite to that from which the capsule was ablated.

The ablation of both capsules causes death sooner than one, and adult animals die sooner than those very young. The removal of one does not always kill, as found by Sequard, though the proportion is small, 2 surviving out of 37.

Phillipeaux asserts that death does not take place in the albino rat, when both capsules are removed. Gratiolet from experiments on young animals, found the mean duration of life longer than Sequard. The duration of life in experiments of my own, coincides with Sequard, but in young animals the period of survival is longer, extending, as I have seen in a kitten, to 36 hours, and in a guinea pig over 31.* Gratiolet thinks death takes place from severity of the operations, not from the influence exerted on the organism by these organs. To prove whether ablation, or the operation caused these symptoms enumerated, and the speedy death, the following experiments were performed.

Similar incisions were made upon a guinea pig, rabbit and dog, as are made for extracting both capsules; my thumb and fore-finger were then introduced into the wound, and brought in proximity to the organs. In no one of the three cases were symptoms produced as when these bodies are removed, but the appetite was good; the sensibility only increased in those parts contiguous to the wound; the temperature remained normal, etc.

The dog on the eighth day had sufficiently recovered to get away; the pig died on the 13th day, and, as a post-mortem revealed, from lesion of one of the lobes of the liver;† and the rabbit, after becoming perfectly tame from my feeding him every morning for 21 days, died from the effects of a cold night.

Brown Sequard's experiments, together with these, have proved to my own mind, that peritonitis, lesions of organs, phlebitis or hemorrhage, are not the cause of the rapid death seen in animals from whom these organs have been ablated.

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*In my own experiments, death followed sooner the removal of the *right* than the left capsule.

† The liver is beautifully divided into 5 lobes in this animal, one of which only was affected.

If then these be not the causes, the inference is drawn that ablation of the capsules must be.

The blood is much modified as found by Sequard; for the pathological condition of pigmentary deposit in the skin of persons coexistent with disease of these organs, as found by Addison, has been verified by Sequard, who found the pigment cells much increased in the blood of animals operated upon. He has procured also crystals spontaneously formed differing in character from hematoidine.

In the skin of animals there was no abnormal increase of pigment, on account of the speedy death, but in two cases of those experimented upon by myself, there were present on the peritoneal coat of the stomach, black spots resembling those described by Addison as occurring on the mesenteric and omental portions of the peritoneum of persons dying from disease of these bodies. These experimental facts, with pathological conditions now known, go to support each other strongly as to the influence exerted on the nervous and vascular systems. The marked debility, want of voluntary motion with other enumerated effects, produced by ablation of these organs, resemble the disorded nervous condition of those cases, reported, where pathological conditions of these organs prevent their proper functions.

In addition to this, the vascular system is deranged, as seen in the abundant deposit of pigment in different portions of the body of those suffering from disease of these organs; and in animals, though the deposit is not increased in the skin, from their rapid death, yet an abundant supply of pigment cells is found in the blood. The spontaneous production of crystals, and the fact that blood from the animals experimented upon, injected into the veins of other animals, causes death as shown by Sequard, would show that there is a change and an important one. It is seen from these facts that these organs exert such an influence on the economy as is essential to life.* The cortical, exerting probably on

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*A two-fold influence, the medullary on the nervous system and the cortical on the vascular, and this influence is such as to make them essential to life.

certain constituents of the blood a transformation, which prevents these constituents from being transformed into pigmentary matter by modifying processes undergone in the passage of the blood through them ; and the medullary co-operating with the nerves, in preserving the proper influence of the nervous system.

Finally, it remains to speak of the pathology. The first notice given of the morbid influence produced by these organs was by Dr. Addison of Guy's Hospital, London. Much praise is due to him for having first directed the attention of pathologists to these organs, and whatever praise is due to others, giving accounts of these organs, they should bear "proximos illi honores."

Mr. Hutchinson of England who published an analysis of 27 cases, confirming the accounts of Addison, and Trousseau, adds testimony, by asserting that he has noticed similar appearances in the French hospitals. In our own country, Dr. Taylor of New York, has been most zealous in pursuing the pathology of these organs.

Symptoms, Cause, &c.—The disease comes on in a gradual insidious form, characterized by resemblances to an anaemic more than any other condition of system. This state of system is described as being *cachectic* rather than anaemic, by Dr. Taylor. The morbid changes vary in rapidity, persons affected notice a general falling off in health, without being able to state the cause ; loss of appetite, indisposition to mental or physical exertion, without that shrivelling condition seen in other malignant anaemic diseases arising from a strumous diathesis, or malarial influence. This condition is masked by derangement of the constituents of the blood. There being a leucocythemic state co-existent with dull pain about the loins in the region of the kidneys, a peculiar change of skin, accompanied with greater languor, irritability of stomach, nervous and vascular derangement. Those affected, present more flabbiness of the solids than an emaciated condition, with sickly, pearly aspect of the conjunctivæ. The debility is peculiar, without great loss of flesh ; there are frequent faintings, indisposition to move, palpitation of the

heart from the slightest exertion. The tongue does not differ from that seen in debility. The pulse is marked by softness and compressibility, is of the normal frequency, except when exertion excites it. The urine is normal in quantity and composition. Great irritability of stomach, sinking feeling in the epigastrium, loss of appetite, with costiveness in the majority of cases reported. The cerebral functions are disturbed, dullness, listless stupid expression, indisposition to exert the mind. In the latter stages, epileptiform convulsions, coma, paralysis, loss of mind, &c., indicate depression of the nervous system.* The most striking point in diseases of these organs is a discoloration of the skin, so peculiar as to be noticed by those affected and their friends. Deposits of pigment, consisting of small irregular patches of a dirty chestnut-amber, brown color, pervading especially those parts where pigmentary matter is deposited. The absence of this matter in those parts of the body, as the matrices of the nails and the palms of the hands, is confirmatory of its being pigmentary matter. Hence, on the penis, the scrotum, the mammae, the umbilicus, face, lips, superior extremities, axillae, and groin it is seen. At times, the discoloration pervading the whole body, gives those affected the appearance of a mulatto. Mr. Hutchinson uses the term, "bronzed," as applicable to this discolored state, or that appearance which is seen on a bronzed statue with the gloss rubbed off. Dr. Taylor agrees with Addison in saying it resembles more the mulatto, or West Indian, and says, that the bronzed condition is only seen in late stages of the disease. The integument is blanched in spots, from deficiency of coloring matter, and the abdominal viscera, particularly the mesenteric and omental portions of the peritoneum exhibit these brown spots. The course of the disease is gradual and slow. In 27 cases reported by Hutchinson, the duration varied from three weeks to three years. In proportion as the lesion of the organs is acute, so

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* Dr. Taylor, who kindly afforded me information on this subject, says in 20 cases, the nervous system was deranged, except in one. The extended experiments of Brown Sequard exhibited this phenomenon, and it was always present in animals experimented on by myself.

is the discoloration and cachectic condition manifested. In the cases reported by Hutchinson, the age of those affected, varied from 12 to 60 years; in 20 cases seen by Taylor, the age varied from 20 to 73 years.

Diagnosis.—The discoloration of the skin, with depositions of pigmentary matter, accompanied by systemic debility, irritability of stomach, and nervous derangement, are the guiding points; yet a conclusion is best derived from negative diagnosis. The disease must not be confounded with discoloration produced by exposure to the sun; for the skin only being discolored at those parts exposed, the hair being changed in color, the ear being discolored, and not where there is disease of the capsules, the gradual clearing up of the complexion by removal of the cause, absence of nervous derangement, of pigment on the lips, and the voluntary movements, physical and mental, being unimpeded, would prevent an incorrect diagnosis from this cause. In cases of jaundice, the matrices of the nails, and conjunctivæ are discolored, the change of color does not occur in patches, but is generally diffused, and absence of pigmentary depositions in the course of this disease, would prevent it from being mistaken for Supra-Renal disease.

In cases where muddiness, debility, and cachexia, occur from malarial, or other influences, the history of the case, the symptoms in the first stages, the absence of pigment, change of color more generally diffused, are guiding points. It is more likely to be mistaken for pityriasis versicolor, but the absence of nervous derangement, the patches being smaller, the itching and contageousness of this affection, with presence of microscopic fungus are differences sufficient to distinguish one from the other.

Prognosis and Treatment.—Of the cases reported, none as yet have recovered; hence the prognosis can be but most unfavorable. The treatment adopted has been of no avail, and no remedies, yet known, act even as moderators of the disease. Nutritious diet, tonics and alteratives, thus supporting the system, and producing a change in the blood, would appear to be rational. Iodide of potassium and a mercurial course have been recommended.

Morbid Anatomy.—In all cases reported, there has been lesion of one or both capsules. In every case where discoloration existed, these bodies were diseased, and in proportion to the duration of disease, and amount of discoloration, was the lesion more extensive. The cases reported by Hutchinson proved, by examination, that death occurred from abscess in acute inflammation, atrophy from fibro-calcareous deposits resembling those found in the pineal gland, hypertrophy with induration, fibrinous effusions resembling tubercle, and cancerous degeneration.

Causes.—It is not understood what is the theory of this disease, consequently the causes are conjectural. We see, however, that symptoms, as described, occur, and autopsies prove that where these symptoms occur, there exists lesion of the capsules—arising from perverted action, as in carcinomatous and scrofulous diseases; we see when these organs are diseased, the symptoms described, and the changes which take place. Liability to fibrinous effusions resembling tubercle, with fibro-calcareous deposits, go to show this to be the case. This perversion is not understood further than are the causes productive of carcinoma and tuberculosis. As has been already mentioned, the portions composing these organs being considered "physiologically distinct," it may be probable, that as lesions affect the cortical or medullary portion, so do symptoms arise pathologically distinct. As, however, in all cases examined, both portions have been diseased, a combination of the effects exerted on the system by both, is shown. The medullary portion composed of nerve ganglia, liable to degeneration, often of the calcareous kind as the pineal gland, would cause from intimate relation to the nervous system, those phenomena of nervous derangement exhibited. The cortical portion belonging to the vascular system, (probably exerting a modifying influence on certain components of the blood which go to form pigmentary matter,) from perverted action, being unable to enact this normal influence, becomes more irritated from accumulation of pigment, and thus causes increasing masses of pigmentary matter, which acting as barriers, prevent circulation in the capillaries supplying the nerve centres, and produce the disease.