

Cases and observations on the molluscum contagiosum of Bateman : with an account of the minute structure of the tumours / by Robert Paterson.

Contributors

Paterson, Robert, 1814-1889.
Bateman, Thomas, 1778-1821.
University of Glasgow. Library

Publication/Creation

[Edinburgh] : [publisher not identified], [1840?]

Persistent URL

<https://wellcomecollection.org/works/bmz775ud>

Provider

University of Glasgow

License and attribution

This material has been provided by This material has been provided by The University of Glasgow Library. The original may be consulted at The University of Glasgow Library. where the originals may be consulted. This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
<https://wellcomecollection.org>





CASES AND OBSERVATIONS

ON THE

MOLLUSCUM CONTAGIOSUM OF BATEMAN,

WITH AN ACCOUNT OF THE MINUTE STRUCTURE OF THE TUMOURS.

BY ROBERT PATERSON, M. D., &c.

Physician to the Leith Dispensary.

(From the *Edin. Med. and Surg. Journal*, No. 148.)

THE term Molluscum was introduced into cutaneous pathology by Dr Willan, to designate a disease characterized by movable tumours on the skin, little sensible and often elastic to the touch, and not affecting the general health of the patient.

Professor Tilesius had undoubtedly described the disease in the case of a beggar at Muhlberg in 1793, but without giving it a name; and we are inclined to think with Dr Jacobovics of Pesth,* that Dr Willan's term *molluscum* was more probably derived from Professor Tilesius's description, than, as Alibert and Bielt think, from the resemblance of the tubercles to those on the bark of the maple tree.† The disease, however, which we are presently engaged with was not known to Dr Willan, and indeed was not known to Dr Bateman until after the publication of the second edition of his *Synopsis*, about the year 1814 or 1815. "A patient was sent to me," he says, "affected with a singular species of molluscum, which appears to be communicable by contact. The face and neck of this young woman were thickly studded with round prominent tubercles of various sizes, from that of a large pin's head to that of a small bean, which were hard, smooth, and shining on their surface, with a slight degree of transparency and nearly of the colour of the skin, the tubercles were all sessile, upon a contracted base without

* Du Molluscum recherches critiques sur les formes la nature, et le traitement, par Dr Jacobovics de Pesth. 1840.

† "Reinhardi visu foedum corpus tectum est verrucis mollibus sive *molluscis*, et madidis sive myrmeciis."

any peduncle. From the larger ones a small quantity of milk-like fluid issued on pressure, from a minute aperture, such as might be made by a needle's point, and which only became visible on the exit of the fluid. The progress of their growth was very slow; for the first tubercle had appeared on the chin a twelve month ago, and only a few of them had attained a large size,—some of the latter had recently become inflamed, and were proceeding to a slow and curdly suppuration; and the cervical glands lying under those on the neck were also swollen and discoloured, as if proceeding to suppurate. She ascribed the origin of this disease to contact with the face of a child whom she nursed, on which a tubercle of the same sort existed; and, on a subsequent visit, she informed me, that two other children of the same family were disfigured by similar tubercles." Since my attention," says Dr Bateman, "was drawn to this species of tubercle, I have observed it in another instance, in an infant brought to me with *porrigo (impetigo) larvalis*, and, on investigation, it was found that she had apparently received it from an older child, who was in the habit of nursing it. In this case the milky fluid issued from the tubercles, and may be presumed to be the medium of the contagion."

I am informed by my venerated preceptor, and respected friend, Professor John Thomson, that Dr Bateman, shortly after their occurrence, mentioned the above cases to him. Dr Thomson not having at that time witnessed any case of this disease, most anxiously looked out for it, and not very long after the time that Bateman described it, a series of cases occurred in the Canongate of Edinburgh, which not only put Dr Thomson's doubts at rest, regarding the disease in question, but also regarding its contagious nature. The series of cases to which I refer have been mentioned by Cazenave and Schedel in their work on diseases of the skin,* as having been mentioned to them by Dr Carswell, the cases having been witnessed by him and Dr Thomson. There is some little difference in the account which appears in Cazenave and Schedel's work, and the original account of the case as drawn up at the time, and inserted in Dr Thomson's case book.† Dr William Thomson has been kind enough to favour me with a copy of the case, as drawn up at the time by his lamented friend, Dr Donald M'Intosh.

March 1821.—"In a family resident in the Canongate of Edinburgh, there are three children, two boys and a girl, affected with *molluscum contagiosum*. About six months ago, small tubercles appeared upon the face of the eldest boy, who, it is supposed, had caught the disease from some of his play-fellows, although none of them at present are known to have had it, nor has it been known ever to have existed in the neighbourhood. From this boy the disease was communicated to his sister, and to his little brother, a child of about nine months old, whom he occasionally carried about in his arms. The contagious nature of the disease is well evinced in the child.

* *Abrégé Pratique des maladies de la Peau*, par MM. Alphée Cazenave et H. E. Schedel. 2d edition, 1834.

† This may have arisen from Dr Carswell having reported the cases to the authors of the work in question from memory, and not from any intentional misrepresentation on Dr Carswell's part.

On the back of its hands a considerable number of tubercles are seen which have been produced by applying them to the face, and scratching those situated there during their inflammatory stage. Some of the tubercles are small, others large, some in a state of active inflammation, others nearly of the same colour as the skin, and quite free from pain. A few of them are pedunculated, but the greater of these number are attached by broad bases. They are seen on different parts of the face, on the forehead, eyelids, nose, lips, red of the lips, cheeks, and under the chin. Those under the chin have produced a considerable degree of inflammation of the skin, and tumefaction of the submaxillary glands. Two or three appear to be decaying, are shrunk and corrugated, and of a reddish brown hue. It is three months since the first appearance of the disease. The mother, though in the constant habit of nursing the youngest child, has not been infected."

I am also enabled, through the kindness of Professor Thomson, to add another series of cases of this rare affection, which, some time after the last mentioned ones, came under his observation.

Professor Thomson was consulted regarding the child of a farmer in the immediate vicinity of Edinburgh, who was affected with this disease in its characteristic form. It was traced to have been communicated to this child of the farmer's by a child of one of the farm servants; but this case could not be traced further. The farmer's child suffered severely from conjunctivitis, produced by the irritation of the tubercles on the edge of the eyelids. The disease was next communicated to the servant girl, who was in the habit of keeping the child during its illness, and appeared in its usual form on that side of the neck alone against which the child was in the habit of laying its face when affected with the ophthalmia. The above cases appear to me extremely interesting in so far as they point out in the most unequivocal manner the contagious nature of the disease.

The first case of this disease which I had an opportunity of witnessing occurred at the village of Newhaven in the month of December 1840. The child, a girl about eighteen months old, extremely robust and active, and belonging to one of the cleanliest and best class of fisher people, had been affected with the eruption for the last three months. It was first observed in the neighbourhood of the mouth and nose, and it now occupies the same localities together with the lower eyelids, and a few thinly scattered over the cheeks and neck. The mother states, that, when it was first seen, the tubercles had very much their present appearance. This child was nursed on one breast, and, although weaned, has the habit of still sucking it. The tubercles vary in size from that of a pin-head to a horse-bean,—the smaller ones having very much the white opaque appearance of pearly granulations, the larger ones being a little more coloured. The smaller ones are round, the larger ones oblong and irregular in shape, very much resembling that of a horse-bean. They are sessile on a contracted base, not pediculated. The larger ones only emit a whitish fluid when pressed. They seem to be not the slightest source of uneasiness to the child, and do not even appear painful when pretty roughly handled.

This child communicated the disease to the breast of the mother, and it appeared entirely confined to the sebaceous glands around the nipple of that breast, which the child continued to suck.

The tumours on the breast are of various sizes, from that of a pea to a hazelnut, three of the larger ones being clustered together, all exude a thick whitish matter when pressed between the fingers, and they seem to be equally insensible to the touch as those on the child. They first appeared on the breast about a month and a half after those on the face of the child.

The largest of these tumours latterly became inflamed and extremely troublesome, from the irritation of the rubbing of the clothes against them.

Particular inquiry was made as to any other members of the family being affected with a similar eruption; but no trace of it could be discovered, and an attempt to find out the source of contagion to the child proved equally unsuccessful; indeed, from the inquiries made, had any similar case existed in the village, it must have been discovered. This series of cases was seen by my friends, Professor Simpson, Dr W. Thomson, Dr Mercer, and Dr Lund, all of whom looked upon them as very characteristic of the disease in question.

Treatment.—Mrs C., the mother, was anxious that something should be done for the tumours, as they afforded her considerable inconvenience from rubbing against her dress, and, at the suggestion of Professor Simpson, the tops of them were touched with caustic potass. The application afforded little uneasiness to the patient; the escharotic destroyed a portion of the tumours, and the remainder soon sloughed off by their bases, leaving a healthy granulating surface, which healed kindly, and no return of them took place.

As the child's health was not in the slightest affected, no treatment whatever was had recourse to. The tumours as they enlarged generally suppurated, scabbed, and then fell off by their base, and as this happened to more of them than was generated, a decided diminution soon took place, and at the present time there are only a very few remaining.

CASE II. presented itself at the Leith Dispensary for consultation on the 2d of April last. The child, Ann M'Queen, 2 years old, strong and healthy, has been affected with the disease for the last two months. The mother ascribes it to her having been carried about by a girl who had some "similar lumps" upon her body, while they resided at Dundee, and immediately before they came to Leith. The eruption at present occupies the left side of the neck and shoulder, and a few are scattered here and there upon the same side of the face and trunk of the body. The disease resembles very much in appearance the case last described. The small tumours have the same pearly appearance, and the larger ones, being slightly redder than the skin, and exuding a milky fluid from the orifice at their apex. The tubercles at present appear in groups, and irregularly scattered over the surface of the skin; their number may be from thirty to forty on the present patient. The mother states that the girl, who was primarily affected at Dundee, used to carry this child chiefly against that side of her neck. But neither the mother nor any other of the children in the family have any appearance what-

ever of the eruption. This, however, may be partly accounted for by the fact, that the dress of this child being tied up round the neck, prevents, in a great measure, at least, any immediate contact between the eruption and the skin of the other children. Several of the largest of these tumours were cut off with a pair of scissors, and the skin healed well afterwards; others were destroyed with the caustic potass and nitrate of silver, but still the number of them on the body of the patient is not much diminished.

The next case which presented itself was that of a young married man, whose wife I had attended in labour some weeks previous. It was observed during the progress of the labour, that numerous small tumours existed at the orifice of the vagina, and in the neighbourhood of the vulva, but, thinking that they might be condylomata, or warts, no further attention was paid to them. The husband, however, shortly after showed me a number of tumours on the penis, which bore the characteristic marks of *molluscum contagiosum*. Upon inquiry regarding similar tumours on his wife, he informed me that they were of the same kind as those on his penis. They occasioned him considerable annoyance, and he applied for the purpose of getting them removed. The larger ones were cut off with the scissors, and the smaller touched with nitrate of silver, and they have all entirely disappeared.

Since the above cases occurred, I have had an opportunity of witnessing a beautiful and well-marked case of this rare disease, occurring in a child under Dr Henderson's care in the Royal Infirmary.

This disease is as yet to be regarded as entirely British,—the latest authors in France, Germany, and America, making no mention whatever of it in their respective countries. We find Rayer, indeed, who wrote in 1827, and who is for referring the molluscum of Bateman to disease of the sebaceous follicles, saying, “*étaient ils autre chose que des tumeurs folliculeuses? est-il bien démontré que cette affection soit réellement contagieuse?*” It would appear from the cases which we have quoted, and from those which we have ourselves observed, that the disease has now been seen sufficiently often to enable us to answer M. Rayer's question in the affirmative. Dr Craigie, many years ago, saw reason to infer, from a case of the chronic molluscum which he communicated to the London Medico-Chirurgical Society, that this disease arises from “*some morbid or vitiated state of the sebaceous follicles;*” * and we have strong grounds for referring the contagious species with M. Rayer to disease of the sebaceous glands. The drawing of enlarged sebaceous follicles in M. Rayer's work on Diseases of the Skin is sufficient to show this, and resembles very much, indeed, the species of molluscum at present under consideration. Besides this fact, however, the position of *molluscum contagiosum* is principally that where the sebaceous glands are most numerous, as at the angles of the nose, mouth, and eyes; and in several attempts which we have made to inoculate the white matter of molluscum into healthy skin, they have all

* Craigie's Pathological Anatomy, p. 643.

been attended with failure ; while in one attempt which was made about a week previous to the period I write this, a slight enlargement is taking place over the follicle already, which leads to the suspicion that a tubercle is about to form on the spot. Nothing as yet, however, can be spoken positively of this observation.

Structure of the Tumours of Contagious Molluscum.—Dr Bateman having mentioned that the milky fluid which these tumours exude seems to be the medium of contagion in this disease, it appeared that it might be of advantage to examine the appearance of the milky discharge, and the structure of the tumours under the microscope. For this purpose, one or two of them were removed from the skin of Case II. on the occasion of her presenting herself at the Leith Dispensary on the 2d of April. The same afternoon, they were examined by my friend, Professor Reid, and myself, under his microscope, and a structure which we were unacquainted with, and which appeared to us peculiar, was noticed. Some days afterwards I removed one from Case I., which exhibited the same appearances ; and, more lately, the tumours from the penis of Case III. presented analogous characteristics. Since then, I have had many opportunities of examining these tumours, taken from Case II., and more lately, through the kindness of Professor Allen Thomson, under his very powerful microscope. The magnified drawings which are annexed, with the exception of Fig. 7, are either represented as seen by Professor Reid, and delineated under his own eye, or by Professor Thomson, and kindly delineated by him.

The structure of the tumours is that of numerous cells, which secrete a whitish milky fluid. This is received from the cells into a central cavity, or irregular-shaped canal, in the interior of the tumour, which conveys the secretion to the orifice of it, where it exudes spontaneously, or on the application of pressure. The cells of which the tumours are composed, when examined after the removal of the skin and cellular tissue, and while they are still covered with their investing membrane, have an irregular quadrilateral shape, some being five-sided, and presenting a very similar appearance to the cells of a honey-comb. This is shown in Fig. 4 and 6. When a thin section, however, is made of the tumours, and placed under the microscope, they are seen to have a long irregular shape, their external extremity being in contact with the investing membrane of the tumour, their internal one being prolonged into a nipple-like prominence. At the same time they are observed to be filled up with the peculiar globules of which the milky fluid is composed. Towards the external extremity of the cells, however, (Fig. 7, *a*,) the globules are observed to be less distinct than at *b*, the internal extremity. When the peculiar milky fluid is placed under the microscope, it is observed to be entirely composed of nucleated cells. These are very irregular in their shape, some being oblong, others ovate, and others having one side straight and the other of an irregular oval, see Figs 8 and 9. They vary also a little in size. Fig. 9 represents one of a medium size, magnified about 500 diameters. They are found to be about the 1000th part of an inch in size, be-

ing, consequently, two and a-half or three times the size of pus globules, and three and a-half times as large as those of blood. This body will be observed to consist of an external, thin, and transparent membranous vesicle, (*a*,) somewhat flattened in its shape, and when these bodies are massed together serving to unite them; and of an external vesicle, (*b*,) generally filled, as represented in the figure, with small granular matter. This granular mass, (*c*), in some, filled completely the tunic vesicle; in others, as in that represented, Fig. 10, it receded from its inner wall. These nucleated granules have, in fact, some resemblance to those of the epithelium. Some of the granules do not possess the external vesicle as seen in Fig. 9, and others possess it of larger size. This Professor Thomson is inclined to attribute to the more or less mature state of the secretions. The external vesicle not being yet developed until it reaches very nearly the free surface of the secreting cells, in this way the smaller size of the vesicles towards the outer extremity of the secreting cell, and their large size towards its internal or mammillary extremity, is easily accounted for—the external scale or vesicle not being at first developed, but its development and increase in size taking place as it becomes fit for evolution. In this way we find that the formation of this diseased structure is very similar to the development of animal and vegetable tissue, and not unlike that which Müller has described as taking place in the development of some kinds of carcinomatous structure.

The manner in which this disease must be communicated resembles much the account which Schwann and Schleiden have given of the development of animal and vegetable tissue.* The nuclei protrude young cellules, which project from their surface as the watch-glass from the watch. As growth proceeds, the young cell increases in size, while the nucleus remains imbedded in its wall." "Fresh nuclei form within the cavity of these young cells, and from a repetition of this process result successive generations of cells. The walls of the young cells are perfectly transparent, but those of the older cells become thickened, and in animal tissues often converted more or less into a fibrous structure." When one of these peculiar granules of which the milky fluid of this disease is composed, enters a sebaceous follicle, a similar process to that just described of nucleolar increase and cellular development take place,—the external vesicle of the primitive cell soon assuming a fibrous structure, and constituting the investing membrane of the subsequent tumours.

The peculiar cells of which the white fluid is composed are easily distinguished by a very moderate magnifying power, and appear to be peculiar to this disease, in so far as I have been able to observe. With this view I have observed microscopically the contents of atheromatous and melliceritious tumours, the contents of sebaceous follicles in health and in disease, &c., but have not been able to see anything similar. As a proof of their being easily distinguished again under the microscope, I found a small abscess at the base of a cluster of these tumours on the neck of one of the patients. I took

* On the Nature and Structural Characteristics of Morbid Growths, by J. Müller, M. D., translated by C. West, M. D. 1840, p. 21.

some of the contents of it, for the purpose of examining whether or not it might be the same secretion as the molluscum; but it was found entirely composed of pus globules. The milky fluid of the molluscum was then mixed with it, together with some blood globules, and the vesicles of molluscum, being much larger than either of the other two, were easily distinguished; and, although the magnifying power was not more than 100 diameters, the distinction between the three sets of globules was easily made out.

General Observations.—We have already mentioned that this disease appears to be entirely British; no case of it having as yet been recorded in so far as we are at present acquainted in the records of any other country. It will, doubtless, however, be sooner or later noticed in other countries.

It would also appear to be entirely an infantile disease; at least primarily, by which I mean that the first of a series of cases (the aboriginal one) has always been an infant. The first case that Dr Bateman saw, that of a young woman, received the contagion from a child affected with the disease, whom she nursed; two other children of the same family were also affected with it. The second case was also that of an infant who had apparently got it from an older child who was in the habit of nursing it. The series of cases which Cazenave and Schedel have related, and which occurred to Drs Carswell and Thomson, first appeared on a young boy, next upon a girl, and then the infant at the breast.

The case which has been related on the authority of Professor Thomson, and which occurred in the country, originally appeared in a child of one of the farm-servants. This child communicated it to a child of the farmer's, it being thus conveyed by the most direct contact to the neck of the servant girl who kept the last mentioned child.

Dr Henderson's case, where, I believe, he could not trace the contagion, also occurred in a child, and the two first series of cases which have been here related occurred in children. The first case appeared on a child, and was communicated to the breast of the mother. The second case was communicated to the child by an older child that nursed her. The third case which I have related cannot be adduced either in evidence for or against, as, from delicacy, it was impossible to gain any satisfactory information from the parties. We have every reason, therefore, for believing that it is a disease, if not entirely originating in children, as certainly most frequently originating in, and being communicated to children, and therefore to be looked upon as truly an infantile disease.

Character of the Eruption.—The eruption in all the four cases which I have witnessed has borne a striking resemblance to each other. They all commenced in the shape of minute pearly granulations, and, increasing in size, became more of the natural colour of the skin. When of the size of a vetch, a minute opening generally became visible on their apices, and emitted a whitish milky fluid on pressure; as the tumours enlarged, they became irregular in shape and "sessile upon a contracted base." Their size varied from a pin-head to a hazel-nut, and their progress in reaching the largest

size was very various, but generally slow. In Bateman's case a twelvemonth had elapsed between the period at which the tubercles began, and that at which the application was made.

In Case II. they followed a much more rapid course than in any of the other cases. They may be looked upon as most generally occurring in irregular clusters of 3, 5, and sometimes even 20. This character is distinctly to be noticed in Dr Bateman's plate, and is beautifully portrayed in a delineation of the first of Dr Thomson's cases, which exists in his magnificent collection. In all the cases we have seen, this fact has been noticed. Although they bear a very chronic character they appear to undergo spontaneous destruction and cure.

When this takes place, either a slow suppuration is established, which soon leads to the shrinking up and death of the tumours and their subsequent falling off; or, as we have seen when they were frequently irritated by picking them with the fingers, inflammation was excited, which soon led to the shrinking up and death of the tumours before any suppuration was established.

The *Molluscum contagiosum* appears not to be a disease of a dangerous nature. The case which Cazenave and Schedel relate on the authority of Dr Carswell, proved fatal, but whether from this disease or any other is not stated. The case which lately occurred in the Royal Infirmary, under the care of Dr Henderson, proved fatal; but we believe that death did not take place from the cutaneous disease. All the other cases which have been recorded were of an extremely mild nature, and, indeed, unless from the irritation of the tumours in the neighbourhood of the eyelids and mouth, giving rise to conjunctivitis and slight irritative fevers; the disease might be said to be one without even uneasiness. Sometimes, however, we find that the conjunctivitis proves very distressing. Professor Thomson informs me that the farmer's child, which has been previously mentioned in his second series of cases, ran great danger of losing its eye-sight in consequence. Another annoying affection which has been mentioned by Dr Bateman, and occurred to a considerable extent in Professor Thomson's and Dr Carswell's case, was an enlargement of the glands in the neighbourhood of the eruption. This latter is very likely to occur in consequence of the irritation of the eruptive disease on the skin in their immediate neighbourhood.

Treatment.—We have already mentioned the course which nature follows in getting rid of these tumours, and in one case we allowed her to keep the treatment in her own hands till nearly a perfect cure was established.

In other cases, however, their progress is slow, troublesome, and they disfigure the person; it is, therefore, necessary to do something for their removal. Professor Thomson found in his experience the sulphate of copper, both in strong solution, and applied solid, effected the destruction of the tumours with sufficient rapidity. Previous to my being aware of the observations of Professor Thomson, I had applied the solid nitrate of silver to the tops of the tumours, and in one case I used the caustic potass, which certainly proved by

far the most speedy and effectual method of cure. From the insensibility of the tumour the application of escharotics gives rise to no pain, and their destruction is speedily effected.

We have not given a proper trial to internal remedies in this disease. Dr Bateman, however, found in his first case, that, after administering the arsenical solution in small doses for a month, "the tubercles were universally diminished, both in number and magnitude, most of them having gradually subsided, a few, especially on the neck, had suppurated." We have tried the arsenical solution in small doses, in Case II. it was not, however, continued so long. We also tried the *Aq. Potassae*, and found no appearance of improvement whatever, although both sets of remedies were continued for about a fortnight. Indeed, during their administration, the disease seemed to follow its usual course of production and of spontaneous suppuration and decay. In Case I. also, the disease followed a very similar course to what Dr Bateman has described, and has become nearly free of the affection, although no treatment whatever has been had recourse to. With regard to other remedies, we have made no trial whatever of them, and are inclined to look upon internal remedies in general as too tedious, when the local ones can be applied with so little pain to the patient, such surety to the destruction of the tumours, and in so much a shorter space of time.

Explanation of Plate.

Fig. 1. Represents the appearance of the face of case first, who communicated the disease to the breast of her mother, while the neck of the same figure shows the appearance which case second presented, having received the disease from a girl that nursed her. Both the children were females, and about the same age,—two years.

Fig. 2. Shows a patch of skin on which the disease from the shoulder of case second is represented of nearly the natural size.

Fig. 3. Represents the tumours in profile.

Fig. 4. Represents the appearance of the tumours when deprived of the skin and cellular tissue; the transparent investing membrane distinctly shows the shape of the cells shining through it.

Fig. 5. Represents a section of one of these tumours, *a.* the cells of which they are composed, discharging the milky fluid towards *b.* the canals or cavity, which conduct it to *c.* the orifice.

Fig. 6. Represents an enlarged external view of the base of the cells with their shape and arrangement.

Fig. 7. Represents cells under the compressor, and the milky fluid escaping.

Fig. 8. Gives a magnified representation of the cells. Upon a thin section being made, and placed under the microscope, the peculiar granules of which the milky fluid is composed, are distinctly seen occupying the cells, and increasing in size as they reach the nipple-like prominence and cavity of the tumour; *a.* the internal extremity of cells, and nipple-like prominence; *b.* the external extremity; *c.* the peculiar granules.

Fig. 9. Represents the peculiar globules of the milky secretion of this disease. They are observed to be of irregular shape, oblong or oval, and to contain nucleoli.

Fig. 10. Represents a medium sized granule, of which the milky fluid is composed, magnified about 500 diameters; the granule itself is about $\frac{1}{1000}$ of an inch in diameter. *a.* represents the external cell; *b.* the vesicle or granule; and *c.* the granulated nucleus.



Fig. 1.

Fig. 3.



Fig. 2.



Fig. 6.



Fig. 4.



Fig. 7.



Fig. 5.



Fig. 10.



Fig. 8.



Fig. 9.









