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tion is, I conceive, a merit which gives the British Association a just claim to the gratitude of the scientific world.

Trin. Coll., Cambridge, Oct. 2, 1840.

XLVII. *Observations on certain Peculiarities of form in the Blood Corpuscles of the Mammiferous Animals.* By GEORGE GULLIVER, F.R.S., F.Z.S., Assistant Surgeon to the Royal Regiment of Horse Guards*.

I N the course of an extensive series of observations†, I have had occasion to remark, that the red particles of the mammiferous animals are singularly susceptible of change in size and form, as if from the effect of organic contractility‡. My attention had long been directed to this subject, when it became still more interesting to me from the results of the examination of the blood of certain deer. A notice of the singular appearances assumed by the blood corpuscles of these animals was given in the Dublin Medical Press of December 18, 1839, and in the Philosophical Magazine for January, 1840; and more fully described, with an illustrative drawing, in a paper read before the Royal Society in February, 1840, and which forms part of the present communication.

In that paper I expressed a doubt whether the remarkable forms presented by the blood particles might not have resulted from changes in the ordinary blood discs; for it was observed that the peculiar figures were more numerous after the blood had been allowed to stand for a short time, while they all disappeared and returned to the circular form when treated with a small quantity of water. In continuing my observations I soon had further reason to confirm this view, as I mentioned in a note on the subject written in the beginning of last March to Dr. Davy. In some specimens of blood which I had recently obtained from the Mexican, Porcine, and Persian Deer, the peculiar corpuscles were by no means so numerous as on former occasions, and in some of the trials were seen but very sparingly, while in other instances the singular particles were present as abundantly as ever.

Hence it became important to ascertain the conditions

* Communicated by the Author.

† Lond. and Edinb. Phil. Mag. for Dec. 1839, and in the Numbers for January, February, March, and August, 1840.

‡ Mr. Ancell, in his excellent "Lectures on the Blood and other Animal Fluids," mentions that Schultz describes the blood corpuscles as possessed of very remarkable organic contractility. See *Lancet*, 1839, p. 147 and 386. Eben and Mayer regarded the red particles as infusory animals.

I take this opportunity of expressing a hope that we may soon have an English version of the interesting papers entitled, "*Untersuchungen über die Structur und Veränderungen der Chylus- Lymph- und Blutkörperchen*," by Dr. Herman Nasse, and published in the valuable "*Untersuchungen zur Physiologie und Pathologie*;" by Drs. Friedrich and Herman Nasse, zweiter Band, Heft 1 and 2.

under which these particles were produced; and although my researches have not hitherto proved perfectly satisfactory in this respect, yet it appears to me that they afford evidence that the blood corpuscles have a contractility or irritability inherent in themselves, which may continue some time after their removal from the body, and enable them to assume permanently the very anomalous forms which I have described and figured. In some instances a large number of the red granulated particles appeared to be produced by the irregular shrinking of the smooth discs*, in others there was a manifest contraction of the particles while under examination in their own serum†, and the corpuscles were very quickly and remarkably modified in figure when extravasated and subjected to contact with the neighbouring tissues‡, evincing the readiness with which the blood discs assume new forms, perhaps connected with the plastic force. It has appeared to me also, that in some cases modifications in the shape of the blood discs might be attributable in great measure to violent action of the heart produced by the fright and struggles of the animal; for when the blood was obtained without at all alarming him the irregular corpuscles were not numerous, while these particles were seen abundantly in blood which was taken when the deer was confined, and made every effort to struggle and get loose, so that the circulation became greatly accelerated. In the Muntjac, a very shy and wild animal, the peculiar particles were always seen in great numbers; but from the more docile Mexican, Porcine, and Persian Deer, a drop of blood could occasionally be obtained before the animal was aware of the operation, and in such cases the irregular shapes were observed but sparingly.

However, although I am disposed to think that in some ruminants, particularly in those just mentioned, the peculiarities in the particles were more or less influenced by the state of the circulation; yet, from the result of a few trials on other animals, it did not appear that fright or violent muscular exertion was always capable of producing the singular forms in question, although it seems to me that the previous observations render it worthy of inquiry, how far the blood discs may be affected by the state of the circulation, or their contractility influenced through the medium of the nervous system. That the blood particles do contract and assume various forms, is certain; but whether this be a vital or merely a physical phenomenon, is a subject of much interest, and well deserving of new researches. There appears to me to be some good grounds for believing that the blood corpuscles do possess an inherent power of contractility.

* See Lond. and Edinb. Phil. Mag. for February, 1840.

† *Ibid.*

‡ *Ibid.*

The following paper, already referred to, contains a description and figure of the peculiar corpuscles before mentioned. I have since seen similar forms in the blood of some other animals; and recently in one of the carnivora (*Genetta tygrina*) I observed the crescentic, spear-shaped, and sigmoid particles in great numbers. The animal was so difficult to secure, that its circulation must have been much excited before the blood was obtained. In a second trial, when the blood of this genet was examined immediately, the peculiar corpuscles were not abundant, although in the course of a few hours there were scarcely any other particles to be observed, and the forms shown in the wood-cut remained until putrefaction began.

It will be seen from the figure, that the appearance of many of these corpuscles is very similar to that of the elongated cells represented by Schwann as concerned in the growth of certain tissues. Dr. Martin Barry has lately noticed that the blood corpuscles in certain cases undergo rapid changes; and he announces that the muscular tissue, and the cells of the chorion, are formed from the corpuscles of the blood*. The pus globules, which have recently been regarded as organic cells, have been frequently considered in this country as transformed blood discs, and on the continent M. Gendrin announced that he had actually seen the blood corpuscle changed into the pus globule†.

Observations on the Blood Corpuscles of certain Species of the Genus Cervus. By GEORGE GULLIVER, F.R.S., Assistant Surgeon to the Royal Regiment of Horse Guards.

(Read before the Royal Society, Feb. 6, 1840.)

The blood corpuscles hitherto described in the vertebrate animals, have either a circular or an elliptical form. Till the late discovery by M. Mandl, of the latter shape in the particles of the Dromedary and Alpaca, and my more recent observation of the same form in the Vicugna and Guanaco‡, the blood discs were supposed to be circular in all the mammalia, and the oval corpuscles to be confined to the lower divisions of the vertebrate animals.

I have now to describe some peculiar forms of the blood corpuscle, which I believe have not hitherto been observed

* Proc. Royal Society, May 7, 1840.

† See my Researches on Suppuration, Phil. Mag., Sept. 1838; on the Softening of Fibrine, Med. Ch. Trans. v. xxii.; on Pus, London Medical Gazette 1839—1840, pp. 201 and 415.

‡ See Dublin Medical Press, Nov. 27, 1839. My paper on the Blood and Pus particles of the *Camelidae*, just published in the twenty-third volume of the "Transactions of the Royal Medical and Chirurgical Society," was read before that Society, Nov. 26, 1839.

in any class of animals. These corpuscles I have examined particularly in the Muntjac, Porcine, and Mexican Deer.

I observed in the blood of these animals a large quantity of crescentic or lunated particles, besides a few of the common circular figure. The former are very remarkable from their great number and distinct shape; they are acutely pointed at the ends, gibbous in the middle, with a convex and concave margin; or being without the concavity, they merely present the figure of the segment of a circle.

But there are other forms equally singular: frequently they are not curved, but straight, and gibbous at the sides—lanceolate, to use a botanical term; occasionally they are obtuse at one end, something like a comma in shape; or, from an acute projection of the convex part, approaching to a triangular figure. I have seen them also nearly square, and not uncommonly with elongation of the angles and concavity of the margins, the latter peculiarities being also sometimes observable in the triangular particles. Finally, they may present a sigmoid figure, as if from twisting of the ends of the lanceolate forms.

Like the common blood discs, these peculiar corpuscles are easily deprived of their colouring matter and rendered invisible by water; but if only a very small quantity of this fluid be added to them, they quickly swell out and assume an oval or circular figure, forming, by the approximation of their edges, long bead-like strings. When treated with saline solutions, the oblong particles become rather smaller, but preserve their figure tolerably well.

These singular particles constitute the greater number of those present in the serum, particularly if the blood be kept three or four hours after having been taken from the animal; and the forms are often well preserved in cool weather for nearly a week; in perfectly recent blood they seem to be rather less numerous, although in a short time all the shapes may be recognized abundantly*.

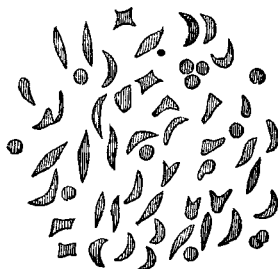
If these singular corpuscles are merely the result of changes of form in the circular discs, such transformations would appear to be altogether peculiar, and at variance with all our previous knowledge of the blood corpuscles of the mammalia.

The first impression will probably be that some of the forms I have described are those which may be presented by different views of the circular discs as they revolve on their axes. Hence it may be necessary to observe, that the crescentic corpuscles are sometimes seen to turn over in the field

* The blood was constantly examined as soon as possible after it was taken from the animal—often within twenty minutes, and always in less than an hour; and in every case directly the blood flowed through the wound specimens were dried instantaneously on glass, with the precautions mentioned in my paper in the Phil. Mag. for Feb. 1840.

of vision, and that the lanceolate particles often so revolve. Besides, their length much exceeds the diameter of the circular discs; the extremities of the oblong corpuscles are acutely pointed, and their form and appearance is altogether remarkably distinct and peculiar. Finally, I have preserved dried specimens, which I shall be happy to show to any gentleman who may feel an interest in the subject; and as the animals are alive in the collection of the Zoological Society, no difficulty is likely to remain in the way of inquiry into the facts recorded in this paper.

For the accompanying drawing (see wood-cut) I am indebted to my friend Mr. John Dalrymple, who executed it from two portions of blood which I sent to him for the purpose; one being dried on glass, and the other preserved in a weak solution of common salt. The larger group represents the corpuscles as he saw them with a deep achromatic object-glass adapted to a compound microscope. The smaller group exhibits the most remarkable forms of the corpuscles selected and compared together.



The following observations were made at the time the blood was examined.

1. Reeves's Muntjac Deer (*Cervus Reevesii*). The circular discs 1-7200th to 1-6000th of an inch in diameter; the oblong particles from 1-4000th to 1-2666th of an inch in length, and 1-12,000th to 1-8000th in breadth, at the gibbous part. Examined in the recent state, also in urine, in a weak solution of muriate of soda, and dried on glass. In the fresh specimens, the spear-shaped, lunated, and common circular corpuscles often seen turning over in the field of vision. There appeared to be a very great variety in the form of the corpuscles; for besides those already described, there were many oval and egg-shaped, and even triangular or square particles, the two latter indeed not so accurately defined as the former. All these figures may be seen in the corpuscles of the Mexi-

can and Hog Deer, but not so numerous as in this specimen of blood from the Muntjac. It was obtained from a vein of the ear; the animal a male, nearly full-grown, and bred in the Zoological Gardens, where its parents died, and are preserved in the museum of the Society.

2. Mexican Deer (*Cervus Mexicanus*). Circular corpuscles not so numerous as some very singular oblong particles, similar to those seen in the blood of the Muntjac. The circular corpuscles generally about 1-6000th of an inch in diameter; the oblong corpuscles 1-3200th to 1-2400th of an inch in length, and 1-12,000th to 1-8000th in breadth, at their gibbous part. In this situation a few of them are as large as the circular discs. The blood examined was obtained from a vein of the ear of a female, apparently full-grown. The observation was the same whether made on the recent or dried blood. The veins in the ear of the animal are numerous and very apparent. From another bleeding, a week after the first, the same result obtained.

3. Hog Deer (*Cervus porcinus*, albino var.). In some blood obtained from a prick of the upper lip, the corpuscles were found to be similar in size and shape to those described in the Muntjac and Mexican Deer, except that some of the circular discs appeared a little larger, and they were generally as numerous as the singular oblong corpuscles. For a second trial, some blood was obtained from an incision of the ear, about a fortnight after the first bleeding, and the former result confirmed. The animal was a male, apparently full-grown.

In conclusion, it may be remarked that the peculiar particles now described, so singularly variable and anomalous, and susceptible of such remarkable mutations in their figure, afford a very interesting subject for further inquiry, which may probably illustrate the physiology of the blood corpuscles. At present so little is known respecting these curious bodies, and so much is to be expected from future research, that we know not what degree of importance may belong to them, although there is reason to believe that the discovery of their use and method of formation would be of great value to science.

An Appendix to the "Observations on the Blood Corpuscles of certain Species of the Genus Cervus." By GEORGE GULLIVER, F.R.S.

(Read before the Royal Society, Feb. 6, 1840.)

Since I had the honour of transmitting my communication to the Royal Society "on the Blood Corpuscles of certain species of the genus *Cervus*," I have had an opportunity of examining some blood obtained from a deer lately received at the Zoological Gardens from the Persian mountains. I am

not aware that the species of this animal has yet been determined, or indeed whether it has ever been described. It is about as large as a full-grown fallow deer.

The blood was procured from a puncture in the upper lip of a female, under circumstances very favourable for the preservation of the size and figure of the corpuscles; they were quickly dried on slips of glass, and submitted to observation with as little delay as possible.

The greater part of the blood corpuscles presented the usual circular shape, although often irregularly triangular, quadrangular, or polygonal; and there were many of the singular forms described in the Muntjac, Porcine, and Mexican Deer. The latter particles corresponded very nearly in size with the measurements already given; the former were rather larger, having an average diameter of $\frac{1}{5066}$ th of an inch, the small and large discs measuring respectively $\frac{1}{6000}$ th and $\frac{1}{4000}$ th of an inch.

Although I would not venture to communicate to the Society any account of the blood corpuscles from a single observation, yet it appears to me that the present one may be considered as an addition to those which I have already made, with as much care as I could, concerning the blood of the other species of deer.

Whether the peculiar corpuscles exist in the circulation of the animals, or may be the effect merely of changes in the form of the circular discs immediately after their abstraction from the vessels, is a subject for further and special inquiry, and one which may tend to throw some light on the nature of the blood corpuscles. But whatever may be the result, the facts will hardly be less singular and remarkable, and I am not aware that they have hitherto attracted the attention of physiologists, notwithstanding the minute examination to which the blood particles of different animals have lately been subjected.

XLVIII. On some Combinations of Arsenic with Cobalt. By THEODORE SCHEERER, and WILLIAM FRANCIS.*

THE combinations which we have to describe in the present paper, were formed in the course of a smelting process which was introduced some years since by Inspector Roscher, into the smalt-works at Modum in Norway. The object of this process is to deprive the prepared and roasted cobalt ores of a great part of their iron and arsenic by smelting, in order to obtain higher and purer kinds of smalt from them.

First Combination.—This forms long fascicular conglo-

* Communicated from Berlin by the Authors.