

Please note: this is very heavily edited version of the original paper by von Baer. The original letter was over 30 pages long.

On the Genesis of the Ovum of Mammals and of Man
A Letter to the Imperial Academy of Sciences of St. Petersburg
By Karl Ernst von Baer
1827

Very Distinguished and Illustrious Gentlemen!

I shall make no attempt to express how greatly I have been exalted by your approval of me, which you indicated by electing me as a corresponding member of your Academy. First of all, I, a man of no renown, have been associated with men whose names are of the greatest importance in the republic of letters, and I shall make every effort to follow in the footsteps of those great men. I believe I could not thank you more suitably for your kindness than to share with you a very recent discovery which it gives me the greatest pleasure to present under your auspices, since it pertains to an account of development; for, when the subject of conversation turns to the investigation of nature's formation of new living things - who is unaware of the unparalleled distinction of your Academy!

The origins of the Canine Foetus

Almost immediately after my illustrious colleague Burdach had invited me to make some contribution to the knowledge of mammalian development, I began to devote myself to these investigations, and I was able to observe in the pregnant dog ova very useful for the comparison of their development with the ova of mammals and birds. Indeed, I might almost have worked out the anatomy of this stage of development then, if at the time I had been sufficiently versed in such researches; but because of faulty method I destroyed two of the four ova, and as a result I was then unable to indicate the disposition of the vascular area. I dissected out the still vital uterus of a live dog, a practise which I now strongly oppose; for although you may achieve your purpose by this method in other mammals, yet in the dog the less developed ova are always torn to pieces by the contractions of the uterus, as seems to have happened in the case of those observers who did not discover ova in the mammalian uterus even several weeks after conception (Gottingen gelehrte Anzeigen von Jahre, 1824, p 195). Two hours later I undertook to remove the third ovum from the uterus, which now lacked all vitality. After the horn of the uterus had been very cautiously cut upward, I clearly saw the external membrane of the ovum intact and equipped with numerous villi; but when I laid down the scalpel in order to consider this membrane, the margins of the uterus which had been very closely joined to those villi had retracted, and I saw it had brightly reddish vascular area. Finally in the afternoon I extricated the fourth ovum intact from the uterus, which was now a little flaccid. I spent several hours examining and delineating the membranes and other things, and as a result when I turned to the microscope examination of the vascular area I was no longer able to discern its limits, which I was then compelled to leave in doubt.

[von Baer then goes on to describe the development of the foetus in dogs and rabbits. During these investigations he notices...]

At the opening of the tube in the same uterus I found a very small granule, conspicuous by its whiteness and swimming freely, which under the microscope appeared as a medium-sized, opaque globule with a halo or lucid periphery. What if this little body, although opaque, were an ovum just slipped down from the tube? Or what if the little opaque globule were the vitellus of the future intestinal sac, and the periphery of the cortical membrane?

Impelled by these considerations I undertook to compare ova yet retained in the dog's tubes. This turned out well, for I purchased a dog in which the corpora lutea were open and in which there was no ovum in the uterus; but in the tubes I found little punctiform bodies of whitish-yellow, which exactly resembled the granules just mentioned except that the latter seemed a little larger. I shall now describe this discovery more fully. In the middle was a globule, completely opaque under the microscope, with a surface which was granular rather than smooth and even, for the whole globule was formed of densely packed granules surrounded by a scarcely observable membrane. The globule was surrounded by a narrow, transparent space and a periphery covered by a thin layer of very small granules. After an overnight maceration the greater part of this powder became separated, whereby a continuous and simple membrane came into view. As a result, we recognised the cortical membrane and the internal globule, but I now much regret that I did not attempt to determine by experiments whether or not the globule lacked a cavity; indeed, it seemed solid, but this was refuted by subsequent observation.

Our ova were of remarkable smallness, for those I measured under the microscope were only $\frac{1}{180}$ of an inch in diameter. Nevertheless when they were in view they were readily observed with the naked eye because of their whiteness, but they were very easily concealed by the intervening wrinkles and little folds of the tube. Hence I freely confess that I found only three, although from the number of corpora lutea I expected six. Nonetheless I can only explain the frustrated efforts of many anatomists seeking the ova within the tube by suspicion that they sought transparent ova and thereby neglected the true ones, although I do not know whether or not the ova in the tubes of all mammals are opaque. Up to the present I have not seen the porcine ova in the tubes because of their very small size and I have not sought rabbits' ova in the tubes.

Ovules in the Ovary of the Dog

It remained for me to ascertain the condition of the ova in the ovary, for it seemed clearer than light that the ova were not the very small Graafian vesicles expelled from the ovary, nor did I consider it likely that such solid little bodies had been coagulated in the tubes from the fluid of the vesicles. When I examined the ovaries before incising them, I clearly distinguished in almost all the vesicles a whitish-yellow point which was in no way attached to the covering of the vesicle, but as pressure exerted with a probe on the vesicle indicated clearly, swam freely in its liquid. Led on more by inquisitiveness than by hope of seeing the ovules in the ovaries with the naked eye though all the coverings of the Graafian vesicles, I opened a vesicle, of which, as I said, I had raised the top with the edge of the scalpel - so clearly did I see it distinguished from the surrounding mucus - and placed it under the microscope. I was astonished when I saw an ovule, already recognised from the tubes, so plainly that a blind man could scarcely deny it. It is truly remarkable and astonishing that thing so persistently and constantly sought and in all compendia of physiology considered inextricable, could be put before the eyes with such facility.

[von Baer then goes on to describe the detailed physiology of the canine ovule.]

How the Graafian Vesicles Are Constructed, and General Considerations of the Mammalian Ovule

In the dog the Graafian vesicles are too small to be examined with success, but I have often investigated them in pugs and, I believe, very accurately. I have compared the vesicles of cows, sheep, dogs, rabbits, the stag, porpoise and dolphin, as well of man, with them, and I have persuaded myself that in all these animals the structure is the same, although in the smaller animals it happens that not all strata are so well separated as in the pig, cow and dolphin.

[Section 5 describes a review of the development of the mammalian foetus, including dissections of pregnant women]

Comparison the Mammalian Ovule with the Ova of other Animals

[following a lengthy description of the ova of many other animals]

Therefore when we consider the ova and generally the maternal body, the Graafian vesicle is the mammalian ovum. But as to its development, it differs greatly from the ovum of other animals in which the nucleus of the ovum is carried down from the ovary as a whole, not only providing a site for the future foetus but also transforming itself into the foetus.

Conclusions

Every animal which springs from the coition of male and female is developed from an ovum, and none from a simple, formative liquid.

The male semen acts through the membrane of the ovum, which is pervious by no foramen, and in the ovum it acts first on certain innate parts of the ovum.

Photos by Paul Silverthorn

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