

LATVIJAS ŪNIVERSITĀTES SALĪDZINOŠĀS ANATOMIJAS UN
EKSPERIMENTĀLĀS ZOOLOĢIJAS INSTITŪTA DARBI
PUBLICATIONS
OF THE INSTITUTE OF COMPARATIVE ANATOMY AND
EXPERIMENTAL ZOOLOGY OF THE LATVIAN UNIVERSITY

№ 41

A. Dauvart

*Simultaneous Heterotopy of Testis and Fat-
body in Rana temporaria.*

R I G A

1933.

(From the Institute of Comparative Anatomy and Experimental Zoology of the
Latvian University, Riga. Director: N. G. Lebedinsky)

Simultaneous Heterotopy of Testis and Fat-body in *Rana temporaria*

by
Anna Dauvart
(With 3 Illustrations)

Some years ago (1926) I described a case of heterotopy of the testis in a male *Rana temporaria*. In this report I also quoted the publications of previous investigators dealing with such cases, as far as they were accessible to me. A year later (1927) I made observations in a male *Rana esculenta* on a heterotopical fat-body, which, as in the case of the testis, was found on the left side of the mesentery.

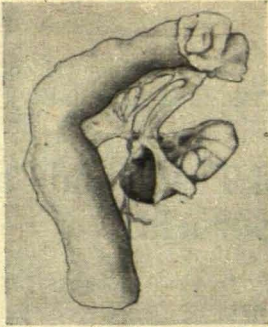
In 1932, at the end of April, I dissected a male *Rana temporaria*, caught in the act of copulation, and found on its mesentery an unusual formation, which undoubtedly seemed to be a heterotopical testis. Lifting the alimentary duct I found on the left side on the normal site of the testis only a fragment of it. On the same side of the abdominal cavity I also found a clew-like organ, whose structure recalled that of a fat-body. As I could take no photograph of this organ immediately, I prepared the duodenal flexure with that part of the mesentery to which the apparently heterotopical testis was attached and fixed it in *Zenker's* fluid. (Fig. 1). After this, I prepared the organs of the alimentary duct and preserved the frog in toto in 10 per cent formalin.

The present case of heterotopy has some similarity in its topographical conditions with the two cases previously described by me, at the same time showing the distinct difference in the simultaneousness of a heterotopical fat-body on a site not already recorded. Therefore I think it necessary to report it.

The heterotopical testis is attached to the left side of mesentery near to duodenal flexure. The connective tissue embedding the gland



is richly supplied with blood vessels. Especially the distal end, lying in the direction of the duodenum, is wholly wrapped up in a compact net of blood vessels (Fig. 1).



1. *Rana temporaria*. Heterotopical testis on the duodenal mesentery. Enlarged 4 \times .
Vardes heterotopais sēklinieks pie duodenālā mezenterija

Fig. 1

The right testis is in the usual place. Beside it lies the remaining part of the left testis. In the case described here the mechanical derangement has worked upon the oral end of the gland or its „Anlage“, as the remaining part of the left gland is more caudal. That is true of the heterotopy of the fat-body (Fig. 2).

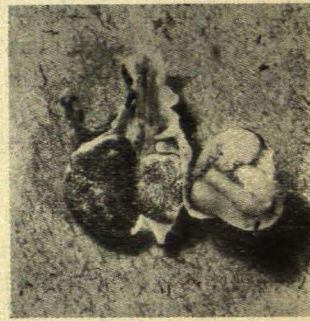
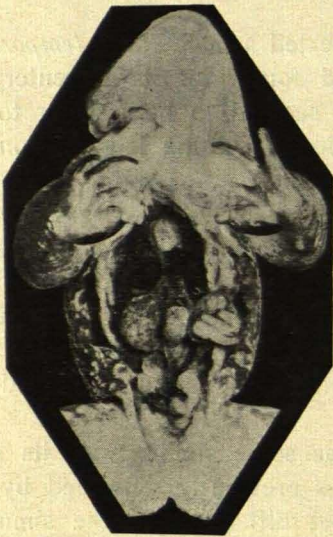


Fig. 2-b

Fig. 2-a

2. *Rana temporaria*: a — normal right testis, part of the left testis and beside it the heterotopical fat-body. b — as in fig. 2 a, slightly enlarged.
a — Labais normalais sēklinieks. Kreisā sēklinieka daļa un blakus tam heterotopais taukķermenis kamolā. b — kā zīm. 2 a, mazliet palielināts.

Measuring and weighing the organs preserved in 80 per cent alcohol the following data were obtained:

	Lenght mm.	Breadth mm.	Volume cu. mm.	Weight mgr.
Normal right testis	8,6	6,1	52,46	110
Part of the left testis	6,5	4,6	29,90	40
Heterotopical testis	2,7	1,5	4,05	6
Fat-body on the normal site (few lobes)	—	—	—	10
Heterotopical fat-body	8,5	7,3	62,05	95

Although the part of the left testis remaining on its usual site is only about half the volume and weight of the right gland, the volume and weight of the heterotopical testis is far below it. The data of the weight show that on the usual site remains only a very small part of the fat-body, a few lobes of 10 mgr. in weight, while the bigger part, 95 mgr. in weight, is heterotopical. The figure (Fig. 2-b) shows, that one of the lobes of the normally sited fat-body is connected with the bulk of the heterotopical one.

For microscopical studies the object was embedded in paraffin and sections of 6 to 8 micra thick made. The sections were stained after the haematoxylin-eosin and *Mallory's* three colour methods. The right testis as well as the normally sited part of the left testis have the typical microscopical structure usually observed in spring, the spermatic tubules being filled with mature spermatozoa.

The heterotopical testis is enclosed in a relatively thick cover of connective tissue. Between the spermatic tubules, especially near the surface of the gland, are found large tufts of connective tissue, which phenomenon is in contrast to the normally developed testis of the frog, where between the spermatic tubules interstitial tissue is scarce. In the central part of the gland the walls of the tubules almost disappear. Careful examination of all sections showed, that the tubules are filled with seemingly degenerated spermatic cells of indefinite shape and different sizes. (In the case reported in 1926 the spermatic cells were almost all of the same size and seemed to recall spermatogons united into spermatocysts [*Witschi*, 1924]). Chromatin grains stained in different intensities are seen, but definite mitoses are found nowhere. Spermatozoa, too, can nowhere be observed. This leads to the conclusion that the heterotopical testis, in the condition of its germ cells and also in the richly developed interstitial tissue, is somewhat similar to a transplanted mammalian testis (*Steinach* and others). It is well known, that cryptorchic testicles also lack normal spermatogenesis, showing hypertrophy of

interstitial tissue. Vasectomy often gives similar results also (quoted from *Harms*, 1926, and *Lipschütz*, 1924).

As regards the spermatozoa, the more distant site of attachment of the gland to the mesentery must be regarded as an exception, as here is found a small fragment of testis, in whose spermatid tubules there are spermatozoa in some 13 sections (6 micra thick). The walls of the tubules are covered with one or two layers of germinal epithelium. In the central part of the tubules 5 to 8 tufts of spermatozoa are found. The diameter of the tubules amounts only to 136 micra.

On one of the microscopical sections of the central part of the fragment of testis the wall between the two tubules has disappeared and a pair of spermatozoa tufts are found in the opening. On the next section a small pore is found in the wall of the tubule. The pore opens into the cavity formed by some strands of connective tissue, and thus forms an outlet for the spermatozoa into the body cavity. This endorses the opinion both of *Gerhartz* (1906) and *Nussbaum*, that even the smallest piece of testis can have a typical structure and show normal function if it has an outlet for its products. *Brambell* (1929) also describes a hermaphrodite germinal gland (ovotestis) of a pig, where on the surface of the testicular part of the gland were observed pores leading into the body cavity.

The heterotopical fat-body is connected with one of the lobes remaining on the normal site although the connexion is a slight one, as seen in the microscopical section. Its microscopical structure is like that of a typical fat-body, yet showing the difference, that in its adenoid tissue, especially in the central part of the fat-body, are found quite large fissures or cavities, quite filled with small lymphocytes. These fissures seem to be formed during the process of folding of the fat-body. The adenoid tissue is also richly infiltrated with lymphocytes. Beside the typical reticulated adenoid tissue strands some independent straight connective tissue strands are found.

In the three cases described by me there is one characteristic feature common to all, viz. that the left side of the frog has suffered from the mechanical derangement. This does not confirm the opinion of *Gerhartz* and others that supernumerary germinal glands are mostly found on the right side. But then the cases of such anomalies observed in frogs are still very few, and it is not possible to draw any conclusions in this respect. It seems that chance, too, plays here its rôle. The causes of the development of such heterotopies seem to me, as to *Merkel* and *Gerhartz*, to be derangements of a mechanical nature.

References.

1. **Brambell, F. W. R.:** The Development of Sex in Vertebrates, London, 1930.
2. **Dauvart, A.:** Ein Fall von Hodenheterotopie bei *Rana temporaria**). W. Roux' Archiv f. Entwicklungsmech., B. 108, 1926.
3. **Dauvart, A.:** Heterotopie des Fettkörpers bei *Rana esculenta* var. *ridibunda*. W. Roux' Archiv f. Entwicklungsmech. der Organismen, B. 109, 1927.
4. **Harms, J. W.:** Körper und Keimzellen. Zweiter Teil. Berlin, 1926.
5. **Lipschütz, A.:** The Internal Secretions of the Sex Glands. Cambridge and Baltimore, 1924.
6. **Stieve, H.:** Zwischenzellen. Handbuch der vergl. Anatomie d. Wirbeltiere von L. Bolk, E. Göppert u. a., B. 6, Berlin u. Wien, 1933.

(L. Ū. Salīdzinošās anatomijas un eksperimentālās zooloģijas institūts.
Direktors: N. G. Lebedinsky)

Rana temporaria sēklinieka un taukķermeņa vienlaicīga heterotopija

Anna Dauvarts

1932. gada pavasarī uzšķerdu kādu kopulā ievāktu *Rana temporaria* tēviņu, kam pie mezenterija bija saskatāms neparasts veidojums, kas noteikti šķita heterotops sēklinieks. Paceļot barības traktu izrādījās, ka kreisā pusē, parastā sēklinieka vietā, atrodas tikai tā daļa. Bez tam, blakus pēdējam, ķermeņa dobumā tai pašā kreisā pusē bij redzams kamolveidīgs orgāns, kas pēc savas struktūras atgādināja vārdes taukķermeni.

Šis heterotopijas gadījums, pēc saviem topogrāfiskiem apstākļiem, uzrāda zināmu līdzību ar diviem manis (1926, 1927) aprakstītiem, bet ar to atšķirību ka šeit novērojama vienlaicīga sēklinieka un taukķermeņa heterotopija.

No pievestiem mērojumumu un svēršanas rezultātiem ir secināms, kā kreisā pusē atlikusi dziedzeņa daļa atbilst, apmēram, pusei normālā dziedzeņa, turpretim, heterotopais sēklinieks stāv tāju tam iepakā.

Tāpat ir redzams, ka no taukķermeņa normalā vietā ir atlikusies tikai niecīga daļa, pavisam smalki nedaudzi lēvari, kurpretim pārvietojusies un kamolā satinusies ir lielākā tā daļa.

Mikroskopiskās studijās izrādījās, ka labās puses sēklinieks, tā arī kreisās puses dziedzeņa daļa uzrāda tipisko, pavasara sezonā novērojamo mikroskopisko struktūru, jo sēklas kanāliņi pildīti ar nogatavojušos spermumu.

*) There also the older bibliography.

Heterotopais sēklinieks ietverts relatīvi biežā saišķaudu segā. Starp sēklas kanālišiem, it sevišķi dziedzeņa periferijā, iestiepjas prāvākas saišķaudu šķipsnas, kas stāv pretrunā ar normāli veidotu vārdes sēklinieku, kur starp sēklas kanālišiem atrodošies interstīciēlie audi ir ļoti vāji attīstīti. Dziedzēņa centrālā daļā pašu kanālišu robežas gandrīz pilnīgi izzūd. Sēklas kanāliši ir pildīti nenoteiktas formas un dažāda lieluma šķietami degenerējošu dzimumšūnu. Ir saskatāmi dažādi intensīvi nokrāsoti chromatīna graudiņi, bet skaidras, noteiktas mitozes nekur nav novērojamas.

Ar savu dzimumšūnu stāvokli un bagātīgi attīstītiem saišķaudiem starp kanālišiem, heterotopais sēklinieks atgādina transplantētu vai arī kriptorchu dzimumdziedzeri.

Starp saišķaudiem, pašā heterotopā sēklinieka piestiprināšanās vietā mezenterijam atradu kādu pavisam niecīgu, pilnīgi neatkarīgi no tikko aprakstītā veidojuma gulošu, sēklinieka fragmentu. Uz kādiem 13 mikroskopiskiem griezumiem ir saskatāmi divi niecīgi, bet tomēr tipisku sēklinieka struktūru uzrādoši sēklas kanāliši. Uz viena no šī sēklinieka fragmenta vidus daļā atrodošiem griezumiem kanālišus šķirošā sienā pārtraucas. Nākošā griezumā ir redzama neliela atvera uz āru vienā kanāliša sienā. Šī izeja ved spraugā starp apkārt gulošām nedaudzām saišķaudu šķiedrām. Šī sprauga veido, tā tad, spermatozoīdiem izeju ķermeņa dobumā.

Heterotopā taukķermeņa mikroskopiskā struktūra atgādina vārdes taukķermenim tipisko ar to atšķirību, ka šeit adenoidos audos, it sevišķi kamola centrālā daļā, ir sastopamas plašākas spraugas, kas pildītas maziem limfocītiem. Arī paši adenoidie audi ir limfocītu bagāli infiltrēti. Bez tipiskām, tiklveidīgi savienotām adenoido audu šķiedrām ir novērojamas vēl, it sevišķi apkārt limfocītu pildītiem dobumiem, patstāvīgas, taisnos virzienos ejošas saišķaudu šķiedras.

Šim līdzīgu heterotopiju izveidošanās atrisinājumu līdz ar *Merkeļu* un *Gerhartz'u* gribētu meklēt tīri mēchaniskas dabas traucējumos.

