Die Zahlen der Tabelle zeigen, dass eine Identifikation der Chromosomen auf metrischem Weg möglich bzw. die Irrtumswahrscheinlichkeit bei der Zuordnung zu den Typen A–H nicht gross ist. Dies trifft allerdings nur für den männlichen Karyotyp zu, wo sich die sechs Chromosomenpaare A–E und H sehr leicht, die Paare F und G etwas schlechter unterscheiden lassen. Beim Weibchen dagegen sind nur die Paare A–E leicht identifizierbar. Die fünf Chromosomen Nr. 11–15 sind ihrer Ähnlichkeit wegen in der Tabelle in eine Gruppe zusammengestellt, welche die Paare F und G und ein weiteres Chromosom umfasst. Chromosom Nr. 16 passt zu keinem Paar. Dieses einzelne Chromosom findet seinen Partner in einem Chromosom der Fünfergruppe, womit wir ein dimorphes Chromosomenpaar erhalten. Das grössere Chromosom wäre als Z-, das kleinere als W-Chromosom zu bezeichnen. Das Z-Chromosom des weiblichen Karyotyps ist dem H-Paar des Männchens ähnlich. Ich schliesse daraus, dass dieses Paar die ZZ-Chromosomen des männlichen Karyotyps darstellt. Aus diesen cytologischen Befunden geht hervor, dass bei *Vipera berus* Heterochromosomen identifizierbar sind und dass das weibliche Geschlecht das heterogametische ist.

Der Chromosomensatz dieser Art setzt sich demnach zusammen aus: 7 Paaren autosomaler Makrochromosomen und 1 Paar Heterochromosomen, die ebenfalls Makrochromosomen sind (♂ = ZZ, ♀ = ZW); ausserdem wurden 20 Mikrochromosomen festgestellt, wobei es wahrscheinlich ist, dass diese Zahl für beide Geschlechter gilt.

Aus ähnlichen Untersuchungen an *Vipera aspis* L., *Natrix natrix* L. und *Natrix maura* L. scheint hervorzugehen, dass diese Arten ebenfalls Heterochromosomen eines ähnlichen Typs im weiblichen Geschlecht besitzen. Diese Arten werden gegenwärtig noch eingehender untersucht[11].

Summary. A dimorphic pair of chromosomes was found among the macrochromosomes in mitosis of females of *Vipera berus* L. It corresponds to a pair of medium-sized chromosomes in the male. The conclusion is drawn that females are heterogametic (ZW-type), males being homogametic (ZZ-type). Similar observations were made in *Vipera aspis* L., *Natrix natrix* L., and *Natrix maura* L.

H. R. KOBEL

Zoologisches Museum der Universität Zürich (Schweiz), 9. Februar 1962.

[11] Herrn Prof. Dr. H. BURLA danke ich für die Anregung zur vorliegenden Arbeit, Herrn Dr. E. KRAMER, Kollbrunn, für die Überlassung der Tiere.

An Electromyographic Analysis of Stepping in the Cat

Attempts to discuss the role of spinal reflex actions in stepping have been hampered by lack of information regarding the temporal sequence of muscle activation in stepping. We have undertaken to fill this gap by correlating the electromyogram from hindlimb muscles with movements during stepping in the unrestricted cat.

The present report deals with the activity in extensor muscles. Our interest was prompted by the finding that some extensor motor nuclei display characteristic differences in their Ia receptiveness, i.e. in their monosynaptic activation by impulses in afferents with annulospiral endings on muscle spindles. The motoneurones to the hip extensor, adductor femoris, receive monosynaptic excitatory action not only from hip extensors but also from the knee extensor, vasto-crureus. Motoneurones of another hip extensor, semimembranosus, receive monosynaptic excitatory action not only from hip extensors but also from knee flexors. Hence adductor femoris would be most effectively Ia stretch activated by the combined movement of hip and knee flexion; semimembranosus, on the other hand, by the movement of hip flexion and knee extension[1]. The difference in Ia receptiveness between these two hip extensors offers a possibility to test the importance of stretch evoked Ia actions for muscle activation in the step. If Ia actions were a dominating factor in muscle

[1] R. M. ECCLES and A. LUNDBERG, J. Physiol. *144*, 271 (1958).

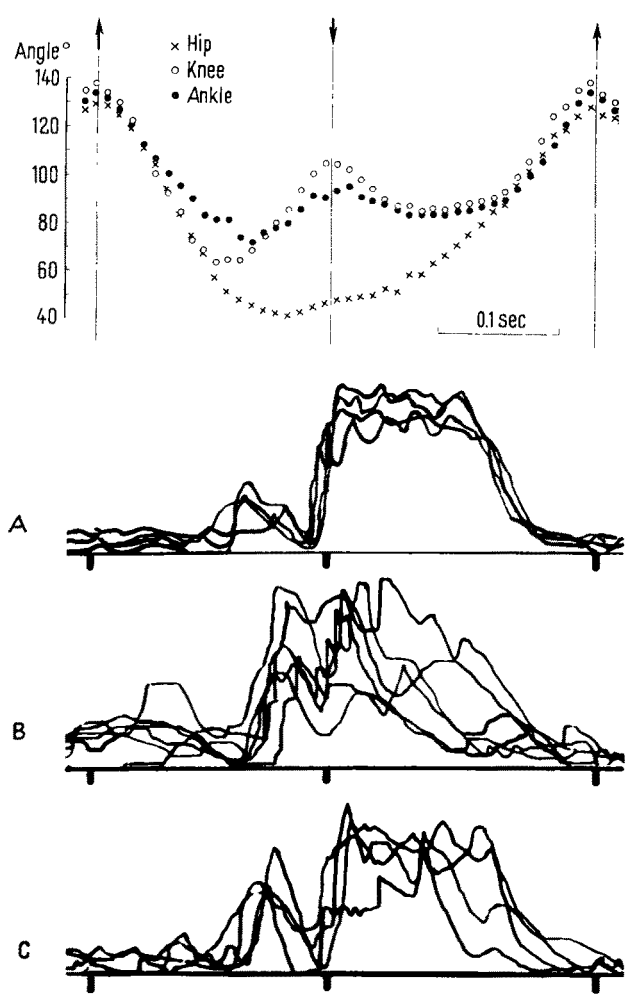

Fig. 1. Superimposed integrated electromyograms from A: vastus lateralis, B: adductor femoris, C: semimembranosus, related to movement in the hip, knee, and ankle joints of the hindlimb. Arrows on top and marks under each EMG refers to foot contact with floor, the foot being put down at ↓. Integration is made by charging a condensor with the EMG potentials after full wave rectifying.

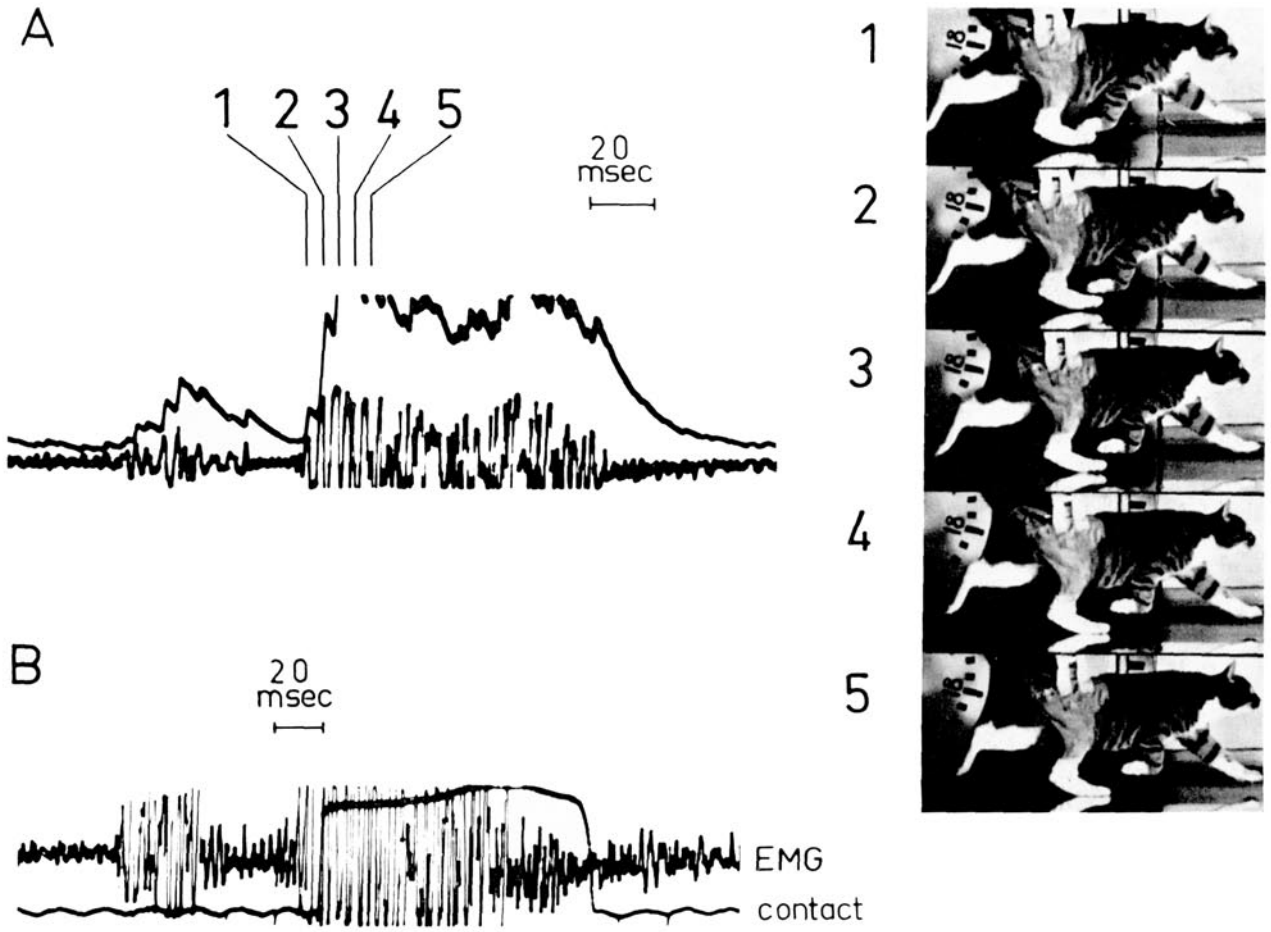

Fig. 2. (A) Direct and integrated EMG from the right vastus lateralis related to synchronously recorded (at 200 pictures/sec) movements of the cat. The right foot is not touching the floor earlier than in picture 3. (B) EMG from the same muscle and electrical recording of the period of contact between foot and floor.

activation during locomotion, semimembranosus (femoral portion) and adductor femoris should be activated in different phases of the step. The electromyographic (EMG) analysis has, however, not revealed any significant difference in the mode in which these muscles are activated. This is illustrated in Figure 1, which also shows the activity in the knee extensor, vastus lateralis. Other extensors, anterior biceps, vastus lateralis, gastrocnemius, plantaris and flexor digitorum longus were activated in a very similar manner. For correlation Figure 1 also shows the movements at the hip, knee and ankle joints. They correspond closely to those found by PHILIPPSON in dog[2]. During extension movements at the hip are out of phase with movements at the knee and ankle. The most striking difference is that flexion occurs at the knee and ankle but not at the hip during the first period of contact with the ground. A previous suggestion[1] that the hip extensors do not contract synchronously with the knee and ankle extensors has been refuted by the EMG analysis. This phase of flexion is almost certainly caused by a yielding under the weight of the body. Hence the comparison between adductor femoris and semimembranosus has failed to provide evidence that Ia stretch reflexes are of dominating importance for activation of extensors in stepping.

Extension during stepping occurs in 2 phases. In the first phase the foot is off the ground, during the second phase it is in contact with the ground. As appears in Figure 2 and also in the integrated records in Figure 1, the EMG activity during the first phase is relatively weak. Associated with the start of the second phase there is an onset of stronger activity. It has been suggested that a similar effect in man is a reflex in response to the stretching of extensors, which occurs when the foot makes contact with the ground[3]. Our analysis has, however, revealed that this burst of activity often starts before the foot makes contact with the ground. Two independent methods were utilized to ascertain this finding. The EMG was correlated with limb movements photographed at 200/sec (Figure 2A). The contact with the ground was measured electrically (Figure 2B). It is concluded that this burst of activity in its onset neither is a Ia stretch reflex nor a reflex response from the pad. We consider it extremely unlikely that it is a spinal reflex from other receptive systems in the hindlimb. Likewise we do not believe that it is a spinal reflex from the fellow limb or from the forelimbs because identical findings were made during trot

[2] M. PHILIPPSON, Trav. Lab. Physiol., Inst. Solvay 7, 1 (1905).
[3] P. HOFFMANN, *Untersuchungen über die Eigenreflexe (Sehnenreflexe) menschlicher Muskeln* (Julius Springer, Berlin 1922).

and gallop and the position of the forelimbs relative to that of the hindlimbs was not relevant.

Zusammenfassung. Eine elektromyographische Untersuchung über die Aktivitätsmuster verschiedener Extensormuskeln am Hinterbein einer frei laufenden Katze ist mit Korrelation zu den Bewegungsphasen der Extremität ausgeführt worden.

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Department of Physiology, University of Göteborg (Sweden) October 21, 1961.

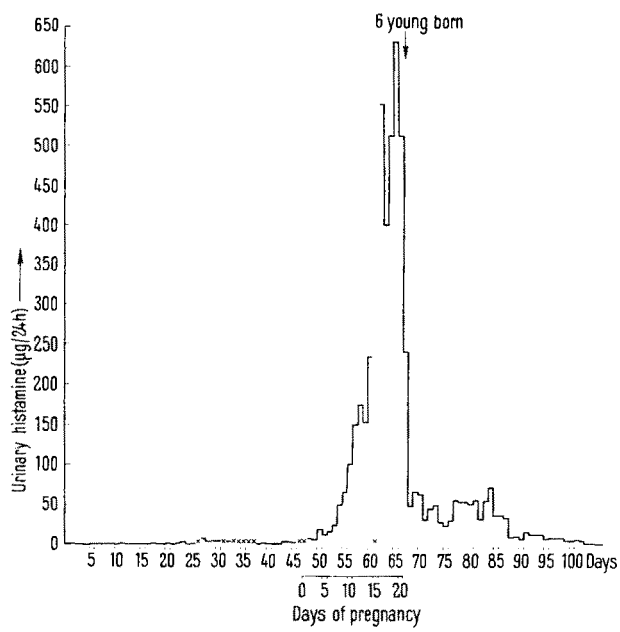
Formation of Histamine in the Pregnant Mouse

An increased urinary excretion of histamine has been observed in the pregnant rat. The increase was found to be associated with an exceptionally high level of histidine decarboxylase activity in the foetuses[1-3]. Little is known about the histamine metabolism during pregnancy in other species. *In vitro* studies of histidine decarboxylase in tissues of mice recently revealed an elevated enzyme activity in the kidney of the pregnant mother[4].

The present experiments show that in the mouse the urinary excretion of histamine is considerably increased during pregnancy, and that this increase may be due partly to a high histidine decarboxylase activity in the foetuses and partly to an elevated level of histidine decarboxylase in the kidney of the mother.

The mice were kept in metabolism cages and fed *ad libitum* a semi-synthetic diet free from histamine (< 0.02 μg/g). Urine was collected in 24 h samples and free histamine was estimated on the guinea pig's gut as previously described for rats[1]. Aminoguanidine sulphate, a histaminase inhibitor, was given in some of the experiments in a dose of 20 mg/kg subcutaneously once daily. Histidine decarboxylase activity was determined *in vitro* with a modification of Schayer's technique[2].

The pregnant mouse excretes abundant amounts of free histamine in the urine (Figure). The rise of histamine excretion begins already in the first week of pregnancy and reaches its peak 2–3 days before term. After delivery the urinary histamine decreases at first sharply, then more gradually and not until 3 weeks after parturition is the non-pregnant level restored. Administration of aminoguanidine before and during pregnancy does not cause a noticeably larger histamine excretion. In the rat an increase in the urinary excretion of histamine begins on the 14th day of gestation and subsides to the non-pregnant level immediately after parturition[1]. Thus, the onset of excess histamine formation is earlier and the termination later in the mouse.



Urinary excretion of free histamine in a mouse before, during and after pregnancy. * stands for sample not examined. The arrow indicates the day of parturition. The mother was deprived of her young immediately after parturition. Aminoguanidine was administed in a dose of 20 mg/kg once daily between 9th–102nd day of observation.

During the period of elevated urinary histamine excretion a high histidine decarboxylase activity is observed *in vitro* in the kidney of the mother mouse, attaining peak values around the 15th day of pregnancy, then gradually decreasing, and remaining elevated for some time after parturition. The histamine forming capacity in other tissues of the mother (skin, lung, stomach, small intestine, liver, and spleen) was of the same order of magnitude as corresponding tissues in non-pregnant animals. Preliminary results indicate that mouse foetuses also are capable of producing histamine and that the foetal histidine decarboxylase activity steadily increases during gestation.

The enzyme responsible for the formation of histamine in the mother's kidney as well as in the foetuses is largely inhibited when α-methyl histidine in a concentration of $10^{-3}M$ is added to the incubation mixture. α-methyl-DOPA, however, is less effective (Table). Studies of the pH-optimum of the histidine decarboxylase in the mother's kidney and the foetuses reveal a maximum around pH 7.2. These findings seem to indicate that here we are dealing with a rather specific histidine decarboxylase.

Inhibition of histidine decarboxylase activity in mouse tissues

Experiment No.	Enzyme source	C^{14}-histamine (μg) formed per g tissue without inhibitor	with α-methyl histidine $10^{-3}M$	with α-methyl histidine $10^{-4}M$	with α-methyl-DOPA $10^{-3}M$	with α-methyl-DOPA $10^{-4}M$
1	Pregnant mouse kidney	24.3	3.1	–	20.8	–
2	Pregnant mouse kidney	14.2	1.8	–	9.7	–
3	Mouse foetuses	5.8	1.3	5.5	5.2	5.6
4	Mouse foetuses	4.3	1.0	2.9	3.5	3.9

The incubation beaker contained ^{14}C-histidine in a concentration of $0.8 \times 10^{-4}M$

[1] G. KAHLSON, E. ROSENGREN, and H. WESTLING, J. Physiol. *143*, 91 (1958).
[2] G. KAHLSON, E. ROSENGREN, H. WESTLING, and T. WHITE, J. Physiol. *144*, 337 (1958).
[3] G. KAHLSON, E. ROSENGREN, and T. WHITE, J. Physiol. *151*, 131 (1960).
[4] E. ROSENGREN and C. STEINHARDT, Exper. *17*, 544 (1961).