Weibchen mehrmals behandelt, wenn die Deckakte nicht zur Trächtigkeit geführt hatten. Es ergaben sich 24 Graviditäten (40%), also weniger als bei den nicht behandelten Tieren. Somit kann nicht ein Mangel an Progesteron die Ursache der geringeren Fertilität der juvenilen Weibchen sein.

Ferner wurden begattete Weibchen 60mal mit Östrogen behandelt (Ovocyclin CIBA 2mal 0,1 γ am 1./2. oder 4./5. Tage p.c.). Diese Tiere brachten 35 Trächtigkeiten (58%). Es ergab also auch diese hormonale Behandlung keine wesentliche Steigerung der Zahl der Graviditäten. Endlich erhielten 30 Weibchen gleichzeitig Progesteron und Östrogen an 2 Tagen der Präimplantationsperiode. Diese Behandlung ergab 10 Trächtigkeiten (33%). Die Resultate sind in der Tabelle II zusammengestellt.

Da nicht ein Mangel an Ovarialhormonen die Ursache der verminderten Fertilität sein kann, nehmen wir an, dass nicht eine einzelne Komponente der zur Gravidität führenden Faktoren im jungen Organismus fehlt, sondern dass, wie eingangs erwähnt, die Koordination der zahlreichen Faktoren gestört ist.

Tabelle II

Behandlung	Begattungen	Graviditäten	Deckakte, die zur Gravidität führen (%)
Ohne Behandlung	50	27	54
Progesteron	60	24	40
Östrogen	60	35	58
Progesteron und Östrogen	30	10	33

Eine analoge Erscheinung zeigt sich im alternden Organismus, wo das Erlöschen der Fruchtbarkeit zunächst auf einer funktionellen Störung des hormonalen Gleichgewichts beruht. Bei der Ratte vermögen in der Nachfruchtbarkeitsperiode die Hypophyse, die Ovarien, der Uterus und die Vagina auf exogene Zufuhr von Hormonen zu reagieren. Die endokrine Funktionsfähigkeit der Gonaden ist, im Gegensatz zur generativen, nicht erloschen. Sie kann nach zeitweiligem Sistieren wieder auftreten, aber die Koordination der verschiedenen Faktoren ist gestört und verhindert die Fruchtbarkeit. Bei alternden Rattenweibchen finden, wie bei den juvenilen, zahlreiche Kopulationen statt, die aber meist nicht zur Gravidität führen: 6,6% gegenüber 76% bei jungen zyklischen Weibchen führten zur Trächtigkeit[3,4].

Zu Beginn und am Ende der Fertilitätsperiode ist die harmonische Koordination der Fruchtbarkeitsfaktoren noch nicht eingespielt oder gestört, dadurch ist das Zustandekommen der Gravidität erschwert.

Summary. Prepuberal female mice often mate normally, but, although the genital organs are fully developed, a great number of matings is not followed by pregnancy. Progesterone, estrogen or both hormones administered during the first days p.c. did not enhance the number of pregnancies. It is concluded that the impaired fertility of the juvenile female is not due to the failure of one of the factors which bring about pregnancy, but, like in the senescent female, to the imbalance of the various functions.

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Sex Hormones as a Factor Controlling the Blood Plasma Arylesterase Activity in Rats

It has been suggested previously that arylesterase activity (EC 3.1.1) is probably controlled by certain sex hormones. The fact that the arylesterase activity of pig blood plasma decreased as the boars reached maturity proved to be due to the effect of male sex hormones on the biosynthesis of active protein rather than to a direct inhibitory effect of these hormones on the enzyme[1]. A similar observation was made with dogs, in which castration caused an increase in plasma arylesterase activity of males[2]. The level of certain plasma esterases of mice may be manipulated by hormone treatment and/or gonadectomy[3]. The present paper describes the effect of estradiol on blood plasma arylesterase activity after short and long periods of time following the hormone treatment of rats.

The arylesterase activity was determined with a gasometric technique using phenyl acetate as the substrate[2]. All experiments were carried out on rats of a Wistar strain. The animals were allowed food and water ad libitum.

Injection of estradiol benzoate (3 times 0.1 mg of Ovex, Leo, Hälsingborg) into rats caused an initial rapid decrease in arylesterase activity in the plasma; this was followed on the 5th–10th day after treatment by an increase in activity to values about 100% above the normal starting activity level. The activity then slowly decreased, reaching the normal starting activity after about 40–50 days. This effect to estradiol treatment, demonstrated in the Figure, is much more pronounced in male rats than in female animals; the effect, however, is significant also in the latter group of test animals (Table I).

It is known that polyesteradiol phosphate, a water-soluble high molecular weight polyester of phosphoric acid and estradiol-17β, produces a greatly prolonged estrogenic effect[4]. To study the long-term effect of this hormone preparation on the plasma arylesterase activity, each animal was injected i.m. with 0.6 mg of polyestradiol phosphate (Estradurin, Leo, Hälsingborg, Sweden) at 43, 60 and 74 days of age, and the esterase activity determined on 74, 90 and 145 days of age. As can

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Table I. Effect of estradiol benzoate on the arylesterase activity of rat plasma in vivo. For experimental details, see Figure

Days after start of treatment	Arylesterase activity			
	Males (n = 10)		Females (n = 10)	
	Mean	S.D.	Mean	S.D.
Before treatment (0)	131.0	14.8	171.3	6.4
3	99.5	31.8	155.8	22.2
9	172.6	15.6	177.4	10.0
16	170.4	15.6	173.8	8.1
23	160.4	8.5	173.3	5.7
50	137.4	13.7	172.4	6.6

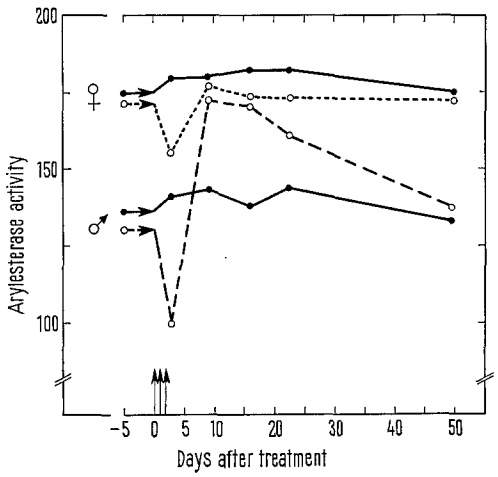
Days compared	t	f	P
Males			
0–3	2.80	18	$\simeq 0.01$
3–9	6.07	18	<0.001
0–9	5.99	18	<0.001
Females			
0–3	2.08	18	$\simeq 0.05$
3–9	2.72	18	$0.05 > P > 0.01$
0–9	1.61	18	>0.05

Table II. Effect of polyestradiol phosphate on the arylesterase activity of rat plasma in vivo

Age (days)	Arylesterase activity					
	Males			Females		
	n	Mean	S.D.	n	Mean	S.D.
74	10	195.4	26.6	10	209.1	19.6
90	9	205.2	22.9	10	216.3	16.4
145	9	198.4	19.7	9	205.4	9.8

Days compared (age period)	Mean difference	t	f	P
Males				
74– 90	4.0	2.22	8	>0.05
90–145	—8.1	2.07	8	>0.05
Females				
74– 90	3.8	2.35	9	$0.05 > P > 0.01$
90–145	—11.6	2.61	8	$0.05 > P > 0.01$

Each animal was given i.m. 0.6 mg of polyestradiol phosphate (Estradurin, Leo, Hälsingborg, Sweden) at 43, 60 and 74 days of age, and the arylesterase activity determined as indicated.



Effect of estradiol benzoate on the arylesterase activity of rat plasma in vivo. The activity values indicate the means (μmoles of phenyl acetate split per min/ml plasma), based on 10 animals of each sex (4 of each sex in the control series). Each test animal (175–200 g) was given i.m. 0.1 mg of estradiol benzoate per day on 3 subsequent days indicated by arrows in the graph. Filled circles, controls; open circles, treated animals. See Table I for a statistical evaluation of the values obtained.

be seen from the results summarized in Table II, there was no significant change in arylesterase activity caused by this long-term treatment. Polyestradiol phosphate in higher concentration than those used in these experiments was shown to inhibit reversibly the arylesterase activity of rat plasma in vitro.

One week after the start of estradiol treatment, a decrease in body weight of 6.3% in male rats and of 2.5% in female rats was observed. During the same period, the weight of the control animals increased by 3.3%. In the second experiment with polyestradiol phosphate, a marked depression of body weight was observed, ranging from 40 to 45% up to the age of 90 days in both sexes. Similar observations on the growth-depressing action of estrogens have been reported previously[5]. The relationship between body weight and plasma arylesterase activity will be discussed in more detail in a subsequent paper[6,7].

Summary. A rapid decrease in arylesterase activity was caused by the administration of estradiol to rats, followed by an increase to activity levels 100% higher than the starting levels. After this double response it required almost 40 days for the activity to return to normal levels. There was no remarkable effect by a long-term treatment with a preparation of prolonged estrogenic effect. The results presented further support previous findings that the arylesterase activity is under the control of steroid hormones.

Zusammenfassung. Zufuhr von Östradiol bedingte bei Ratten eine rasche Verminderung der Aktivität der Arylesterase, gefolgt von einer Aktivitätszunahme, die etwa 100% höher lag als die ursprünglichen Werte. Nach erfolgter doppelter Antwort dauerte es fast 40 Tage bevor die Enzymaktivität die normale Höhe wieder erreichte. Dadurch werden frühere Befunde bestätigt, wonach die Arylesteraseaktivität durch Steroidhormone reguliert wird.

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