mässig verlaufenden Fibrillen in den feinen Granula besteht, doch fehlen zwischen den Fibrillen die ribosomen ähnlichen Granula (Figur 5).

Bei Kindern haben wir drei Typen von Sertolizellen nachgewiesen, und nennen sie Sa-, Sb- und Sc-Zellen[10]. Der Sa-Typ kann als Ausgangsform für den Sb- und Sc-Typen betrachtet werden. Der Sc-Typ oder die präadulte Sertolizelle tritt erst im 13. Jahr in Erscheinung[10].

Nur ein einziges Charcot-Böttcher'sches Kristalloid wurde in Sc-Zellen gesehen. Dieses ist ca. 5 µm lang und 0.8 µm breit. Wie das Kristalloid in den Spermatogonien befindet es sich in Kernnähe und in seiner Umgebung befinden sich neben Mitochondrien und endoplasmatischem Reticulum häufig Lipoidgranula. An mehreren Stellen sieht man Lücken, den sogenannten «see-through» Effekt[6]. Das Kristalloid ist aus ca. 100–150 A breiten Fibrillen aufgebaut. Es sind keine elektronendichten Granula zwischen den Fibrillen vorhanden. Granula sind aber deutlich in den Aufhellungszonen zu beobachten: ihrem Aussehen nach scheint es sich um Ribosomen zu handeln. Die Fibrillen setzen sich in tonofibrillenähnliche Systeme fort. Eine begrenzende Membran um das Kristalloid fehlt (Figur 6).

Diskussion. Das Kristalloid von LUBARSCH wurde vor allem bei Spermatogonien von Erwachsenen beobachtet und beschrieben[5,6]. LUBARSCH[1,2], SPANGARO[11] und STIEVE[12] berichteten, dass dieses Kristalloid erst während der Entwicklungsjahre auftritt, und beim geschlechtsreifen Mann stets zu finden sei. Nach unseren Beobachtungen konnten wir schon im ersten Lebensjahr in A-Typ-Spermatogonien Kristalloide feststellen. Mit steigendem Alter nehmen sie an Grösse zu. Die B-Typ-Spermatogonien, die im 4. Lebensjahr erstmals erscheinen, können bereits Kristalloide besitzen. Bei anderen Spermatogenesestadien von Kindern haben wir keine Kristalloide beobachten können.

Bis heute ist die Entstehung des LUBARSCH'schen Kristalloids schleierhaft. SOHVAL et al.[6] haben die Ansammlung von feingranulärem Material in der Umgebung des Kristalloids als Bildungsmaterial für dasselbe aufgefasst. Bei Kindern sind solche Ansammlungen ebenfalls feststellbar. Falls eine solche Ansammlung in den Spermatogonien zu finden ist, liegt sie aber isoliert in der Zelle, weitweg von eventuell schon vorhandenen Kistalloiden. Wir haben noch ein anderes Gebilde mit unregelmässigem Fibrillenverlauf und ohne ribosomenähnliche Granula gesehen. Beiden Gebilden fehlt jeweils ein typischer Bestandteil des Kristalloids. Ihren Strukturen nach dürfte es sich nach unserer Meinung um die Vorstufe des Kristalloids von LUBARSCH handeln. Diese Auffassung wird von folgenden Beobachtungen gestützt: 1. Als Grundstruktur weisen beide Feingranula auf. 2. Sie haben die Tendenz, fibrilläre Strukturen aufzubauen. Die erste Struktur scheint eine jüngere Stufe als die zweite zu sein.

Das Kristalloid der Sertolizelle zeigt ein ähnliches Aussehen wie das LUBARSCH'sche Kristalloid. Ultrastrukturell unterscheidet es sich vom LUBARSCH'schen Kristalloid durch die Abwesenheit der ribosomenähnlichen Granula, die bei der Spermatogonie im interfibrillären Zwischenraum gefunden werden, sowie durch die Abwesenheit der Feingranula, die als Grundstruktur bei der Spermatogonie vorhanden sind[6].

Beim Charcot-Böttcher'schen Kristalloid sind die Aufhellungszonen («see-through» Effekt) ausgeprägter als beim Kristalloid von LUBARSCH. Der Ursprung des Kristalloids von Charcot-Böttcher ist ebenfalls unklar. Es ist nur in der menschlichen Sertolizelle vorhanden und in der Präpubertätsperiode nicht nachzuweisen[3,4,6]. Beim 13jährigen finden wir im Tubulus fast ausschliesslich Sertolizellen vom Sc- oder präadulten Typ welche schon wie adulte Sertolizellen ein Kristalloid von Charcot-Böttcher besitzen. Da wir beim 13jährigen keine ausgereiften Spermien feststellen konnten, legt diese Tatsache die Vermutung nahe, dass die Sertolizellen in ihrer Entwicklung etwas weiter als das jeweilige Bildungsstadium der Spermien fortgeschritten sein dürften.

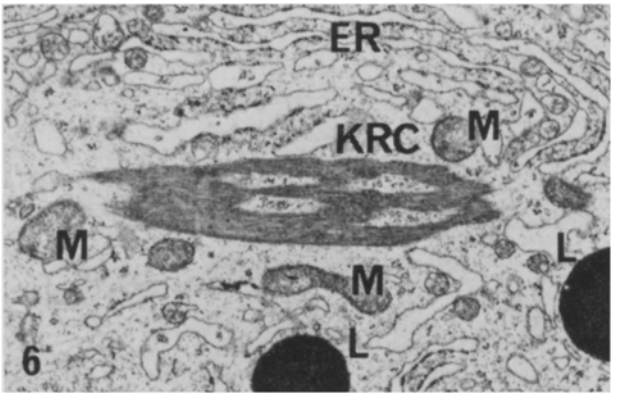

Fig. 6. Kristalloid von Charcot-Böttcher (KRC) bei einem 13jährigen Kind. Mitochondrien (M); endoplasmatisches Reticulum (ER); Lipoidgranula (L). Elektronendichte Granula in der Aufhellungszone. ×12 000.

Summary. The fine structure of the crystalloid in spermatogonia has been studied in biopsies from 18 children and compared with the crystalloid in Sertoli cells. The crystalloid of LUBARSCH can be seen already in 4-month-old children and it grows larger with age. Furthemore we have discussed the origin of spermatogonial crystalloids.

H. SEGUCHI und F. HADZISELIMOVIC

Anatomisches Institut der Universität Basel, Pestalozzistrasse 20, CH–4056 Basel (Schweiz),
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Influence of Pregnancy and Lactation on the Healing Processes of Gastric and Duodenal Ulcer Models in the Rat

It has been well documented that pregnancy is beneficial to peptic ulcer in women by protecting against its development and accelerating its healing[1–3]. In experimental studies, KAHLSON et al.[4] and KELLY and ROBERT[5] have reported that pregnancy and lactation strongly prevented the formation of drug-induced gastric ulcers in rats. Moreover, CREAN and RUMSEY[6] found that pregnancy and lactation caused hyperplasia of gastric

mucosa in rats. Thus, it was of interest to study in rats whether 1. the healing course of gastric and duodenal ulcers is different in male and female, 2. pregnancy and lactation can exert any favorable influence on the healing of chronic gastric and duodenal ulcers. In addition, gastric secretory conditions of rats during and after pregnancy were studied in order to correlate with the healing of gastric and duodenal ulcers.

Materials and methods. Male and female Donryu rats of initial body wt. of 180–200 g were used.

Mating. A vaginal smear was made in the afternoon and each rat found to be in proestrus was placed in a cage with 2 males. The next morning another vaginal smear was made and the animals in which sperm was found were kept and considered pregnant.

Induction of gastric and duodenal ulcers. Gastric ulcers were induced by the standardized method of TAKAGI et al.[7] in male and female rats (non pregnant) and female rats at 3 days after pregnancy.

Briefly, under ether anesthesia the abdomen was opened and 20% acetic acid solution (0.01 ml) was injected into the subserosal layer of the glandular stomach. Postoperatively, the animals were maintained on rat chow and water ad libitum. Duodenal ulcers were induced in rats as described for gastric ulceration by the method of OKABE et al.[8]. Under ether anesthesia, the abdomen was opened and a metal mold (6 mm in diameter) was tightly placed upon the serosal surface of the duodenum wall, about 5 mm distal to the pylorus. Acetic acid (100%, 0.06 ml) was poured into the mold and allowed to remain 30 sec. After removal of the acetic acid, the abdomen was closed and the animals were fed normally. These animals were sacrificed at 5, 10, 20 and 30 days after the operation; that is, at day 7, 12 and 22 of pregnancy and at day 8 of lactation or non-lactation. The stomach and duodenum were removed, treated with 1% formalin solution[7] and the ulcerated area was measured under the dissecting microscope (10×) with a square grid as the ulcer index. As to the duodenal ulcer, the depth of the ulceration was qualitatively estimated. In the deeply penetrated cases (over 2 mm in depth) the ulcerated area was multiplied by 1.5 times to adjust the severity of ulceration.

Gastric secretion. In order to examine the gastric secretory conditions during the pregnancy and lactation, a pylorus ligation technique was employed according to the SHAY's original method[9]. Male and female rats

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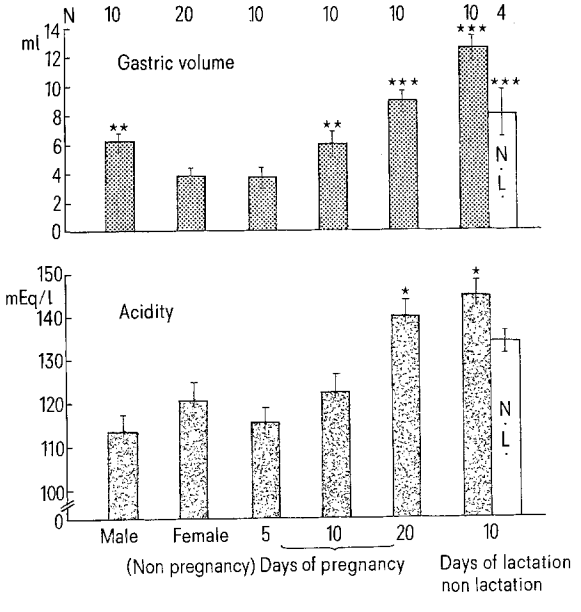
Influence of pregnancy and lactation on the healing processes of the chronic gastric and duodenal ulcers induced by acetic acid solution in the rat

Treatment	Days after operation for ulceration							
	Day 5		Day 10		Day 20		Day 30	
	No. of rats	Ulcer index (M ± S.E.)	No. of rats	Ulcer index (M ± S.E.)	No. of rats	Ulcer index (M ± S.E.)	No. of rats	Ulcer index (M ± S.E.)
Gastric ulcer								
Male rats	10	22.2 ± 1.8	10	10.9 ± 1.2	10	7.1 ± 2.5	10	9.3 ± 1.3
Female rats								
Non-pregnant	10	21.2 ± 1.7	10	13.0 ± 2.3	10	12.4 ± 2.3	10	11.0 ± 1.8
Pregnant	10	20.3 ± 2.1 (Day 7)	10	10.2 ± 1.1 (Day 12)	10	17.3 ± 3.3 (Day 22)		
Lactating							7	6.1 ± 1.3 (Day 8)
Non lactating							3	11.7 ± 2.6 (Day 8)
Duodenal ulcer								
Male rats	10	37.1 ± 2.2	10	23.0 ± 4.4	10	8.4 ± 1.6	10	8.2 ± 1.9
Female rats								
Non pregnant	10	46.3 ± 3.6	10	26.3 ± 3.0	10	10.4 ± 2.3	10	9.7 ± 2.5
Pregnant	10	39.6 ± 3.4 (Day 7)	10	22.9 ± 3.7 (Day 12)	10	24.7 ± 5.6[a] (Day 22)		
Lactating							7	7.9 ± 2.7 (Day 8)
Non lactating							3	13.9 ± 3.4 (Day 8)

Day in parenthesis is a day of pregnancy, lactation or non-lactation. [a] Value significantly different from non-pregnant rats ($P < 0.05$).

(170–200 g), with or without pregnancy, were fasted for 24 h in the individual cages with free access to water. Under light ether anesthesia, the pylorus was ligated and 4 h later the animals were sacrificed with ether. After centrifugation of collected gastric juice, samples were analysed for volume and titrated with 0.1 *N* NaOH to pH 7.4 on the Hitachi pH meter for titratable acidity which was expressed as mEq/l. The level of significance was calculated by using Student's *t*-test.

Results. In comparison with that of male rats, the gastric ulcer in female rats (non-pregnant) showed almost the same healing process until 30 days after operation, except at day 20, at which time female rats had a rather larger ulcer than male (Table). Pregnancy (Day 7 and 12) did not exert any appreciable influences on the healing process of gastric ulcers but caused a slight delay of healings at Day 22 as compared with that of non-pregnant female rats. Lactation for 8 days after delivery considerably accelerated the healing of ulcers in comparison with non-pregnant and non-lactating rats; both animals showed almost the same size of ulcers. Concerning the duodenal ulcer, the healing process of the ulcer was not different between male and female rats (non-pregnant) throughout the experimental period. The duodenal ulcers in pregnant rats observed at Day 7 and 12 of pregnancy were almost the same as those of non-pregnant rats. At Day 22, there is a significant delay of ulcer healing in pregnant rats ($P < 0.05$). 8 days after lactation, the ulcers in mother rats were slightly smaller than in non-pregnant and non-lactating rats. As shown in the Figure, the gastric volume in female rats (non-pregnant) was significantly lower than that in males, but acidity was almost the same in both sexes. Both gastric volume and acidity were not changed 5 days after pregnancy. However, the animals showed a gradual and significant increase of the volume and acidity from day 10 of pregnancy to day 10 of lactation. In contrast, non-lactating rats showed the lower volume and acidity in comparison with that of lactating animals, although these values were still significantly higher than those of non-pregnant females.



Gastric secretions of male and female (non-pregnant) rats and pregnant or lactating rats, obtained by pylorus-ligation technique (4 h). Vertical bars mean standard error of the mean. * $P < 0.05$. ** $P < 0.01$. *** $P < 0.001$.

Discussion. The present experiments indicated that the healing processes of gastric and duodenal ulcers of female rats were almost the same as those of male. Pregnancy did not exert any appreciable influence on the healing of chronic ulcers at the early stage (Day 7 and 12) but tended to delay the healing at late stage (Day 22); especially the duodenal ulcer showed a significant delay of healing. However, lactation for 8 days produced a tendency for acceleration of the healing both of gastric and duodenal ulcers. CREAN and RUMSEY[6] have suggested that gastric ulcer might heal rapidly during pregnancy because increased epithelial cell turnover was observed in pregnant rats. Although we did not examine the mucosal conditions of the stomach with ulcer in this study, mucosal hyperplasia, if at all, seemed not to help the recovery of the injured mucosa. Most of the literature demonstrates that pregnancy and lactation afforded an increased gastric secretion in man and animals. LILJA and SVENNSON[10] and LONG[11] have reported that, during pregnancy or lactation, of rats the basal and stimulated gastric secretion were increased. This experiment also confirmed that pregnancy and lactation resulted in an increase of both gastric juice and acidity. These results suggest that one of the causal factors for the apparent delayed healing of duodenal ulcer seems to be the hypersecreted gastric juice during the pregnancy, especially at a late stage when gastric secretion reached nearly the maximum response. Clinical data supports the above view, because hypersecretion is frequently found in patients with duodenal ulcer and is speculated to be the cause of the disease[12].

As the matter of fact, the duodenal ulcer models used in this study were significantly accelerated to heal by prolonged administration of antacid and antipeptic agents (unpublished data). Although lactation resulted in an increased secretion, the healing of both gastric and duodenal ulcers was rather enhanced in comparison with those of non-pregnant and non-lactating rats. The authors can not comment on this question at present, but it seems likely that lactation may exert really beneficial effects on the healing by overcoming the deleterious influence of hypersecreted gastric juice. As gestation itself causes an enormous physical pressure in the abdominal cavity, leading to impaired movement of the gastrointestinal tract, this may be taken to be a factor in the etiology of delayed healing of ulcers.

Résumé. La gestation, à son début, n'a pas accélé la guérison des ulcères gastrique et duodénal, mais elle l'a retardée à sa fin. La lactation a légèrement accéleré la guérison des ulcers, par rapport à celles qui s'opère chez des rates non-portantes ou sans lactation. La gestation et la lactation ont entraîné l'hypersécrétion gastrique et l'hyperacidité chez le rat à pylore lié.

K. TAKEUCHI, S. OKABE and K. TAKAGI

University of Tokyo,
Department of Chemical Pharmacology,
Faculty of Pharmaceutical Sciences,
Bunkyo-ku, Tokyo (Japan),
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