time washed iodide out, thus producing thyroid hyperplasia. This similar behavior of SCN^- is not surprising; rather it is to be expected from the position of SCN^- at the end of the Hofmeister anion series (acetate> Cl^->Br^->I^->SCN^-, etc.) Since the effects of these anions on protein swelling, surface tension, and on many other phenomena increase as the SCN^- end of the series is approached, it is reasonable to suppose that the ability of the thyroid to filter these ions from the blood would be affected similarly.

A question that arises is how the thyroid differentiates between the halogens and other ions. A point of similarity is found in the arrangement of their electrons. All have 7 in their outer shells consisting of 2 in the s and 5 in the p groups. We suggest that this characteristic electron arrangement of the halogens is one that may enable thyroid tissue to effect this differentiation. At the same time it would explain why *all* halides are filtered from the circulating medium in preference to other ions. While thiocyanates closely resemble the halides in their chemical properties, and while the behavior of tissues towards halides and thiocyanates is similar we do not know whether their nuclear structure is correspondingly alike.

Further to support this view one should note the preferential accumulation of Mn and At by the thyroid. Like the halogens these elements of the seventh periodic group also have 7 electrons in their outer shells but instead of 2 s and 5 p electrons, the arrangement is believed to be reversed. And as stated in the first part of this paper one would also expect the remaining elements of group VII, *viz.*, technetium (element 43), and rhenium, to be preferentially filtered from the blood.

It becomes a matter of great interest to determine the relative avidity of the thyroid for these elements, to determine whether the preference follows a definite order, and to note the effect of the reversal of the electrons in the outer shell.

Summary. 1. Thyroid filters preferentially and accumulates thiocyanates as well as all the elements of the seventh periodic group that have been studied, *viz.*, Cl, Br, I, Mn, At.

2. All halides and thiocyanates when administered in relatively large amounts compared with iodine wash inorganic iodide from the body and prevent new supplies of iodine from being received by the thyroid, thus producing thyroid hyperplasia and goiter. It is suggested that these ions exert, at least in part, a mass action-like effect.

3. It is further suggested that similarity in arrangement of electrons in the outer shell of the elements of the seventh periodic group enables the thyroid to differentiate between them and other elements.

16985

Water Content of Rat Uterus and Oviducts During Proestrus and at End of Heat.*

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During the period of sexual receptivity in the rat the uterine cornua are distended with fluid which is retained by the tonic contractions of the cervix.[1,2] The appearance of the fluid within the lumina coincides with a significant decrease in uterine tissue water.[3] Also during heat several of the ampullar loops of the oviducts become greatly distended with

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2 Blandau, R. J., *Am. J. Anat.*, 1945, **77**, 253.

3 Astwood, E. B., *Am. J. Physiol.*, 1939, **126**, 162.

fluid and serve as the reservoir for the newly ovulated ova.[4,5] We were interested in determining whether changes in the tissue water of the oviducts paralleled those observed in the cornua and whether such changes could explain the source of the luminal fluid dilating the loops of ampullae.

Materials and Methods. Forty-one sexually mature female rats, of Wistar strain, weighing 148 to 205 g, were carefully observed to determine the onset of sexual receptivity.[6] Twenty of these females were killed at the end of heat or at the time of greatest loss of uterine tissue water.[3] The remaining 21 females were killed during proestrus or when the tissue water had reached its maximum.[3] The cornua, oviducts, and ovaries were removed intact. The utero-tubal junctions were cut and the oviducts and ovaries were put into Ringer's solution. The mesometria were carefully trimmed from the cornua and the vagina from the cervix. Each horn was then split open along its entire length, blotted on absorbent paper and weighed in weighing bottles. With the aid of iridectomy scissors and a binocular dissecting microscope, the oviducts were trimmed free of ovaries, periovarial sacs and all excess adipose tissue. A fine pipette was inserted into the fimbriated end of each oviduct and a stream of air blown through it to remove the luminal fluid. With the pipette still in place, the oviduct was removed from the Ringer's solution, brought onto absorbent paper and blotted, and the flow of air continued until it was free of fluid. The oviducts were placed in weighing dishes and weighed on a micro-analytical balance. The cornua and oviducts were subsequently dried in an oven at 110°C and reweighed. The loss of water in the cornua and oviducts was expressed in terms of per cent per 100 grams of body weight.

Results. The average percentage of water in the tissues of the cornua of females killed during proestrus was 81.8 $\pm$ 1.05 and at the end of heat 80.5 $\pm$ 0.48 (Tables I and II). The average percentage of tissue water in the oviducts in females killed during the period of proestrus was 76.5 $\pm$ 1.25 and at the end of heat 75.7 $\pm$ 0.84 (Tables I and II). There is a significant decrease in the uterine tissue water at the end of heat when compared with that of uteri removed during proestrus. The average figures presented in the tables correspond closely with those published earlier by Astwood.[3] In using the vaginal smear technic for timing his animals he reported the average per cent of uterine water during proestrus as 82.77 $\pm$ 0.35 and during late estrus as 80.37 $\pm$ 0.17.

Although there is a slight decrease (0.8%) in the tissue water of oviducts examined at the end of heat when compared with those removed during proestrus this decrease does not follow the pattern observed in the cornua. The significance of the difference between the percentage of water of the oviducts removed during proestrus as compared to those removed at the end of heat was tested by the Student's "t"-technic. The "p" value obtained ("p" = 0.027) indicates that there is no statistical significance in the differences of the two groups.

Discussion. The significant decrease in uterine tissue water between the period of proestrus and the end of heat has been confirmed. This increase in the water content of the cornua has been previously demonstrated to be due to the specific action of estrogens.[7,8] The sudden decrease in uterine tissue water during heat is thought to be due either to a decrease in estrogen production or to the action of progesterone which has an inhibitory influence on the deposition of tissue water. The origin of the fluid which dilates the ampullae of the oviducts during heat is probably not from the tissue water of this organ. The possibility of retrograde flow of uterine fluid in the normal female has been suggested but ligation of the oviducts just above the utero-tubal junction does not influence the extent to which the dilatation progresses. In addition, dyes

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TABLE I.

Total Weight, Dry Weight, and Percentage Water of Uteri and Oviducts of Rats Killed at the End of Heat.

Animal No.	Hr after onset of heat	Body wt	Uteri			Oviducts		
			Total wt, mg per 100 g body wt	Dry wt, mg per 100 g body wt	% water	Total wt, mg per 100 g body wt	Dry wt, mg per 100 g body wt	% water
4	15	152	256.1	51.6	79.8	9.212	2.279	75.3
5	17	165	349.0	66.1	81.1	10.317	2.492	75.9
7	14	180	216.2	40.8	81.1	8.069	1.939	76.0
15	13	195	228.7	42.9	81.2	7.617	1.899	75.1
17	12	185	240.8	48.0	79.7	7.422	1.775	76.2
18	12	180	296.2	57.3	80.7	9.128	2.168	76.3
19	12	185	289.1	56.9	80.3	8.178	1.937	76.3
20	12	148	438.8	84.9	80.7	10.475	2.528	75.9
21	14	149	254.6	51.5	79.8	9.351	2.168	76.8
22	14	175	222.5	45.3	79.7	7.166	1.858	74.1
23	12	172	259.7	50.2	80.7	7.014	1.641	76.6
24	12	150	230.9	45.2	80.4	7.608	1.800	76.4
25	12	200	298.0	57.9	80.1	5.874	1.419	75.8
26	13	170	288.7	56.1	80.6	6.589	1.558	76.7
27	14	155	230.3	45.7	80.2	8.049	1.937	75.9
28	12	175	346.4	67.0	80.7	8.502	2.041	76.0
29	12	152	254.4	50.4	80.2	8.564	2.068	75.9
30	13	164	257.6	50.1	80.5	6.358	1.560	75.5
31	13	172	262.6	51.4	80.4	7.561	1.958	74.5
32	13	182	411.3	76.9	81.3	6.875	1.827	73.5
	Avg		281.6	54.8	80.5	7.996	1.943	75.7
	σ		59.91	11.04	0.48	1.217	0.284	0.84

TABLE II.

Total Weight, Dry Weight and Percentage Water of Uteri and Oviducts of Rats Killed During Proestrus.

Animal No.	Hr after onset of heat	Body wt	Uteri			Oviducts		
			Total wt, mg per 100 g body wt	Dry wt, mg per 100 g body wt	% water	Total wt, mg per 100 g body wt	Dry wt, mg per 100 g body wt	% water
8	88	180	300.2	51.0	83.0	8.420	2.052	75.6
9	88	170	281.6	86.0	82.0	7.829	1.966	74.9
10	89	165	361.5	62.4	82.7	9.382	2.257	76.0
11	89	205	285.9	49.6	82.7	6.756	1.721	74.5
14	84	175	268.2	45.9	82.9	7.504	1.919	74.5
16	88	174	383.7	69.4	81.9	8.190	2.040	75.1
51	84	172	284.9	50.3	82.5	8.389	1.863	77.8
52	86	174	243.3	44.3	81.8	7.926	1.803	77.3
53	86	222	319.4	57.3	82.1	5.416	1.255	76.8
54	87	184	283.2	50.5	82.2	8.401	1.830	78.4
55	88	182	346.6	69.7	79.9	8.145	2.007	75.4
56	87	166	391.0	70.5	82.0	9.645	2.183	77.4
57	87	160	325.7	62.9	80.7	8.196	1.962	76.1
58	87	176	258.6	46.0	82.2	8.118	1.773	78.2
59	88	171	209.3	40.3	80.8	6.762	1.597	76.4
60	82	186	213.1	45.0	78.4	7.446	1.853	75.2
61	85	188	354.8	65.3	81.6	7.372	1.752	76.2
62	85	178	318.1	57.5	82.0	8.651	1.981	77.1
63	83	180	212.2	39.3	81.5	9.355	2.003	78.6
64	88	182	293.1	53.6	81.7	8.033	1.834	77.2
65	88	180	280.2	49.4	82.4	8.092	1.789	77.9
	Avg		295.9	55.5	81.8	8.001	1.878	76.5
	σ		51.71	11.66	1.05	0.932	0.206	1.25

injected into the cornua during heat do not find their way into the ampullae of the oviducts. Follicular fluid may contribute to the luminal fluid but the ampullar loops have already become distended before ovulation occurs. It has been postulated that there is an increased flow of fluid from the coelomic cavity into the oviduct at the time of ovulation.[9,10] From the investigations of Alden,[11] and our unpublished data, it seems likely that the periovarial sac opening is functionally closed during the period of heat.

Summary. The water content of the uterus and oviducts of adult rats during the period of proestrus and the end of sexual receptivity has been determined. There is a significant decrease in the water content of the uterine tissue during the period of heat. No significant decrease was found in the water content of the oviducts examined during this same period.

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16986

Coproantibody Response in Humans Following T.A.B.* Vaccination.

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(Introduced by John F. Kessel.)

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The value of coproantibody determination in the laboratory diagnosis of various enteric infections has been discussed recently by Harrison and Banvard.[1] The presence of agglutinins in feces was first described by Davies,[2] but this work was overlooked until the Russian investigators, Predpechensky and Moroz,[3] Skochko,[4] and Yampolsky, Gorfunkel and Aronina,[5] utilized the presence of fecal antibodies in the laboratory diagnosis of bacillary dysentery.

According to all previous investigators, agglutinins in the feces appear sooner than agglutinins in the blood serum in cases of actual enteric infection. This might suggest a local formation of the antibody in the tissue of the intestinal tract. Burrows and coworkers[6,7] indicate that antibody is excreted in the feces of animals and humans vaccinated with *V. cholerae* antigen. It is difficult to conceive how the subcutaneous injection of dead cells could stimulate the local formation of antibodies in the intestinal tract. Their appearance under these circumstances might indicate rather some mechanism of spill over from the blood stream. This view is substantiated in part by the observations of the Russian workers who found a high correlation between the presence of cellular exudate in the stool and fecal antibodies in cases of bacillary dysentery. Stools which contained large numbers of red blood cells and leucocytes commonly contained agglutinin in higher titer than stools which showed little or no cellular exudate. Burrows *et al.*,[7] however, emphasize that fecal antibodies reach their peak titer before serum antibody and tend to decline before the maximum serum

* T.A.B.—Typhoid, Paratyphoid A and Paratyphoid B vaccine.

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