the virus in the lungs of the animals infected sputa was swallowed. In addition the multiplication of the virus in the digestive tract has been postulated and is being investigated. 4. No attempts have been made to isolate the virus from the feces of human patients with typical epidemic influenza.

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Chemical Composition of Fluids from Benign Cysts of the Antrum.

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The maxillary sinus may be the site of several types of benign cysts; this report deals only with the non-secreting type. These cysts form in the connective tissue of the antrum mucosa and are lined by loose connective tissue which contains many capillaries, along with numbers of leucocytes and reticulo-endothelial cells. These cysts vary considerably in size and require a period of weeks or months to develop to the point where they fill the antrum. They contain a clear fluid which coagulates rapidly after removal and has a yellow or amber tinge.

Little is known about the formation of these cysts or why they produce such definite symptoms in a patient. It was thought, therefore, that chemical analyses of the fluid obtained from these cysts might contribute some useful knowledge.

Experimental. The presence of the non-secreting cyst was determined by X-ray films of the sinus, which showed a large, rounded, soft-tissue mass lying in the maxillary sinus. To obtain the fluid from the cyst and to reach the anterior part of the sinus the antrum is punctured with a curved trocar and cannula. Because the cyst may lie anteriorly, the method of puncture must permit exploration of the anterior and inferior region of the sinus as well as posteriorly. The cyst may regress after puncture and lavage. Recurrent or large cysts require surgical removal.

The volume of fluid obtained varied from 2 to 10 cc, depending upon the size of the cyst and the efficiency of the puncture. The specimens were always clear with a yellow tinge and always clotted. The fibrin was removed by twirling on a glass rod and the clear

filtrate was used for all analyses. The fluids used for pH and CO_2 determinations were collected under oil.

Cyst fluids were procured from 25 cases. The number of constituents examined depended upon the amount of fluid available. The determinations were rotated to obtain representative data for each constituent. The following determinations were made: pH, total CO_2, water, proteins, non-protein nitrogen, chloride, sodium, potassium, calcium, magnesium, and sugar. The pH was determined colorimetrically.[1] Carbon dioxide was measured with the Van Slyke and Neill manometric gas apparatus.[2] Chlorides were determined by the wet ashing method of Van Slyke[3] with the Wilson and Ball modification,[4] and water by weighing 1 cc aliquots before and after drying to constant weight in platinum crucibles in a 100° oven. Proteins were determined by the micro-Kjeldahl method of Campbell and Hanna[5] and were estimated by multiplying by 6.25, the total nitrogen corrected for non-protein nitrogen.[6] The albumin and globulin were determined by the method of Howe;[7] sodium and potassium were estimated by the methods of Butler and Tuthill[8] and Shohl and Bennett,[9] respectively. Calcium determinations were made by the method of Kramer and Tisdall,[10] as modified by Clark and Collip;[11] magnesium by the method of Denis.[12] For sugar the method of Miller and Van Slyke[13] was applied.

Results. The results may be grouped under 2 heads: (1) Water content and the concentration of glucose and nitrogenous constituents (Table I), and (2) the concentration of electrolytes (Table II).

For comparison with blood serum the analytical data are expressed in units per liter of solute in both media because the average percentage of water in both is approximately the same. From Table I it will be seen that the protein concentration in the cyst fluids was only slightly lower than that found in blood serum. All

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of the fluids contained fibrinogen. The A/G ratio was also similar to that found in blood serum. The non-protein nitrogen and glucose concentrations were found to be approximately the same as in serum.

The pattern of electrolytes in the fluid (Table II) resembles that of blood serum, the concentration of total base in the fluids never

TABLE I.
Water and Concentration of Glucose and Nitrogen Constituents in Antrum Cyst Fluids.

Patient	H_2O g per l	NPN g per l	Protein g per l	Fibrin g per l	A/G	Glucose mg per l
L.A.	932.0	.32	65.0			
L.B.	933.8	.35	72.5			
G.H.	941.7	.20	60.0	0.81		
T.G.	945.6	.29	57.1	1.78	3.72	
H.B.	946.5	.29	51.0			890
D	955.0					
N.K.	938.8	.22	62.7			
P.D.B.	931.3	.30	67.4		2.05	
R.O.	942.7	.25	63.6		1.87	970
H		.27	54.7	2.18	2.37	950
E.B.						920
J.C.		.26	61.9			970
A.T.						1170
O.L.		.30	49.4		1.95	
S.R.		.30	58.2	0.64	2.48	
Avg	940.8	.28	60.3		2.41	980
	± 6.0	.04	6.4		0.62	60
Serum	937.0	.28	66.6		1.80	920

TABLE II.
Electrolyte Concentration of Antrum Cyst Fluids.

Patient	pH	CO_2 mM per l	Na mM per l	K mM per l	Ca mM per l	Mg mM per l	Cl mM per l
P.D.B.				4.43			101.6
L.A.			149.0	4.55			110.4
L.B.			140.0	3.92	2.25	.90	81.3
G.H.			141.4	5.72	2.45	1.00	109.0
T.G.			138.5	4.50	2.30	.89	103.7
H.B.				3.88			100.2
A.L.	7.64	25.9					
D				4.94			98.6
A.P.			141.8				
N.K.			142.0				103.8
R.O.			139.6	4.19			105.8
J.C.					2.10	.79	92.6
M.N.	7.63	26.55					
E.A.J.	7.67	22.65					
H							98.0
S.R.							98.8
E.B.							102.6
Avg	7.65	25.0	141.8	4.54	2.27	.89	100.5
		±1.8	±3.1	±0.60	±0.12	±.08	±7.2
Serum	7.35	27.5	135.0	4.55	2.70	.81	100.5

being less than that found in blood serum. The sodium content was either equal to that of serum sodium or greater (138.0 mM to 149.0 mM); calcium was generally lower (2.10 mM to 2.45 mM); and potassium and magnesium concentrations corresponded with the normal serum concentrations. The amount of chloride varied from 81.3 mM to 110.0 mM, averaging 100.5 mM. The pH of the three fluids taken under oil was alkaline (7.63-7.67).

Discussion. Photomicrographs show that the collection of fluid in benign cysts of the antrum occurs in the subepithelial connective tissue. There is a distinct similarity between blood serum and cyst fluids from the antrum with respect to the concentrations of certain chemical constituents. The similar concentrations of glucose, non-protein nitrogen, CO_2, calcium, sodium, potassium, and magnesium in the cyst fluid and in normal serum indicate that these diffusible substances pass from the blood to the fluid. The chloride concentrations, which in 7 of the 13 fluids were higher than the average blood serum values, suggest that the cyst fluids are derived essentially from the blood. The protein content, however, is much higher than that of transudates; in fact, it is much like those of true inflammatory exudates. Schade, *et al.*,[14] found total protein values of 3.4 to 5.8 g % in representative inflammatory pleural and peritoneal exudates, which correspond to the magnitude of the total protein (6.0 g %) obtained from the antrum cysts. Since the membranes surrounding the cyst fluids are inflamed and contain many leucocytes and bacteria, it may be assumed that they have become so altered as to permit the free passage of protein with the result that the concentration of this constituent in the effusion is the same as in the blood serum.

Since linear correlations between specific gravity and total solids in serums have been established by Sunderman,[15] and between specific gravity and protein by Moore and Van Slyke,[16] a serum-like protein content in the analyzed antrum fluids should accordingly be accompanied by the high solids and the high specific gravities that were obtained.

As shown above, the pH was on the alkaline side (7.65), and the sugar content was 98 mg %. This corresponds with the pH results of Boots and Cullen[17] who found that non-septic joint fluids were not acid and generally had an alkalinity within the range of normal

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serum pH; and, also, with the glucose results of Allison and his co-workers[18] who found that the sugar content of non-septic synovial fluids was higher than in infected fluids. Working with sterile synovial fluids with high leucocyte counts Cajori and Pemberton[19] found a high acidity and a low sugar content, but they accounted for this as probably the result of glycolysis. Therefore, the results obtained here indicate that these cyst fluids are sterile and that they do not contain leucocytes in sufficient number to produce glycolysis. Bacteriologically, all of these antrum cyst fluids were sterile by ordinary means of cultivation, which also accounts for the alkaline pH and the normal glucose values.

The above analytical findings, therefore, are analogous to those obtained by previous workers on fluids resulting from transudation from the blood, with the exception of the high protein content. This last semblance to inflammatory exudates may be explained by the increased permeability of the cyst membranes resulting from infection, bacterial products, and proliferative vascular reactions.

Results. Total water, protein, glucose, and electrolyte concentrations were determined on fluids obtained from the non-secreting type of benign cysts of the antrum. The means were as follows: Total water, 940.8, ±0.6 g; protein, 60.3, ±6.4 g; glucose, 980. ±60 mg; pH, 7.65, ±0.02; CO_2, 25.0, ±1.8 mM; chloride, 100.5, ±7.2 mM; sodium, 141.8, ±3.1 mM; potassium, 4.5, ±0.6 mM; calcium, 2.27, ±0.12 mM; and magnesium, 0.89, ±0.08 mM per liter of fluid.

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Effect of Digitonin on Solubility of Phospholipids.

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In the Bloor-Knudson procedure[1] for the determination of the cholesterol ester content of blood plasma, digitonin in alcoholic

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