more marked and generalized than is usually seen in a localized infection with drainage to regional nodes as, for example, in streptococcic sore throat. The epidemic nature of the condition is also in favor of a specific etiological agent. In order to demonstrate the ability of the granulocytic apparatus to respond, four patients were given a foreign protein (typhoid vaccine) intravenously. All patients responded with a leukocytosis, the increase being entirely confined to the polymorphonuclear leukocytes.

2902

Chronic benzol poisoning.

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(Introduced by Fred M. Smith).

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Our purposes were to verify in human pathology, the morbid anatomical changes described in animals poisoned with benzol, and to observe the effects of benzol medication on patients with chronic myelogenous leukemia.

The first studies were on a patient occupationally exposed to the fumes from a vat of benzol from January 6, 1925, to March 20, 1925. The symptoms, findings and course including a terminal sepsis were typical of chronic benzol poisoning. Entrance to the hospital was on May 27, 1925, and death on June 7, 1925.

Blood: R.B.C. 860,000; W.B.C. 1400; Hb. 20 per cent. Differential. Polymorphonuclear neutrophiles 13 per cent; lymphocytes 48 per cent; endothelial leucocytes 39 per cent. No normablasts were seen. Blood platelets 70,000. Coagulation time 9 minutes. Bleeding time 13 minutes.

Necropsy showed hemorrhages into the skin, mucous membranes and meninges. The lungs had the gross appearance of broncho-pneumonia. Microscopically the alveoli were plugged with fibrin which contained many organisms but no inflammatory cells. Numerous areas of focal necrosis were present in the liver. Organisms were plentiful in these areas but no inflammatory

cells could be found. The bone marrow contained very few cells of any type and there was no evidence of active formation of either red or white corpuscles. No megacaryocytes were seen.

Our findings conform clinically to those of reported cases,[1] and confirm, in the human, numerous morbid anatomical changes observed in experimental animals, namely:

1. Leucopenia.

2. Aplastic anemia.[2] Our own case did not verify the destruction of adult forms, as reported by Selling, since there was no excess of iron pigment in the tissues.

3. Thrombocytopenia.[3]

4. Aplasia of bone marrow, *i. e.*, replacement of the erythropoetic, leucopoetic and platelet forming elements by fat.

5. Absence of inflammatory cell response to infection.[4]

In addition our observations seem to warrant the conclusion that endothelial cells, both circulating and fixed, are not especially damaged by benzol.

The following facts have been quite well established clinically and experimentally and are in agreement with the results seen in twenty-one of our cases of chronic myelogenous leukemia which were treated with benzol.

1. A leucopenia is the earliest index to chronic benzol poisoning.[5] A prompt fall in the number of cells of myelocytic origin was noted in all cases, the more immature forms disappearing from the circulation first.

2. Injury to the erythroblastic elements is the last to appear and the last to disappear.[2] In most of the cases the fall in red blood corpuscles was very gradual and in the interval between admissions the leucocytes promptly rose while the erythrocytes lagged considerably behind.

3. There is marked variation in personal susceptibility to benzol.

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[1] Santesson, *Arch. f. Hyg.*, 1897, xxxi, 336.

[2] Selling, L., *Ziegler's Beitrage*, 1911, li, 576.

[3] Duke, W. W., *Arch. Int. Med.*, 1913, xi, 100.

[4] Winternitz, M. C., and Hirschfelder, A. D., *J. Exp. Med.*, 1913, xxvii, 657.

[5] Hamilton, A. P., *J. Amer. Med. Assn.*, 1922, lxxviii, 627.

Case	Tot. dosage of benzol in minims.	Period of administration.	Leucocytes		Erythrocytes		Result
			Before	After	Before	After	
1	3495	47 days	340,000	11,200	5.6m	6.1m	Symptomatically improved
2	555	25 days	292,000	300	2.1	1.0	Purpura and death
3	7104	3 1/3 yrs.	430,000	11,600	3.3	.8	No untoward symptoms

4. The effect of benzol on the bone marrow persists after withdrawal of the drug.

Benzol was routinely discontinued when the leucocyte count reached 30,000 but in many cases these cells continued to fall to a level well below normal.

The action of benzol in these cases, though parallel to the action on normal subjects, is not in itself conclusive because the patients were diseased and many of them received radium or Roentgen ray or both simultaneously with the benzol.

2903

Fertility of the white rat on purified rations.

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It has been observed that animals (rats) fed exclusively on milk[1] or on purified rations made to simulate milk[2] seldom reproduce. In those instances where reproduction has occurred, few young were born and only a small percentage have survived the suckling period. The failure in the reproduction function of

[1] Daniels, A. L., and Hutton, M. K., *J. Biol. Chem.*, 1925, lxiii, 143.

[2] The purified ration consisted of casein 18 grams; lard 23 grams; butter 5 grams; cod liver oil 2 grams; cornstarch 47 grams; NaCl 0.514 grams; K_2HPO_4 2.587 grams; $NaH_2PO_4.4H_2O$ 1.172 grams; magnesium citrate 0.76 grams; $CaCl_2.H_20$ 2 grams; iron citrate 0.75 grams; potassium iodide 2 per cent solution, 0.4 cc.; alcoholic extract of 22 grams of wheat embryo.