at this time were negative. This may indicate that the degree of infection decreases at the end of the summer. A definite statement cannot be made, however, since the degree of infection during September 1944 at Campbell River is not known and no comparison can be made.

Microfilariae were found in the blood of 22 per cent of the adults but were not observed in any of the juveniles. In no case were they very numerous. This does not mean, however, that the young birds were not infected. It is possible that the adult parasites were present but had not reached maturity in the solid tissues. Consequently, the young stages would not have appeared in the blood.

Mixed infections were found in 7 birds as follows:

		Per cent
Haemoproteus, Leucocytozoon, Trypanosoma	1 bird	2
Haemoproteus, Leucocytozoon, Microfilaria	3 birds	7
Haemoproteus, Trypanosoma	1 bird	2
Haemoproteus, Microfilaria	2 birds	4.5

Few data as to the mode of transmission of these parasites were obtained. Louse-flies (*Diptera, Hippoboscidae*) of unknown species were noted on 4 out of 53 birds (7.5 per cent) collected at Campbell River in 1943. However, no adequate study was made to prove that these were the transmitting agents. In any case, they do not appear to be numerous enough to account for the high percentage of infected birds in the population.

None of the birds examined appeared to be suffering any ill effects from infections by any of these parasites.

(I am indebted to Dr. A. M. Fallis, of the Ontario Research Foundation, for assistance in the preparation of this note.)

Reference

1. Herman, C. M. *Bird-banding*, 1944, **15**, 3, 89–112.

The Relative Effectiveness of Pure Penicillins G, X, and K

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In connection with the study of a new penicillin prepared in this laboratory it was noted that the blood levels resulting from its injection were of a shorter duration than those obtained under the same conditions from a commercial penicillin. Because this new penicillin (No. 128) had an activity of 3,500 units/mg. as compared with 2,300, 1,667, and 900 units/mg. for penicillins K, G, and X, respectively, consideration was given to the possibility that it was being excreted faster than the others. This might follow when one considers that it takes approximately four times as many molecules of penicillin X as it does of the new penicillin to give dosages which are equivalent in terms of International Units.

Accordingly, an experiment was set up to determine whether the rate of excretion of a pure penicillin is a function of its potency in terms of units/mg., or, in other words, of the number of molecules injected. The penicillins used were analytically pure preparations of the crystalline compounds. These had been subjected previously to extensive chromatographic treatment to insure their separation from other penicillins. They were dissolved in normal saline at a concentration of 5,000 units/ml.

Each penicillin, on different days, was injected into each of the same four subjects. Twenty-five thousand units were injected intravenously into one arm, and blood samples withdrawn from the other arm at suitable intervals. Urinary excretion of the penicillins was measured at half-hourly intervals during the first two hours and hourly thereafter. The urine was assayed[1] by the usual cylinder[2]-plate method against *Staphylococcus aureus* 209P, and the blood levels were determined by the method of Heilman (*1*) against her strain of a hemolytic streptococcus. A penicillin G standard was used in each case.

The duration of penicillin blood levels of at least 0.03 unit/ml. for each of the penicillins was as follows: penicillin G, 2–2.5 hours; penicillin 128, 1–1.25 hours; penicillin K, .5–.75 hour; and penicillin X, 4–4.5 hours. Even though the figure for penicillin X is somewhat exaggerated because the test organism is approximately eight times as sensitive to this penicillin as it is to the standard penicillin G,[3] the blood levels do not fall in the same order as the activities as expressed in units/mg.

The explanation for the poor action of penicillin K is apparent when one examines the excretion figures. These indicate that during the first two hours, the various penicillins are excreted in the following percentages: penicillin G, 83; penicillin 128, 58; penicillin K, 28; and penicillin X, 78. Penicillins G and X were excreted in the amount of approximately 80 per cent, the difference between them being within experimental error. Penicillin K, however, was excreted to the extent of only about 30 per cent. Since very little penicillin is excreted after the second hour,

[1] The authors are indebted to H. W. Cromwell and his staff for all assays reported in this paper, and to F. H. Stodola, of the Northern Regional Research Laboratory, for his gift of the necessary penicillin X.

[2] Paper discs were used rather than cylinders.

[3] This was determined for each of the penicillins on the original solutions containing 5,000 units/ml. Penicillin X prevented hemolysis at eight times the dilution, and penicillins K and 128 at the same dilution, as did penicillin G.

this can only mean that penicillin K is very rapidly destroyed in the body—so rapidly that its therapeutic effectiveness must be very small indeed. These excretion figures also indicate the incorrectness of the original premise which formed the basis of the experiments. It would appear that, in the dosage used, penicillins G and X are excreted at about the same rate, even though twice as many molecules of X were used, and that the rate of excretion of penicillin K is obscured by its high rate of inactivation. At the very low concentrations in which penicillin occurs in the blood it is apparently almost completely removed in one passage through the kidneys.

A check experiment was made with a recent commercial lot of penicillin. Chromatographic examination and corollary checks (including crystallization of its penicillin G) showed this lot to contain approximately 92 per cent of G and 8 per cent of K. Examination of the blood levels and excretion data indicates that this commercial penicillin behaved in every way as did the pure penicillin G—that is, within experimental error.

Conclusions

On the basis of this admittedly preliminary and meager experimental evidence, one would be justified in concluding that (1) penicillin K is so unstable in the human that its therapeutic usefulness when used parenterally is open to very serious question; (2) penicillins G and X are sufficiently stable that their excretion by the kidney represents the limiting factor in the maintenance of therapeutic blood levels; and (3) penicillin X is sufficiently more active (on an International Unit basis) against at least one strain of a hemolytic streptococcus that its use would be indicated for an infection caused by any organism of similar sensitivity.

Reference

1. Heilman, D. H., and Herrell, W. E. *Amer. J. chem. Path.*, 1945, **15**, 7–9.

News and Notes

George Briggs Collins, professor of physics at the University of Notre Dame, has been appointed head of the Department of Physics at the University of Rochester. Dr. Collins, who will begin his new duties with the fall semester in September 1946, succeeds Lee A. DuBridge, head of the Rochester Physics Department for the last 12 years, who has resigned to become president of California Institute of Technology. Dr. DuBridge, as director of the Radiation Laboratory, was closely associated with Dr. Collins at M.I.T. during the war.

Paul Willard Merrill, of the staff of the Mt. Wilson Observatory, was awarded the Henry Draper medal by the National Academy of Sciences on 23 April for his numerous important contributions, particularly those on stellar spectroscopy.

David Glick has been appointed associate professor of physiological chemistry at the University of Minnesota and consultant in biochemistry to the Veterans' Hospital, Minneapolis. His appointment was effective 1 April 1946.

Frank B. Jewett, president, National Academy of Sciences, delivered a lecture on 10 May before the Sigma Xi Chapter of North Carolina State College. Dr. Jewett spoke on "The Future of Scientific Research in the Postwar World."

Kazimierz Sembrat, Instytut Zoologiczny Uniwersytetu, Wroctaw, Poland, lost all of his academic literature during the war and suffered severe physical injuries from bombings. He is greatly in need of reprints and textbooks in zoology, particularly in the field of experimental embryology. Dr. Sembrat was a Rockefeller fellow at the University of Chicago, Yale University, and the Marine Biological Laboratory at Woods Hole during 1936–37.

Ernest H. Volwiler, executive vice-president of Abbott Laboratories, was granted a D.Sc. degree at Miami University, Ohio, on 2 June. Dr. Volwiler has been a member of the board of directors of Abbott Laboratories, Chicago, and director of research since 1930. He was elected vice-president in charge of research and development in 1933, and became executive vice-president of the Laboratories last March.

John R. Ball, professor of geology and paleontology at Northwestern University and for 30 years a member of the staff, will retire at the end of the current academic year but expects to continue active geologic work.

Alpheus W. Smith, physicist and retiring dean of Ohio State University Graduate School, was awarded an LL.D. at the Ohio State commencement exercises on 7 June.