DR. JASANI: Triamcinolone was selected because it had already been used in several similar studies.

DR. O. SAVAGE (*London*): How did the patients do clinically on the day they did not have the corticosteroid?

DR. JASANI: The patients receiving 8 mg. of triamcinolone at 8 a.m. one day had a recrudescence of symptoms from about 2 p.m. the next day. Afterwards all patients had relatively greater relief of symptoms and did not mind having the steroid on alternate days.

DR. O. SAVAGE (*London*): They had a pretty unhappy time during part of the second day?

DR. JASANI: In the beginning perhaps, but so did patients with the 4 mg. nightly dose, who experienced return of their symptoms between 2 and 6 p.m. on the following day.

DR. O. SAVAGE (*London*): Dr. Carter—you have shown that you can wake up a suppressed adrenal by giving ACTH. Have you any evidence that it stays awake? In the slides you showed, you had always put them back on systemic steroids.

DR. CARTER: No, not always. Pituitary-adrenal responsiveness is maintained whilst the patients receive ACTH, rapidly lost when they are converted to steroid therapy and regained if they revert to ACTH therapy. After ACTH had been discontinued the pituitary-adrenal responses remained normal.

PROF. J. J. R. DUTHIE (*Edinburgh*): Do these patients give themselves their injections?

DR. CARTER: Yes, mostly. One or two do not, either because they cannot calculate the dosage or because their hands are not agile enough.

Measurement of Synovial Blood Flow in Normal and Diseased Joints. By W. C. DICK, R. A. ST. ONGE, K. WHALEY, F. GILLESPIE, J. A. BOYLE, M. K. JASANI, and W. W. BUCHANAN (*Glasgow*).—Synovial blood flow has been calculated in normal and diseased knee joints using as a method the disappearance of radioactive Xenon from the knee. The mean value obtained from twelve normal knee joints was 2.78 ± 0.53 , while for fourteen patients with osteoarthritis it was 3.97 ± 0.81 and for forty patients with rheumatoid arthritis it was 9.94 ± 0.69 , all results being expressed as ml. per 100 g. synovial tissue per minute.

It has also been possible to demonstrate the anti-inflammatory effect of intra-articular injection of hydrocortisone in eleven rheumatoid patients, the mean blood flow before being 12.92 ± 1.65 and after the injection 8.87 ± 1.54 ml. per 100 g. synovial tissue per minute.

Discussion.—PROF. E. G. L. BYWATERS (*Taplow*): I thought the Society might be interested to see two historical slides taken some 20 years ago, when I tried to measure synovial blood flow in the knee in man by using the joint as its own plethysmograph; we put in a needle on a three-way tap attached to a manometer, and then put on a venous cuff proximal to the joint, which was wrapped in a non-extensible bandage. This formed the plethysmograph box, and the rate of flow of saline out of

the needle along the manometer gave an index of the amount of blood entering the joint. In several patients blood in-flow came up at something like 3 mm. per minute. Now our results were in terms of mm. per minute, which represented blood flow; you have used the term "ml. per g. tissue"—this must be a very difficult calculation to make unless you have weighed the tissue. Can you tell us how you got this?

DR. DICK: Synovial blood flow is equal to the derived value from the exponential fall-off of radioactivity multiplied by Lambda, which is the partition co-efficient of Xenon for synovial membrane with respect to blood. All radioactive methods of determining blood flow are based ultimately on three things, the Fick principle, the partition co-efficient and the constant clearance, and all can be transposed mathematically quite acceptably into ml. per 100 g. per minute. This has been done for brain, for fat, and for muscle, by using this equation.

PROF. E. G. L. BYWATERS (*Taplow*): This is a theoretical gramme rather than a measured gramme?

DR. DICK: It is as practical as is any other measurement of a gramme in this field. I should not like to say more than that.

DR. J. FERGUSON (*Glasgow*): It struck me that one or two of your curves might be biexponential rather than monoexponential. Have you any explanation?

DR. DICK: That is so. The fall off of radioactivity was in counts per minute against time. In many normal patients and in most patients with osteoarthritis we got a monoexponential curve, which was no problem. The mathematical expression was

$$y = Ke^{-\lambda t}$$

With certain patients, however, at the beginning of the study we got curves with a rapid fall initially levelling off to a low level later, and by the method of Veall and Vetter these can be resolved into two components. We appeared to get these curves when we imposed more trauma on the patient. It appeared to correlate with pain initially; so we altered our technique and inserted a needle attached to a saline-loaded syringe into the joint cavity and left it absolutely still for 5 minutes. We then replaced the saline with Xenon and injected very carefully. With this technique we abolished the first component, so we concluded that this was an injection phenomenon, presumably because we were injecting practically straight into the blood vessels initially. In all subsequent investigations we got a monoexponential curve. The same has been noted in other fields by other workers.

DR. M. I. V. JAYSON (*Bath*): One of our problems has been that Xenon is particularly soluble in fat. Is this taken into account in your calculations?

DR. DICK: The clearance from adipose tissue has been estimated by the same technique to be 2.86 ml. per 100 g. per minute; that is, a normal synovial level, so this can hardly account for the difference. Furthermore by directly measuring the partition co-efficient of Xenon for synovial tissue with respect to blood, I think we have obviated this problem.

DR. A. ST. J. DIXON (Bath). Although you assume that loss of Xenon from the joint occurs entirely *via* the blood stream, this is not necessarily true. In rheumatoid joints, contrast arthrograms show that contrast material with a lower diffusibility than Xenon may leave the joint by the lymphatic system, particularly in the elbow and wrist. This point is even more important if you think in terms of joints in motion rather than joints at rest.

DR. DICK: The point about moving is certainly true. We have considered this but it was impracticable to measure it properly when moving. The point about the lymphatic drainage of the joint; is not this a time related phenomenon? Does it not take significantly longer?

DR. A. ST. J. DIXON (Bath): You see it within a few minutes of doing an arthrogram.

DR. DICK: Where can it be detected?

DR. A. ST. J. DIXON (Bath): In a knee arthrogram, contrast appears in the lymphatics in the popliteal fossa and may miss the popliteal lymph nodes. In the elbow, the epicondylar lymph nodes are quickly opacified, sometimes within a couple of minutes.

DR. DICK: There may well be, as you say, some lymphatic component, but since lymphatic flow is related to blood flow this problem may not be insuperable.

Iron Content of Synovial Tissue in Rheumatoid and Normal Individuals. By A. G. MOWAT and T. E. HOTHERSALL (*Edinburgh*).—Published in full in the *Annals* in July, 1968.

Computer Matching of Arthritis Patients. By J. A. BOYLE, J. A. ANDERSON, and W. W. BUCHANAN (*Glasgow and Oxford*).—One of the problems in arthritis is the comparison of patient groups, particularly in the field of epidemiology. A procedure which allowed accurate matching of groups of patients in different centres is desirable. This communication described a method which might allow this to be done. A standard reference set of patients with defined rheumatoid arthritis was constructed and another reference set of patients with defined osteoarthritis was also used. Using a procedure derived from Bayes' law for the probability of causes, the likelihoods of each of a fresh group of patients belonging to the patient population in both reference sets were calculated. The discrimination achieved by this technique between the two diseases was presented and its possible applications were discussed.

Discussion.—DR. J. S. LAWRENCE (Manchester): Are you talking about hospital patients or are they people discovered in the population?

DR. BOYLE: We were dealing with hospital patients, but it could perhaps be used with patients with mild arthritis who did not go into hospital.

DR. J. S. LAWRENCE (Manchester): In the population sample, one is dealing with many people with mild-osteoarthritis and comparatively few with rheumatoid arthritis; if you apply criteria blindly you end with far too many false positives. The American Rheumatism Association criteria have been satisfactory in hospital patients because they are applied to patients with rheumatoid arthritis.

DR. BOYLE: I do not know if the method will work when applied to population samples, but it could possibly be used in the following way. A sample of patients with sero-positive erosive arthritis could be measured against the probability matrices; the scatter of likelihoods which result from this comparison could then be compared with the scatter of likelihoods given by patients who are thought to have rheumatoid arthritis in another country. The question of false positives therefore would not arise.

DR. J. S. LAWRENCE (Manchester): That is right so long as the same observer has seen these patients in different parts of the world.

DR. BOYLE: The observer error isn't insurmountable but I agree that this would introduce difficulties.

DR. J. S. LAWRENCE (Manchester): So you say, "We think this is probably rheumatoid arthritis", and so you are introducing an opinion to start with.

DR. BOYLE: I agree that this technique is not intended to define rheumatoid arthritis, but merely to compare your opinion of what rheumatoid arthritis is, using your criteria, with someone else's opinion in a different part of the world, using the same criteria.

PROF. E. G. L. BYWATERS (Taplow): The big problem is that the patient's illness runs along in time; when filling in computer forms on items which the patient has manifested in the past you are doing a retrospective survey.

Long Leg Arthropathy. By A. ST. J. DIXON and S. CAMPBELL-SMITH (*Bath*).—To be published in full in the *Annals* with the subsequent discussion.

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BUCHANAN, and F. C. GILLESPIE (*Glasgow*): In an effort to obtain an objective index of articular inflammation, radioscanes were performed on a variety of joints in 24 patients with rheumatoid arthritis of varying severity, 25 minutes after the intravenous administration of 1 m.Ci radiotechnetium (^{99m}Tc). Localization of the isotope in the joint was easily demonstrated using a Picker Magna-Scanner V. It was thus possible to quantitate the display of the isotope in a joint. The method was sufficiently reproducible for clinical use, and the uptake had been found to be a function of the clinical severity of joint inflammation.

Further studies had shown that the isotope was not actively concentrated by the diseased synovial membrane, and this finding suggested that the display of isotope in an inflamed joint might reflect enhanced vascularity of the synovial membrane and other joint tissues.

Discussion.—DR. J. T. SCOTT (*London*) asked if the maximal uptake of radio technetium correlated with the temperature of the skin over the joint.

DR. DICK said that he did not yet have the equipment to make such measurements.

DR. J. H. GLYN (*London*) asked if it were safe to repeat the measurements more than once in the same patient.

DR. DICK felt that if the individual dose could be reduced to the region of 100 microcuries, it should be possible to repeat the tests, say, three times a year.

PROF. J. H. KELLGREN (*Manchester*) asked if the method described provided any more information than ordinary clinical observation.

DR. DICK considered that the amount of uptake of isotope was a measure of blood flow and provided an objective measurement and could be used as a rapid method of assessing the effect of drugs.

DR. LAVENDER suggested that the uptake of isotope was not solely related to blood flow.

MR. A. KATES (*London*) pointed out that the results presented differed from those obtained using radioactive gold injected intra-articularly.

DR. DICK suggested that the difference might be due to the differing uptakes of the two isotopes by synovial cells.

Chronic Polyarthritis in Nigerians. By B. M. GREENWOOD (*Taplow*): To be published with the discussion thereon in a future issue of the *Annals*.

Demonstration. PROF. E. G. L. BYWATERS (*Hammer-smith and Taplow*) presented a demonstration on "The Early Lesions of Ankylosing Spondylitis". While almost all published autopsy cases were in the ossified stage, four out of 23 autopsies at Hammersmith and Taplow showed earlier lesions. These included inflammatory erosions of cartilage at the disc margin, Romanus lesions, and discitis proper, the lesions resembling those of polychondritis rather than those of rheumatoid arthritis.

CORRECTION

In the March, 1969, issue of the *Annals*, p. 197, col. 2, ll. 3 and 4, for millimetres read millilitres.