measured by radioimmunoassay using sheep anti-PGE₂-BSA. Drugs were added immediately before incubation using the following concentration ranges: indomethacin (0.1 ng—10.0 µg/ml); aspirin (1 ng—100 µg/ml); phenylbutazone (1 ng—100 µg/ml); feprazone (1 ng—100 µg/ml), and naproxen (1 ng—100 µg/ml); colchicine (1 ng—10 µg/ml); dexamethasone (1 ng—10 µg/ml); prednisolone (1 ng—10 µg/ml), and dehydrocortisone (1 ng—10 µg/ml).

Macrophages produce substantial amounts of PGE (mean 11.6, range 2.4—43.2 ng, PGE₂ equivalent/10⁶ cells/24 h) whereas neutrophils produce much less (mean 0.4, range 0.2—0.62 ng, PGE₂ equivalent/10⁶ cells/24 h) measured by radioimmunoassay. The production of E-type PG by macrophages is inhibited by NSAIDs with a rank order of potency, on a weight basis, of indomethacin > feprazone > aspirin > phenylbutazone > naproxen > sodium salicylate. Anti-inflammatory glucocorticosteroids also inhibited macrophage PGE synthesis with a relative potency of dexamethasone > prednisolone > hydrocortisone. Colchicine, however, stimulated PGE production by the macrophages.

Whereas human rheumatoid synovial fragments produce substantial amounts of PGs and show comparable susceptibility to anti-inflammatory drugs as exhibited by guinea pig peritoneal exudate macrophages, cells present in human synovial effusions (predominantly polymorphonuclear (PMN) leucocytes) are poor effective sources of PGs *in vitro*. It is noteworthy that there is no correlation between the levels of PG and the PMN leucocyte count in synovial effusions (Patrino *et al.*, 1975) and that the appearance of PGs in urate crystal induced synovitis precedes PMN leucocyte infiltration (Glatt *et al.*, 1974); also that human peripheral blood PMN leucocytes are poorly active in generating PGs (Zurier, 1975). Both the NSAIDs and the steroidal anti-inflammatory drugs showed an efficacy in blocking PG production which broadly paralleled their clinical effectiveness in the former case and closely followed the anti-inflammatory activity in the latter. The stimulation of PG production by colchicine has also been noted in human rheumatoid synovial cultures (Levine, 1973) and during urate crystal induced synovitis (Glatt *et al.*, 1974). These observations suggest that macrophages are the most likely source of PGs in inflammatory joint disease, and indicate that the guinea pig peritoneal exudate macrophage may be an appropriate model for the evaluation of anti-inflammatory drugs.

References

- BLACKHAM, A., FARMER, J. B., RADZIWIŃ, H., AND WESTWICK, J. (1974) *Br. J. Pharmacol.*, **51**, 35
 BRAY, M. A., GORDON, D., AND MORLEY, J. (1974) *Br. J. Pharmacol.*, **52**, 453P
 FLOWER, R. J., GRYGLEWSKI, R., HERBACZYNSKA-CEDRO, K., AND VANE, J. R. (1972) *Nature New Biol.*, **238**, 104
 HIGGS, G. A., MCCALL, E., AND YOUTLEN, L. J. F. (1975) *Br. J. Pharmacol.* **53**, 539
 GLATT, M., PESKAR, B., AND BRUNE, K. (1974) *Experientia*, **30**, 1257
 LEVINE, L. (1973) *Pharmacol. Rev.*, **25**, 293
 MCCALL, E., AND YOUTLEN, L. J. F. (1975) *Proc. VI Int. Congress Pharmacol.* Abs. 999
 PATRINO, C., CIABATTONI, G., DIMUNNO, O., BOMBADIERI, S., GRECO F., AND GROSSI, D. (1975) *Proc. VI Int. Congress Pharmacol.* Abs. 1447
 ROBINSON, D. R., SMITH, H., AND LEVINE, L. (1973) *Arth. Rheum.*, **16**, 129
 VANE, J. R. (1971) *Nature New Biol.*, **231**, 232
 ZURIER, R. B. (1975) *Proc. 2nd Int. Conference on Prostaglandins* (eds. B. Samuelsson and R. Paoletti). Raven Press, New York (in press)

Selective concentration and localization of gold in macrophages of synovial and other tissues during and after chrysotherapy in rheumatoid patients. B. Vernon-Roberts*, J. L. Doré*, J. D. Jessop†, and W. J. Henderson†. (*Bone and Joint Research Unit, The London Hospital**; *The University Hospital of Wales, Cardiff.†*) Published in full in the *Annals*, 1976, **35**, 477.

Changes in collagen of synovial membrane in rheumatoid disease. C. R. Lovell, M. I. V. Jayson, and A. J. Bailey (*Department of Medicine, University of Bristol, and Agricultural Research Council, Langford, Bristol*)

Gross thickening of the synovium is a principal characteristic of rheumatoid disease. However, knowledge of the structure of synovial collagen and the changes in disease is limited.

Rheumatoid synovia were obtained at surgery from 10 cases of age range 40–70 years. Control specimens, matched for age and site, were obtained from autopsies of patients who had no evidence of rheumatic disease. We analysed the synovial membrane for the genetic type of collagen and the nature of the intermolecular crosslinks by reduction with tritiated borohydride (Bailey *et al.*, 1970). The rates of collagen biosynthesis were determined from the formation of nondialysable ³H-hydroxyproline after incubation of the tissue in ³H-proline labelled culture media (Herbert *et al.*, 1974). Fractional precipitation of the pepsin-solubilized collagen as described by Chung and Miller (1974) showed the presence of polymorphic forms, and these were identified as type III (60%) and type I (40%) collagens in both normal and rheumatoid synovia.

Analysis for the presence of borohydride reducible crosslinks showed both dihydroxylysinoxidation and monohydroxylysinoxidation. A high proportion of the latter crosslink was present in young tissue, but failed to decrease during maturation. However, analysis of synovium from rheumatoid patients in the older age group showed the presence of a high proportion of dihydroxylysinoxidation, indicating increased collagen synthesis. In contrast to the crosslink found in scleroderma skin this crosslink is not cleaved by D-penicillamine and tissue culture studies indicate that D-penicillamine fails to inhibit the increased collagen synthesis of rheumatoid synovium.

In summary, the type of collagen proliferated in rheumatoid synovium appears to be similar to normal but possesses a more stable crosslink that is resistant to D-penicillamine. Furthermore D-penicillamine therapy does not inhibit the rate of formation of this new collagen.

References

- BAILEY, A. J., PEACH, C. M., AND FOWLER, L. J. (1970) *Biochem. J.*, **117**, 819
 CHUNG, E., AND MILLER, E. J. (1974). *Science*, **183**, 1200
 HERBERT, C. M., LINDBERG, K. A., JAYSON, M. I. V., AND BAILEY, A. J. (1974) *Lancet*, **1**, 187

Friction and lubrication of artificial hip joints. A. Usworth (*Leeds*)

The lubrication of artificial hip joints has been recognized as being important for some time. Not only would any full fluid film lubrication help to reduce friction, but it would also reduce the wear rate of such prostheses. Experiments were done on different types of prostheses, namely metal on plastic and metal on metal, to determine

frictional characteristics, and hence lubrication modes present within artificial joints. The apparatus used was a pendulum machine which uses either a natural hip joint or an artificial joint as the fulcrum, and measures the friction resistance directly by means of a special hydrostatic load carriage. The loading of the artificial joint can be either static or dynamic. The dynamic mode functions by means of a jacking device which drops the load onto the joint at the instant of beginning the swinging motion and thereby simulates the impact loads encountered in the hip at heel strike. It will be shown that the lubrication mechanism found in prostheses is likely to be mixed in nature with a degree of hydrodynamic lubrication present under certain conditions.

In a second series of experiments using a Charnley Muller prosthesis, and silicone fluids of different viscosities, the coefficient of friction is shown to reduce as the viscosity increases. This viscosity dependence is indicative of a fluid film type of activity within the joint surfaces. Certain characteristics of design influence the development of fluid film lubrication, and comparisons can be drawn between the frictional resistance of different types of prostheses under dry and lubricated conditions.

Results from the pendulum tests showed that when artificial hip joints were lubricated with synovial fluid or silicone fluid the shapes of the 'coefficient of friction against number of cycles' curve were very different from the dry cases and indicate partial fluid film lubrication rather than boundary. In all the joint tests, synovial fluid helped to reduce the average coefficient of friction (Table I). An important physical parameter in joint

Table I

Type of joint	Coefficient of friction	
	Dry	Lubricated
Charnley hip joint	0.1	0.05
Muller	0.1	0.05
McKee-Farrar	0.26	0.2

Table II Muller hip

Viscosity of silicone fluid (Ns/m ²)	Coefficient of friction (range)
Dry	0.08 — 0.09
0.0096	0.08 — 0.13
0.048	0.055 — 0.11
0.096	0.04 — 0.075
0.192	0.025 — 0.06
0.96	0.008 — 0.04

lubrication was seen to be the viscosity of the lubricant (Table II). This supports the earlier conclusions in that prosthetic joints do depend to some extent on fluid film lubrication.

Lubrication of synovial membrane. A. F. Cooke, D. Dowson, and V. Wright (*Rheumatism Research Unit, Leeds*). Published in the *Annals*, 1976, 35, 56.

Arthritis in Flemish primitive paintings. J. Dequeker (*Rheumatology Unit Academic Hospitals, Katholieke Universiteit, Leuven, Belgium*)

Rheumatoid arthritis was first clearly described as an

entity by Landré-Beauvais in 1800. Before that time there were no convincing examples of the disease in medical writing except perhaps the description of the arthritis of Constantine IX (980–1055), who suffered from a progressive inflammatory polyarthritis affecting the soft tissues and with increasing deformities. Ankylosing spondylitis with or without peripheral joint involvement, however, existed with some frequency in the ancient world.

Although the art of the past is a suitable avenue to explore the existence of rheumatoid arthritis before 1800, several authors have commented on the absence of rheumatoid deformities in painting or sculpture before 1800. Living in a country possessing a collection of Flemish paintings, it was a challenge to look with a rheumatologist's view at our ancient paintings.

Hands are often said and are indeed a mirror of rheumatological diseases. With a magnifying glass in hand I went over catalogues and reproductions of paintings in my possession in order to discover hand lesions resembling rheumatoid arthritis. In my own city two paintings showed rheumatoid-like lesions. In the altarpiece of the holy sacrament upper panel of the left shutter 'Abraham and Melchizedek', painted by Dirk Bouts, who lived and died in Leuven (1475), a monarthrititis of the proximal interphalangeal joint of the left finger was present. In a painting of Jan Rombauts (ca. 1500) representing Christ appearing to St. Peter, Jesus Christ had a hand deformity resembling the hand of patients with long-standing rheumatoid arthritis.

Encouraged by these findings I searched further and found that the famous portrait of Frederigo de Montefeltre, presumably painted by Jan van Gent (1476) showed arthritis of the proximal interphalangeal joint of the left index and possibly also of the third metacarpophalangeal joint of the same hand. In a drawing by Jan van Eyck (+1441) of John IV, Duke of Brabant, swan-neck and boutonnière deformities of the right fingers are clearly seen. In the painting 'The Donators' by Jan Gossart (1508), also named Mabuse, polyarthritis of the fingers of the left hand of the male figure was evident with flexion deformities of the second, fourth, and fifth fingers. Jacob Jordaens (1593–1678) in the painting of his own family pictured his housemaid with hands resembling rheumatoid arthritis showing swelling of the second and third metacarpal and proximal interphalangeal joints.

It is evident that one has to be careful in making medical deductions from painters' artistic expression, especially of the hands since they use the hands as a powerful expression of feelings or as a hallmark of a particular school. So it is well known that in a number of paintings of Rogier Van der Weyden the fingers are particularly fine and long with often a clinodactyly deformity of the little finger. The deformities described in this paper, however, are not of this kind and are only accidentally seen. Furthermore, most of the paintings showing arthritis are portraits of known personalities.

Although none of the described deformities or swellings are indisputable examples of rheumatoid arthritis, they at least suggest that the painter must have been confronted with rheumatoid-like lesions in his models. In two paintings only a swelling of a proximal interphalangeal joint is seen. This monarthrititis could be due to

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