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Organisation: A. Kelâmi, H. Melchior, and F. H. Schröder

Andrology

TOXICITY OF CYANOACRYLATE ON THE RAT SEMINIFEROUS EPITHELIUM

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The toxicity of the tissue adhesive Cyanoacrylate (Histoacryl, Braun, Melsungen) on the seminiferous epithelium of the rat testis was investigated in order to assess its suitability for use in the operation of orchidopexy.

The adhesive was applied unilaterally to two groups of rat testes. In six animals the adhesive was applied extravaginally while in the second group of ten animals it was applied directly to the tunica albuginea. After 28 days the rats were castrated and the testes examined histologically. The opposite testis acted as control in each case. The histology was assessed qualitatively and quantitatively using tubular area, spermatocyte count and individual nuclear areas. The extravaginal application did not result in any histological change or alteration in any of the quantitative parameters. The intravaginal application resulted in scar tissue formation and a foreign-body giant cell reaction. In these areas atrophic tubules were seen. The inflammatory reaction was not pronounced. There appeared to be a difference in tubular area, spermatocyte count and nuclear area but these differences were not statistically significant. Scar formation was very localised.

The adhesive appears to be safe for clinical use, provided certain safeguards are respected, and this material has been used successfully in 98 children.

(References can be requested from the authors)

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LIGATION OF THE TESTICULAR VESSELS - A MORPHOLOGICAL STUDY

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The morphological changes in the testis following ligation of the testicular vein were compared with the results of ligation of both vein and artery and control groups in the rabbit. The findings have a significance for the choice of operation for varicocele.

In the control group the diameter of the seminiferous tubules increased from 218μ at 3 months to 253μ at 10 months. Following ligation of both artery and vein by the Palomo method the diameter decreased from 153μ at 3 months to 82μ at 6 months and then increased again to 153μ at 10 months. Following ligation of the testicular vein alone (Bernadi), no differences from the control group were observed.

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THE INFLUENCE OF EXTRAGENITAL MALIGNANCY ON SPERMATOGENESIS

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Testicular atrophy has been observed following the inoculation of tumour-cell cultures into an experimental animal. The effect of fast and slowly growing extragenital tumours on spermatogenesis was studied in rats and hamsters.

Relatively slowly growing melanoma cells were implanted beneath the dorsal skin of 20 hamsters. Testicular biopsies were obtained before, and 4 and 6 weeks after tumour implantation. After 4 weeks, significant testicular atrophy was observed with arrested spermatogenesis at spermatocyte levels. Further atrophy was observed at 6 weeks, and spermatogenesis was arrested at spermatogonia level. Mean tubular diameter was diminished and degenerative changes were obvious. Occasionally, complete fibrosis or Sertoli-cell only populations were observed.

Inoculation of fast-growing solid Walker carcinoma into 25 Sprague-Dawley rats resulted in the death of the animals at 10-12 days. Testicular biopsies were obtained initially and at 2, 4 and 7 days. No testicular changes were observed in these animals.

These changes may be brought about by influences on DNA synthesis. The early death of the animals in the Walker carcinoma group may not have allowed sufficient time for this effect to become apparent.

(References can be requested from the author)

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THE ACTION OF SOME HORMONES AND DRUGS ON THE ISOLATED HUMAN VAS DEFERENS

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Preparations of isolated human vas deferens of patients with prostatectomy were examined for their mechanical reactions to hormones and drugs (method: Biophysik 7, 276 (1971) and 11, 289 (1975)). The preparations have no spontaneous mechanical activity. Catecholamines, acetylocholin, 5-hydroxytryptamine and potassium induce phasic and tonic contractions. The action of catecholamines and acetylcholine could be abolished specifically with phentolamine, resp. with atropine. Cyclic dibutyryl-adenosine-monophosphate, isoprenaline and fenoterol inhibited the activity induced by catecholamines and potassium. Isoprenaline alone in higher concentrations could activate previously untreated preparations. Buphenine inhibited the adrenaline-induced mechanical activity at low concentrations; in higher concentrations this drug acted excitatory and it had a complete adrenolytic effect. Transmural electrical stimulation (10 to 100 Hz, 0,1 to 40 ms pulse duration) resulted in contraction.

The human vas deferens is in some pharmacophysiological properties similar to that of the guinea-pig (see: Ambache a. Zar: J. Physiol. 216, 359 (1971); Sjöstrand a. Swedin: Acta physiol. scand. 90, 513 (1974)). Systematical further investigations may be of importance in the treatment of ejaculatory disturbances and in the development of functional contraceptive drugs.

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RESEARCH ON A BIOLOGICAL, RESORBABLE ADHESIVE FOR USE IN UROLOGICAL SURGERY

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A 10% solution of fibrinogen-cryoprecipitate and factor XIII concentrate was applied to a resorbable collagen velour. The tissue to be joined with this adhesive was rinsed with a fibrinolysis inhibitor and the collagen velour then applied and held in place for five minutes.

In 20 rabbits a 1 cm bladder incision was closed by this method and the bladder wall examined histologically at 1, 2, 3 and 4 weeks.

Healing proceeded satisfactorily and at 4 weeks a connective tissue scar was all that was visible. The bladder mucosa was intact. The same material was applied to the prostatic bed following suprapubic prostatectomy in 25 patients. There was no significant postoperative bleeding and the tissue adhesive was completely resorbed.

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VASO-VASOSTOMY USING HIGH CONCENTRATION FIBRINOGEN TISSUE ADHESIVE

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Fibrin may act as a tissue adhesive when it is formed from highly concentrated fibrinogen by the action of thrombin and factor XIII.

This tissue adhesive was used in 30 rabbits for re-anastomosis of the vas deferens following transverse division. The vas was splinted during the operation and the splint removed one minute following anastomosis. Patency was tested radiologically and by injection of dye. Histological studies were carried out at weekly intervals for 6 weeks.

At 6 weeks 58 % of the animals had a patent anastomosis. There was little scar formation and sperm granulomas were rarely seen. Occlusion of the lumen appeared to be due to inadequate aposition rather than the presence of adhesive within the lumen. The use of human fibrinogen induces allergic reactions and results in a great amount of granulomatous reaction, and homologous fibrinogen may result in a greater patency rate.

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VASO-VASOSTOMY IN THE RAT WITH SILICONE AND POLYESTER TUBES

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Four different techniques of vaso-vasostomy have been investigated in the rat. The use of a silicone tube permanently implanted to bridge a gap, and the use of a silicone tube to splint an end-to-end anastomosis with subsequent removal of the tube, both resulted in leakage and testicular atrophy in more than 80 %. This may be partly due to the operative technique which involved delivering the testis from the scrotum.

The use of a silicone tube as a permanent implant to splint an end-to-end anastomosis and the similar application of an absorbable polyester tube both resulted in a 90 % patency at 3 weeks. Sperm counts pre- and post-operatively showed no statistically significant difference. Histological examination showed endothelial growth over the surface of the implanted tube.

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Angiology

ANGIOGRAPHIC STUDIES OF RENAL INJURIES: AN ANIMAL STUDY

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The use of renal arteriography and phlebography in the critical assessment of renal trauma has been studied in dogs following blunt trauma to the exposed kidney. Of 18 animals which were studied angiographically, 3 also underwent renal pharmacophlebography.

Following minor trauma the vessels may become irregular with small vessel tearing. There is a decrease in flow rate and maybe in-

definite separation of the cortex from the medulla. The normally well-defined arcuate and interlobular veins were not opacified during phlebography. Major trauma is accompanied by contrast extravasation and parenchymal tearing. The phlebogram showed a delayed washout, confirming decreased arterial blood flows. Compression of the vascular pedicle occurred with perirenal haematoma. A subcapsular haematoma is seen as a double renal contour with a concave cortical margin. Apparent nonfunction on routine urography may be shown angiographically to be a minor injury.

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PERMANENT OCCLUSION OF RENAL CIRCULATION BY EMBOLISATION WITH MICROSPHERES: ANGIOGRAPHIC AND HISTOLOGICAL FINDINGS

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Selective renal arterial catheterisation by the transfemoral technique was performed in 12 dogs, and 30,000 to 50,000 microspheres of 250 ± 40 µ diameter were injected. This is followed by complete occlusion of the intrarenal circulation. Mean survival time was 8 days with some animals surviving to 4 weeks. At this time the kidneys were shrunken and fibrotic, with no vascular structure. In 8 cases microspheres were found in the contralateral kidney, and embolisation of lumbar arteries occurred in 3 cases. This is probably due to reflux of microspheres into the aorta.

Satisfactory occlusion of the renal circulation was achieved by this method but the problem of reflux of the microspheres remains.

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EXPERIMENTAL OCCLUSION OF THE RENAL ARTERY BY INFLATION OF A SEPARABLE BALLOON

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A modified Swan Ganz catheter has been developed in which the balloon may be separated from the catheter after inflation and left in position in the renal arteries. A heating wire is incorporated in the catheter and separates the balloon by melting the catheter. The balloon is placed in the renal artery by the Seldinger technique and inflated. Separation is then performed and the catheter withdrawn.

Complete and permanent occlusion of the renal artery has been achieved using this technique in 4 dogs.

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EXPERIMENTAL LIGATION OF THE LEFT RENAL VEIN

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Following right nephrectomy the left renal vein was ligated in various positions with and without prior ligation or narrowing of the inferior vena cava.

Ligation adjacent to the kidney results in death from haemorrhagic renal infarction. Ligation adjacent to the vena cava results in a reduction in renal function and marked elevation in serum urea and creatinine. Renal function subsequently becomes normal. Prior ligation or narrowing of the vena cava results in earlier recovery of renal function. Recovery is dependent upon the development of a collateral circulation.

If resection of the vena cava is required

during radical nephrectomy the opposite renal vein must be ligated as close to the vena cava as possible.

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POST-ISCHAEMIC REGULATION OF OXYGEN SUPPLY TO THE RENAL CORTEX

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Renal blood flow, oxygen consumption, local oxygen tension and microcirculatory changes were measured in dogs following periods of ischaemia of 1, 10, 20 and 30 min.

The post-ischaemic oxygen uptake of kidney increases with increasing ischaemia time. A close correlation found between pO_2 and local blood flow suggesting that the microcirculation depends upon local oxygen uptake. This suggests the possibility for the existence of oxygen sensors in the kidney playing a part following ischaemia in the re-establishment of a normal tissue pO_2.

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Calculi

EXPERIMENTAL LOCALISATION OF RENAL CALCULUS FORMATION

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Renal calculus formation was induced in two groups of rabbits. In nine animals 0.03 mg dihydrotachysterine (AT_{10}) and 1 g calcium were given orally for 4-12 weeks. A further 8 animals received 0.09 mg of AT_{10} and 1 g calcium daily.

Calcium distribution in the kidney was studied by X-ray microanalysis and showed the highest calcium concentration in the cortex, diminishing towards the papilla. The absolute concentration increased with feeding time. After three weeks crystal formation could be identified in the cortex both in the glomerulus and in Bowman's capsule. Subsequently, at 12 weeks, apatite crystallites could be identified in all zones of the kidney. Magnesium and zinc concentrations were also highest in the cortex.

These studies suggest that crystal formation which may subsequently initiate stone formation begins primarily in the glomerulus and Bowman's capsule and not in the renal medulla or papilla.

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STUDIES ON THE MATRIX OF URINARY CALCULI

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During demineralisation and dissolution studies of the matrix of various types of urinary calculi have been carried out using the scanning electron microscope.

Organic matrix can be seen as a thin membrane covering the surface of the larger crystallites or bridging between individual crystals. Following demineralisation with 5%-EDTA solution idiomorphic crystallites appear which are free of matrix. A fine alveolar matrix structure remains following complete demineralisation. This is particularly well-developed with cystine calculi. Dissolution of calculi occurs in distilled water but much more slowly in urine and is followed by renewed crystallisation. This regrowth of crystal is more rapid in alkalinised urine and in the presence of proteus bacteria.

Organic matrix does not appear to be of primary importance for the process of crystallisation, but by forming gelatinous

envelopes round the crystallites, is responsible for the concentric and radial rings within the crystal fabric.

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NEPHROTOMY CLOSURE WITH DURAL RIBBONS

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A sutureless technique for the closure of nephrotomy incisions has been compared with conventional sutures and the degree of parenchymal damage assessed.

In 13 rabbits bilateral total longitudinal nephrotomies were performed. The right kidney was closed with conventional figure-of-8 sutures. The left kidney was closed by tying crossed ribbons of human dura around the kidney. Follow-up urograms were performed monthly for 8 months and the animals were sacrificed at monthly intervals. The blood pressure was recorded in those animals surviving to 8 months.

There were no macroscopic, histological or urographic differences between the kidneys. The blood pressure was marginally elevated compared with control rabbits.

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Microbiology

IDIOPATHIC HAEMATURIA AND NAKED BACTERIA

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The possible role of cell wall-deficient ("naked") bacteria in idiopathic haematuria has been investigated. Blood from patients with idiopathic haematuria and normal controls was lysed in hypotonic saline, filtered through 0.22 µ Millipore filter and cultured in special broth and agar. Routine blood cultures were also performed.

In 21 out of 22 patients, dense bodies were found in the blood which later converted to gram positive coccal and filamentous bacteria within 2 to 14 days. Routine blood cultures were negative. One patient with haematuria of 3 years' duration and a diagnosis of chronic proliferative glomerulonephritis was found to have naked bacteria which reverted to streptococcal-like organisms, filamentous forms and large catalase-positive round bodies on repeated cultures. Haematuria ceased after 1 week's treatment with erythromycin, and during treatment the reversion of the bacteria to ordinary forms did not occur or required more than 4 weeks. After stopping erythromycin there was an increase in the number of round bodies present in the blood and conversion to ordinary organisms occurred more rapidly. Haematuria did not occur during this period. Dense bodies found in normal controls either did not convert or did so only after prolonged periods.

These dense bodies may represent adaptation of bacteria to the environment of the blood stream and they appear to be capable of development into diverse morphological forms.

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IMMUNOLOGICAL ASPECTS OF THE PATHOGENESIS OF ABACTERIAL LIPID A-INDUCED NEPHRITIS IN THE DOG

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The intrapelvic injection of the endotoxic lipid A results in interstitial nephritis in dogs but not in puppies. The possibility that this is related to immune response was further in-

vestigated. Tritium-labelled lipid A was injected into the renal pelvis of 3 groups of dogs. Only 1 group had received no previous treatment, 1 group had been previously immunised with 50 mg lipid A vaccine, and the 3rd was preimmunised with four increasing doses of lipid A vaccine up to 400 mg at 5-day intervals.

Histological changes were observed over a 6 week period. All 23 dogs developed interstitial nephritis and reaction was increased in the single dose preimmunisation animal. The reaction was diminished by repeated reimmunisation. The reaction appears to depend on immune response to lipid A and the lack of an active immune system may explain the failure to induce lipid A nephritis in new-born dogs.

The in vitro investigation of lipid A on the growth of renal cells showed no effect when immunoglobulins and complement were absent from the culture medium.

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Toxicology

EXPERIMENTAL STUDIES ON THE NEPHROTOXICITY OF CONTRAST MEDIUM

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The nephrotoxicity of a cholecystographic contrast medium was investigated following unilateral renal arterial injection. A contrast medium normally used in renal arteriography served as control. The contrast media were injected into the left renal artery in two groups of 4 minipigs, and renal function followed by split urine collections over 15 min periods before, immediately after and 72 h after injection, and clearances were determined with 2 radioisotopes (^{125}I hippuran and ^{169}Yb DTPA).

Renal plasma flow was reduced in both kidneys following Angiografin. There was no change in the left kidney following administration of Biligrafin but a reduction of 41.5% in the opposite kidney. Renal plasma flow was normal in all kidneys after 72 h. Biligrafin did not alter glomerular filtration rate but Angiografin resulted in a reduction in both kidneys. These values were also normal after 72 h. Histological changes were minimal, affecting the renal tubules and involving both kidneys. There were no differences between the two contrast media.

No permanent functional changes were observed with either contrast medium but the histological changes suggest that the possibility of parenchymal damage in an already damaged kidney could occur.

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INFLUENCE OF DEXTRAN SOLUTIONS ON RENAL FUNCTION

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Renal function was determined by urine flow rate, U/P ratio, osmotic clearance and free water clearance in 24 dogs following exchange of 35 ml/kg body weight of blood with 6% dextran of MW 60,000 or 10% dextran solution MW 40,000. Ringer lactate was infused at 40 ml/h throughout the experiment and retransfused dogs were used as controls.

No changes in circulatory or renal function were observed in the control animals. Urine output decreased in those animals receiving dextran and the low molecular weight solution resulted in temporary anuria. The urine viscosity increased to 60 times the control value in those animals receiving the high molecular weight dextran.

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EXPERIMENTAL COMPARISON OF TWO AMINOGLYCOSIDE ANTIBIOTICS

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The efficacy and nephrotoxicity of kanamycin and its derivative amikacin were investigated in rats. Urinary enzymes and blood urea were measured during antibiotic treatment over 12 days. Increased tubular cell excretion was seen at doses as low as 5 mg/kg/day with kanamycin and 10 mg/kg/day for amikacin. The urinary enzymes increased at higher dose levels with both drugs, and foci of tubular necrosis were visible between 100 and 500 mg/kg/day. Glomerular lesions appeared only when the dose of 500 mg/kg/day was exceeded.

Oestradiol-induced E. coli pyelonephritis was induced in 75 animals and 50 of these were treated for 1 week with 10 mg/kg/day of either drug. Both drugs were successful in reducing the number of viable bacteria and there was no difference between the two drugs.

Amikacin appears to be marginally less nephrotoxic than kanamycin.

(References can be requested from the authors)

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Transplantation

RENAL FUNCTION IN THE RAT WITH ADDITIONAL TRANSPLANTED KIDNEYS

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Two additional supernumerary kidneys were transplanted in rats to study the phenomenon of renal counterbalance. This results in doubling of the total renal mass confirmed by intravenous pyelography and estimation of renal volumes. However over an 8 month observation period glomerular filtration and effective renal plasma flow remained unchanged compared to control animals.

The addition of supernumerary kidneys results in functional modulation of glomerular filtration and renal blood flow without change in kidney size.

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HYPOTHERMIC RAT KIDNEY STORAGE

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The technique of hypothermic kidney storage prior to autotransplantation has been studied in rats. Following intravenous mannitol and phentolamine the kidney was exposed to 2 min of warm ischaemia and perfused for 10 min with two different perfusates. The kidneys were then stored for periods of up to 24 h at 4° C after which autotransplantation was performed following contralateral nephrectomy.

The high sodium perfusate resulted in a higher perfusion pressure than the intracellular type solution containing high potassium levels. Apart from this there was no significant difference between the two perfusing solutions with GFR falling by 60 % on the 2nd day and returning to normal values on the 4th day. Fractional sodium excretion was 5 times normal on the 2nd day but had returned to normal values by the 4th day. Excretion urography at 3 weeks showed good excretion with parenchymal hypertrophy.

The survival rate following autotransplantation was low, being in the region of 25 % following 17 h storage. Further studies of hypothermic storage in the rat are required before a satisfactory experimental model can be developed.

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ANGIOGRAPHIC AND ULTRAMICROSCOPIC EXAMINATION OF CRYOPRESERVED CANINE KIDNEYS

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The preservation of kidneys at sub-zero temperatures has been investigated in the dog. After removal the kidneys were flushed with Collins solution and then perfused for 1 h with 5% albumin solution at 8-10° C in the Gambro perfusion machine. The kidneys were then flushed with a cryoprotectant glycerol solution and rapidly cooled to -50° C and stored for 3 h in a freezing chamber. After thawing in saline solution at 2° C the kidneys were flushed with sorbitol and again perfused with 5% albumin which was subsequently made hyperosmolar (875 mosm/l) with mannitol. The kidneys were then reimplanted into the neck. Angiographic and ultramicroscopic examinations were performed at various stages.

Even in those kidneys showing normal angiographic patterns and good flow rates before freezing the flow was extremely low after thawing. Angiographic studies at this time showed marked perfusion defects and narrowing of the intrarenal vessels. Ultramicroscopic studies at this stage showed that the endothelium had become disconnected from the intermediate layer of the arteries. The swollen endothelial cells partially occluded the vessels. Introducing a high osmolarity perfusate after thawing, the flow rate remained high and angiograms between 1 and 24 h of perfusion showed a normal angiographic pattern. Following reimplantation urine was produced for 10 h but the kidney then became soft and cyanotic. Microscopic examination showed necrotic endothelial cells, interstitial haemorrhage and widespread thrombosis.

Perfusion with low osmolarity solutions may contribute to osmotic lysis of the endothelial cells and this effect can be reduced by the use of high osmolarity perfusates.

(References can be requested from the authors)

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BLOOD FLOW INVESTIGATIONS IN XENOGENEIC KIDNEY GRAFTS

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Quantitative blood flow studies in hyperacute xenogeneic rejection of transplanted kidneys have been carried out using a scintillation camera. Xenon washout curves were performed on 31 rabbit kidneys perfused by a modified Fresenius solution and in 9 of these during normothermic haemoperfusion by a cat. Hyperacute rejection occurred in each case and a dramatic reduction in renal blood flow, and renal cortical blood flow occurred within 10 min and progressed to complete rejection at 35 min. This type of rejection may be the result of preformed cytotoxic antibodies as well as vascular spasm.

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EXTRACORPOREAL RENAL SURGERY: EXPERIMENTAL STUDIES IN THE DOG

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Extracorporeal renal surgery (bench surgery) has been investigated in the dog for the removal of staghorn calculi.

Unilateral staghorn calculi were induced in 10 dogs by the injection of 2-3 ml of methyl methacrylate into the renal pelvis. The kidneys were mobilised 3 weeks later, the vessels divided and the kidney brought out onto a work bench. The ureter had been mobilised but remained in continuity. After 15 min of warm ischaemia the kidneys were flushed with 300 ml of modified Collins solution at 4° C. No

further cooling was used and the kidney temperature rose to 18-20° C after 6 h. The calculi were removed and individual calyces inspected. After 6 h the kidneys were autotransplanted, including reconstruction of primary renal artery branches in 1 case. Contralateral nephrectomy was performed.

All kidneys resumed spontaneous function immediately and plasma creatinine values were normal at 5-8 days postoperatively. Just 1 animal died of intussusception.

Extracorporeal renal surgery at ambient temperatures following single cold perfusion appears to be tolerated well. Retaining ureteric continuity avoids the complications of uretero-neocystostomy.

(References can be requested from the authors)

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Miscellaneous

COMPARISON OF HISTAMINE CONTENT AND HISTAMINE METHYLTRANSFERASE ACTIVITY IN RABBIT KIDNEY FOLLOWING URETERIC, ARTERIAL AND VENOUS OBSTRUCTION

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Histamine content (fluorometric assay) and histamine methyltransferase (HMT) activity (radiometric assay) were determined in rabbit kidney following ligation (1) of the ureter for periods of between 1 day and 30 weeks, (2) of the renal artery or renal vein for periods of up to 72 h. Contralateral kidneys and sham operated animals served as controls. Following ureteral obstruction, histamine content doubled after 24 h and then declined to reach normal values after 2 weeks. HMT activity increased 4-fold to a maximum at 4 weeks and then declined slowly. Ligation of the renal artery resulted in a decline in histamine content and HMT activity. Ligation of the renal vein resulted in a transient rise to twice normal values within 1/2 h and then declined to normal levels after 4 h. HMT values showed no elevation and decreased to a value of 10 % within 8 h.

(References can be requested from the authors)

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AN ANIMAL MODEL OF POST-TRAUMATIC OEDEMA

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Post-traumatic oedema was produced in the rat bladder by compression with a soft intestinal clamp and electrical stimulation. The bladders were removed after 48 h and the degree of oedema determined by the difference between wet and dry weights.

Treatment with Alpha-Chymotrase^R led to an increase in the mechanically produced oedema but the electrical oedema was reduced by 20 %. Reparil^R reduced mechanical oedema by nearly 80 % and electrically produced oedema by over 90 %. Using Urbason^R mechanical oedema was absent and electrical oedema reduced by nearly 90 %.

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RENAL FUNCTION FOLLOWING RESECTION OF THE HILAR RENAL LYMPHATICS OF THE RABBIT KIDNEY

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After complete mobilisation of the kidneys ligation and resection of the hilar lymphatic vessels the kidneys were wrapped in polyethylene foil

and renal function studies were performed 2 and 7 days later. A sham operation was used as control.

There was no change in the control group. The operated kidneys showed changes within the meaning of a reduction in renal blood flow on the 2nd day, which had recovered by the 7th day. Histological examination of all kidneys was normal.

(References can be requested from the authors)

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SODIUM AND WATER BALANCE AND THE RENIN-ANGIOTENSIN SYSTEM FOLLOWING RELIEF OF RENAL ARTERY STENOSIS

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Unilateral or bilateral renal artery stenosis was created in rats by the application of a silver clip of 0.2 mm ID to the renal artery. The subsequent diet contained 100 mEq of sodium per kilogram and demineralised drinking water. Hypertension was established after 3 weeks. In unilateral cases removal of the clip resulted in a fall in blood pressure to normal values within 6 h. Angiotensin II and urea levels fell to normal and there was only slight natriuresis and diuresis.

The removal of 1 clip in cases with bilateral renal artery stenosis also resulted in a fall in blood pressure to normal values. There was increased natriuresis and diuresis with increasing angiotensin II and serum urea levels, but no correlation could be obtained between changes in blood pressure and sodium or water excretion.

Therefore the fall in blood pressure cannot be accounted for by changes in plasma angiotensin II levels or salt and water loss.

(References can be requested from the authors)

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