intervals for enzyme assay. The effect of enzyme concentration was observed at 2.5–30 mg hepatopancreas/ml extract. For substrate concentration experiments, the concentration of TAME varied between 0.005–0.10 M.

Results and discussion. The hepatopancreatic trypsin of *M. lamarrei* showed optimum activity at pH 7.5 (figure 1). As the pH range of the digestive tract of *M. lamarrei* is 6.4–6.7[4], at this pH range the enzyme activity will be quite high, i.e. about 60% of the optimum. The pH for the optimum activity of various crustacean proteases ranged from 7.0–8.53 (table) which closely resembles that found in *M. lamarrei.*

Trypsin from the hepatopancreas of *M. lamarrei* showed optimum activity at 45 °C (figure 2); and more than half-activity at 25–30 °C, which is the temperature of the ambient, showing that the enzyme will be quite active in natural conditions. Same temperature optimum was reported for *Panulirus japonicus*[13] and slightly higher (49 °C) optima for *Orconectes virilis*[7] and *Penaeus setiferus*[14].

pH for the optimum activity of proteases from various crustaceans

Crustacean	Source	pH
Thalamita crenata[5]	Gastric juice	8.53
Orchestia gammarella[6]	Midgut caeca	8.0–8.5
Orconectes virilis[7]	Gastric juice	8.0
Diogenes bicristimanus[8]	Digestive gland	7.0–7.8
Podophthalmus sp.[9]	Midgut gland	7.9
Homarus americanus[10]	Gastric juice	8.0
Streptocephalus dichotomus[11]	Hepatopancreas	7.4–8.0
Cancer borealis and C. irroratus[12]	Hepatopancreas	8.0

The hydrolysis of the substrate increased linearly with the increase in incubation period (figure 3) and enzyme concentration (figure 4), showing that the enzyme activity was not affected by the concentration of hydrolytic products of the substrate as has also been reported in certain insects[3,15,16]. The data on the effect of substrate concentration on the trypsin activity, when plotted in a Lineweaver-Burk plot gave a straight line (figure 5). Michaelis constant (K_m) of the enzyme was found to be 2.38×10^{-2} M.

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The activity of sorbitol dehydrogenase in some mammalian erythrocytes

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Summary. The activity of sorbitol dehydrogenase was found to be high in the red blood cells of man, dog, guinea-pig and mouse and comparatively lower in those of goat, sheep, rabbit, cat and rat.

The enzyme sorbitol dehydrogenase (SDH) is a part of the polyol pathway in which glucose is metabolised to fructose according to the following reactions:

$$\text{glucose} + \text{NADPH} + \text{H}^+ \xrightarrow[\text{reductase}]{\text{aldose}} \text{sorbitol} + \text{NADP}^+$$

$$\text{sorbitol} + \text{NAD}^+ \xrightarrow{\text{SDH}} \text{fructose} + \text{NADH} + \text{H}^+$$

Although this pathway was originally described in seminal vesicles[1], human red cells have recently been shown to metabolize approximately 3% of their glucose in this way under normal conditions[2,3]. NADH produced as a consequence of the conversion of sorbitol to fructose provides reduced pyridine nucleotide for methaemoglobin reduction[3]. The enzyme from human red blood cells has been partially purified and characterized[4]. The present study was undertaken in order to establish whether this enzyme is present in the red blood cells of some domestic and laboratory animals.

Materials and methods. Blood was collected from the anticubital vein in man; the jugular vein in sheep, goat, dog and cat; by cardiac puncture in guinea-pig, rat and mouse and from the marginal ear vein in rabbit. Blood samples were collected in tubes containing dried sodium heparin. The red blood cells were washed 3 times in cold saline, frozen and thawed once, and haemolysates were prepared by adding 3 volumes of water. The enzyme activity of SDH was measured at 37 °C in a Gilford recording spectrophotometer according to the method of Torrance[5] and was expressed as μmoles/min/g Hb.

Activity of sorbitol dehydrogenase in the red blood cells of various mammalian species

Species	Number	Sorbitol dehydrogenase activity (μmoles/min/g Hb) Mean ± SEM
Man	10	1.490 ± 0.068
Mouse	6	2.360 ± 0.289
Dog	6	1.910 ± 0.376
Guinea-pig	6	1.769 ± 0.112
Rat	6	0.753 ± 0.066
Cat	6	0.643 ± 0.064
Rabbit	6	0.496 ± 0.038
Goat	4	0.119 ± 0.043
Sheep	6	0.109 ± 0.021

Results and discussion. The results are shown in the table. The enzyme activity was present in the haemolysates of all the species tested; it varied from 0.109 µmoles/min/g Hb in sheep red blood cells to 2.36 µmoles/min/g Hb in the mouse red blood cells. When the results are placed in the order from low to high values, the following sequence results: sheep and goat, rabbit, cat, rat, man, guinea-pig, dog and mouse. It is interesting to note that the 2 ruminant species examined have comparatively much lower enzyme activity, are known to have very low activity of glucose-6-phosphate dehydrogenase and have a basically different carbohydrate metabolism.

The role of SDH in the metabolism of human red blood cells has been studied recently[2-5]. The significance of fructose, the end product of the reaction catalyzed by SDH, is increasingly being recognized. The ability of fructose, but not of glucose, to enhance incorporation of inorganic phosphate into 2,3-diphosphoglycerate (2,3-DPG) in the presence of adenosine and inosine suggests that fructose is not being metabolized purely by the glycolytic pathway[5]. It has also been shown recently that fructose infusion has 2 opposing effects, a right shift in the oxyhaemoglobin dissociation curve due to the Bohr effect and left shift due to lowered levels of 2,3-DPG[6]. Certainly the results presented here, showing a wide variation in the activity of SDH in the red blood cells of different mammalian species, should stimulate further research to help understand the interrelationship of sugars, 2,3-DPG and oxygen transport.

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Velocity gradient and contraction frequency of the pyeloureteral system[1]

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Summary. An optical detection method, using video imaging, is used to quantitatively record the frequency and velocity profile of the renal pelvis of the rabbit. It is demonstrated that concentric waves originating at the periphery of the pelvis have an initial velocity of 3.2 cm/sec, accelerating toward the pelviureteral junction reaching a final velocity of 6.4 cm/sec.

Visual observations of the exposed surface of the pyeloureteral system demonstrate[2] that upper urinary tract contraction waves originate along the perimetry of the renal pelvis. These observations are visualized as a concentric wave propagating towards the pelviureteral junction. A qualitative examination of the propagating wavefront indicates that the speed of contraction within the renal pelvis is increasing. This paper presents quantitative data demonstrating the existence of velocity gradient within the renal pelvis.

Methods. Kidneys were obtained from 12 female New Zealand rabbits weighing 4–6 kg. The anatomical preparation and dissecting procedures to expose the renal pelvis have been described in Gosling and Constantinou[2]. In order to maintain a stable and constant oxygenation of the preparation the renal artery was catheterized and perfused at 2 ml/min with Krebs solution using a peristaltic pump. The surface of the renal pelvis thus exposed was immersed in Krebs solution to a depth of 1 cm and secured. A video camera equipped with a telephoto lens was focussed on the surface of the renal pelvis in such a way as to visualize a complete quadrant of the field (figure 1).

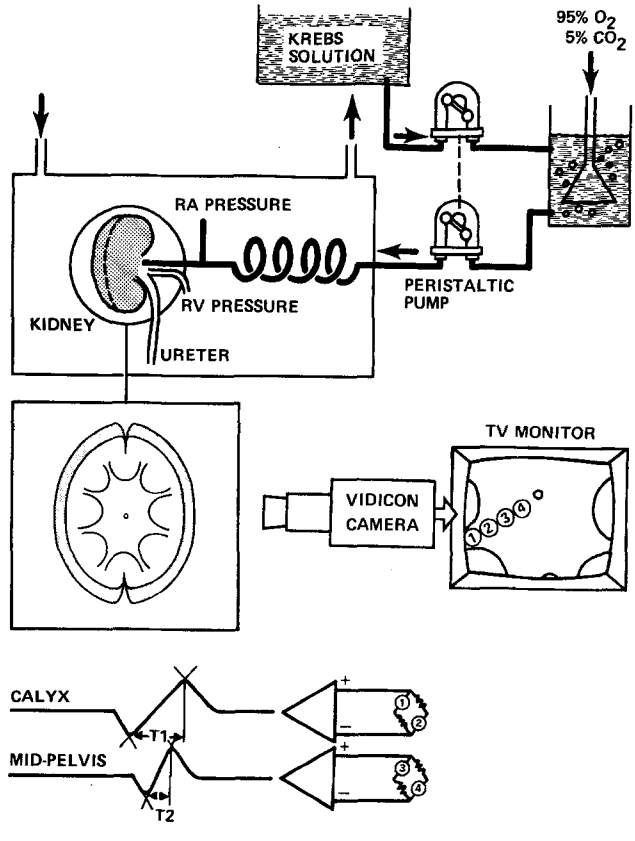

Fig. 1. System for the perfusion and optical recording of the frequency and velocity characteristics of the intrapelvic contractile characteristics. The surface of the renal pelvis is shown in the square box on the left corner. The kidney is perfused with Krebs solution and contractile waves can be visualized. The area of the pelvis is magnified using a telephoto lens and TV camera. Contraction waves can be seen on TV monitor and detected using bridge photocells 1–4. The velocity of contraction between the passage of a wave between each pair of photocells is recorded on an oscilloscope and plotted on a recorder.