The rate of pentosenucleic acid replacement in the pancreas*

Recently ALLFREY *et al.*[1] and DE DEKEN-GRENSON[2] have reported that the uptake of labelled precursors by pentosenucleic acid (PNA) in the mouse pancreas is remarkably lower than that of several other organs such as the mouse liver and kidney or the hen's oviduct. Data obtained in this laboratory with adult rats weighing about 200 grams are in good accord with the previous results in this respect. However, the pancreas is an organ unusually rich in PNA, and the apparent low activity of this organ to incorporate the labelled phosphate into PNA may be entirely due to this peculiar situation. This is seen in Table I which comprises our own determinations and also in Table II and III which are the recalculation of the data presented by the previous workers[1,2,3].

It can thus be concluded that the rate of replacement of PNA in the pancreas, if expressed in amount replaced per unit weight of tissue, is by no means inferior to those of the other organs considered. Apparently enzyme systems catalysing synthesis and degradation of PNA are operative to rather comparable extent in both the pancreas and some other protein-producing organs.

TABLE I

UPTAKE OF ^{32}P BY PNA OF PANCREAS, LIVER AND KIDNEY OF ADULT RATS*

Organ	*PNA content mg P/100 g tissue*** *a*	*Relative sp. act.**** *b*	*"Apparent" rel. uptake§ c*	*Rel. uptake/100 g tissue*	
				$a \times b \times 10^{-3}$	$a \times c \times 10^{-3}$
Pancreas	168 ± 17^{6}†	0.35 ± 0.10^{4}	15.7 ± 2.8^{4}	59 ± 18	264 ± 54
Liver	67.1 ± 5.1^{9}	0.86 ± 0.09^{5}	28.9 ± 0.3^{5}	58 ± 8	194 ± 15
Kidney	40.8 ± 2.5^{6}	1.40 ± 0.02^{2}	42.1 ± 0.1^{2}	57 ± 4	172 ± 35

* 24 h after single injection of ^{32}P-orthophosphate.

** Determined by the SCHNEIDER method.

*** $\frac{\text{sp. act. (c.p.m./}\mu\text{g P)}}{\text{dose (c.p.m.)}} \times \frac{\text{gram body weight}}{200} \times 10^{6}$; method as in ref.[4]

§ $\frac{\text{sp. act. of PNA} \times 100}{\text{sp. act. of acid-sol. P.}}$

† Mean and standard error with number of determinations in parentheses, each determination being performed with single animal.

TABLE II

UPTAKE OF ^{32}P BY PNA OF MOUSE PANCREAS AND FOWL OVIDUCT: RECALCULATED FROM DE DEKEN-GRENSON[2]

Organ	*PNA content % of dry weight a*	*Rate of renewal of PNA (%/h) b*	*Rate of renewal of PNA/h/unit weight of tissue a × b*	*Rate of protein synthesis (%/h)*
Pancreas	12.0	0.17	1.2	> 3
Oviduct	2.0	0.7	1.4	4

TABLE III

UPTAKE OF GLYCINE-^{15}N BY PNA OF PANCREAS, LIVER AND KIDNEY OF MOUSE: RECALCULATED FROM MIRSKY *et al.*[1,3]

Organ	*PNA content (%) a*	*Atom % ^{15}N excess b*	*Uptake of ^{15}N/unit weight of tissue a × b*
Pancreas	1.20	0.063	7.56
Liver	0.389	0.189	7.35
Kidney	0.237	0.120	2.85

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In this connection, mention should be made of DE DEKEN-GRENSON's paper[2] evaluating the rate of PNA replacement in relation to the rate of protein synthesis. She compared the rate of protein synthesis (amount of protein synthesised per unit time in percentage of the total amount of protein present) with the *relative* rate of PNA replacement (amount of PNA replaced per unit time in percentage of total amount of PNA present). The vast discrepancy of the rate of PNA replacement between the pancreas and the oviduct, in contrast to a fairly good coincidence in the rate of protein synthesis of the two organs, led her to conclude that there is no direct quantitative relationship between the protein synthesis and PNA replacement. This conclusion is obviously irrelevant, however, because the two quantities have been compared at different levels with regard to the reference standard. By expressing the rate of PNA replacement in a relative measure proportional to the amount of PNA replaced per unit weight of tissue which largely consists of proteins (*cf.* col. 5-6, 4 and 4 of Tables I, II and III, respectively), a direct comparison of the two quantities may become feasible. It now turns out that the two organs in question show no significant difference in both the rate of protein synthesis and the rate of PNA replacement.

This argument may still be insufficient to invalidate the DE DEKEN-GRENSON's conclusion concerning the lack of direct connection between PNA replacement and protein biosynthesis, because she and also HOKIN AND HOKIN[5] demonstrated that the experimentally induced synthesis of digestive enzymes in pancreas failed to augment the incorporation of radiophosphate into PNA both *in vivo* and *in vitro*. Several recent findings[6,7] suggest that the synthesis of enzyme proteins in microorganisms require a concomitant synthesis of PNA. But the degradation of PNA obviously has no intimate bearing on the protein synthesis[4,8,9]. It is not implied here, however, that the replacement (actually, the biosynthesis or degradation, or even both) of PNA in mammalian or avian tissues is in some way linked to protein synthesis. It should rather be emphasised that the biological significance of the replacement of PNA in growing[1] as well as non-growing organs of higher animals, as demonstrated by tracer technique, still remains an open question.

HIROZI K. KIHARA
MINORU AMANO
HASHIM IKEMOTO
ATUHIRO SIBATANI

Department of Cytochemistry and Histology, Yamaguchi Medical School, Ube (Japan)

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Zur biologischen Wirkung von Cytochrom *c*

Eigene Untersuchungen bei Vergiftungszuständen mit Malachitgrün bei Ratten und Hunden lassen Beziehungen zwischen diesem Farbstoff und Cytochrom *c in vivo* erkennen, die 3 grosse Fragenkomplexe umfassen, deren Bearbeitung für das Verständnis der biologischen Wirkungsweise des Cytochroms *c* nützlich zu sein vermag.

1. Die Malachitgrünvergiftung ist im Tierversuch durch Cytochrom *c* zu beeinflussen, sodass sich hieraus die Möglichkeit einer Testierung der biologischen Wirkung von Cytochrom-*c*-Präparationen ergibt.

2. Die Malachitgrünvergiftung führt zu Veränderungen am Elektrocardiogramm von Ratten und Hunden, die bei Gabe von Cytochrom *c* reversibel sind. Hieraus lassen sich Rückschlüsse auf den Energiestoffwechsel des Herzens und insbesondere des Reizleitungssystems ziehen.

3. Der "Cytochrom-*c*-Defekt" (H. VON EULER) bei tumortragenden Ratten (Walker-Carzinom) wirkt sich auf die Malachitgrüntoleranz der Tiere in einheitlicher Weise aus, das heisst, sie sinkt deutlich ab. Dem parallel geht ein Speicherungsvermögen von Malachitgrün im Tumorgewebe in einer noch unbekannten Leucoform. Das Tumorgewebe wird hierdurch beeinflusst, seine Übertragbarkeit wird deutlich geschädigt.

Zu 1. Die intravenöse oder intraperitoneale Vergiftung mit Malachitgrün führt bei Ratten und Hunden unter den Erscheinungen von Atemnot, beschleunigter, ruckartiger Atmung und Cyanose, Schleimhautblutungen und final Auftreten von schaumig-blutigem Sekret aus Maul und Nase, zum Tode. Dem entspricht pathologisch-anatomisch ein schweres Lungenödem mit Blutungen in die Alveolen. Auch im Herzmuskel lassen sich, vorwiegend in der Gegend des Verlaufes des Reizleitungs-