ferences, except with added glucose when groups 1 and 2 were higher ($P < 0.05$) than the controls.

In Table III the effect of Na_2SeO_3 administration on the $Ba^{14}CO_3$, when uniformly labelled ^{14}C-glucose was added to the incubation medium is shown. In both chronic and acute toxicity and in both tissues studied a statistically significant decrease ($P < 0.01$) in $Ba^{14}CO_3$ production was found at all levels of selenite administered.

The decrease was greater in amount in the kidney than in the liver and also in acute toxicity than in chronic toxicity. It is interesting to note the much greater sensitivity shown by the selenite in acute than in chronic toxicity.

Discussion. From Table I it appears, on the whole, that increase in the oxygen consumption noticeable in the 2 organs is not related to the presence in the incubation medium of exogenous glucose. At this stage it is unexplained why there is an increase of O_2 consumption in kidney minces of group 2. On the other hand, increasing quantities of selenite decreased $^{14}CO_2$ production from the tissue minces. A decrease in the utilization of glucose and an increase in that of fatty acids could explain these results. In fact a decrease in the formation of $^{14}CO_2$ due to an increase in the utilization of non-radioactive glucose, thus producing a greater amount of non-radioactive CO_2 with a decrease in the specific activity of $Ba^{14}CO_3$, seems not to be the cause, since from group 1 the decrease in the production of radioactive carbon dioxide is not accompanied by a proportional increase in the respiratory activity. Selenite could stimulate fatty acid degradation, thus lowering the specific activity of $^{14}CO_2$.

This experiment has shown that, except for some unexplained erratic results, both chronic and acute selenium toxicity have negligible effects on the oxygen uptake of rat liver and kidney minces, with or without added glucose, but that in both types of toxicity the aerobic production of $^{14}CO_2$ from D-^{14}C-glucose by these minces is markedly diminished.

Further experiments with labelled fatty acids could demonstrate an increased catabolism of these substances induced by selenite[7].

Riassunto. Nessuna influenza sull'attività respiratoria di cellule di fegati e reni di topi è stata notata quando gli animali sono stati trattati con somministrazioni acute o croniche di Na_2SeO_3. La diminuzione della produzione di $^{14}CO_2$, quando i tessuti degli animali trattati con Na_2SeO_3 sono stati incubati con ^{14}C glucosio, suggerisce la possibilità di un aumento dell'attività catabolica dei lipidi.

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Activity of 6-Phosphogluconate Dehydrogenase in the Preimplantation Mouse and Rabbit Embryo

The glucose 6-phosphate dehydrogenase (G6PD) activity in the preimplantation mouse embryo during the first few days of development is very high[1], yet the ratio of carbon dioxide formed from carbon one of glucose compared to carbon six of glucose is approximately one throughout the preimplantation period[2]. In contrast, although total glucose utilization in the rabbit embryo is about three times higher than in the mouse embryo, the G6PD activity in the rabbit embryo is only about $^1/_5$ the level found in the mouse embryo[3], and the ratio of CO_2 from carbon one to carbon 6 of glucose is about 9 during the first 3 days of development in the rabbit[4,5]. This evidence suggests that G6PD is not acting as a regulator of pentose shunt activity in a similar manner in the early mouse and rabbit embryo. Therefore, the activity of 6-phosphogluconate dehydrogenase (6PGD) was measured to see if the total activities of this enzyme more accurately reflected the activity of the pentose shunt in the embryos.

The methods for obtaining the embryos and handling the embryos have been previously described[1,5]. Briefly, the embryos were obtained by flushing the reproductive tracts of the animals at specific times after ovulation. The embryos were washed free of debris and other cells and stored at $-70\,^\circ C$ in 6×60 mm tubes. The freezing liberates the enzyme. The 6PGD activity was assayed by measuring the fluorescence of NADPH produced during a 60 min incubation at 37 °C. Details of the assay techniques have been described[3]. The reaction mixture consisted of 100 µl of 50 m*M Tris* buffer (pH 7.8), containing NADP (1.0 m*M*), 6-phosphogluconate (1.0 m*M*), magnesium chloride (10 m*M*), EDTA (1.0 m*M*), and crystalline bovine serum albumin (0.1%). The NADPH formed was determined fluorometrically following treatment with alkali[6,7].

The results of the determinations on both mouse and rabbit embryos for the entire preimplantation period are shown in the Table. The 6PGD activity is 10–20 times higher in the rabbit embryo than in the mouse embryo during the first 3 days of development. In fact, the 6PGD activity in the rabbit embryo is about the same as the G6PD activity in this species throughout the preimplantation period. Both enzymes are level during the first 3 days of development in the rabbit and then begin to increase in activity on day 4 with formation and expansion of the blastocyst. However, there is considerable tissue mass increase associated with blastocyst development in the rabbit, and therefore both 6PGD and G6PD decrease in specific activity during the preimplantation period (Table).

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Pentose shunt enzyme activities in the preimplantation mouse and rabbit embryo

Stage of development	6-Phosphogluconate dehydrogenase Activity in moles of NADP reduced per embryo per h × 10^{12} Mouse		Rabbit		Glucose 6-phosphate dehydrogenase Activity in moles of NADP reduced per embryo per h × 10^{12} Mouse[1]	Rabbit[3]	Protein content in ng per embryo Mouse[8]	Rabbit
Unfertilized	13.6 ± 0.7	(4)	246 ± 22	(6)	1390	263	27.8	100
Fertilized	12.3 ± 0.7	(5)	256 ± 38	(6)	1360	243	27.8	100
Day 2	11.0 ± 1.1	(5)	251 ± 70	(6)	1510	263	26.1	100
Day 3	28.8 ± 3.2	(5)	259 ± 43	(6)	1400	215	23.4	100
Day 4	57.7 ± 1.1	(5)	338 ± 25	(6)	735	256	22.2	–
Day 5	61.3 ± 5.2	(4)	573 ± 68	(6)	190	812	21.9	1307
Day 6	–		3088 ± 517	(6)	–	1612	–	6235

Values for 6-phosphogluconate dehydrogenase are means ± S.E.M. The number of determinations is in parentheses. Protein content for the first 3 days of development in the rabbit is estimated to be about 100 ng based on the volume of the rabbit embryo which is about 3.5 times the volume of the mouse embryo in the early stages. Protein content of day 5 and day 6 rabbit embryos was determined by the method of LOWRY, ROSEBROUGH, FARR and RANDALL[9].

In the mouse embryo 6PGD activity is very low during the preimplantation period and is about $^1/_{100}$ the G6PD activity during the first 2 days of development. However, the pattern of change for 6PGD is opposite that found for G6PD; the former rises and the latter decreases during the last half of the preimplantation period so that their activity levels are approaching one another at the time of implantation. The 6PGD specific activity actually increases in the mouse embryo during the preimplantation period.

The low level of activity of 6PGD during the preimplantation period, particularly during the first 2 or 3 days of development, suggests that this enzyme is more important than G6PD in regulating the activity of the pentose shunt in the mouse. The high level of G6PD in the mouse embryo may represent enzyme present in the oocyte before ovulation and thus may reflect requirements for this enzyme during the preovulatory phase of oocyte development rather than during postovulatory embryo development[10].

Zusammenfassung. Im frisch ovulierten Ei der weissen Maus beträgt die Aktivität der 6-Phosphoglukonat-Dehydrogenase (6PGD) nur etwa $^1/_{100}$ derjenigen der Glukose-6-Phosphat-Dehydrogenase. Beide Enzyme zeigen ähnliche Aktivitäten bei Kaninchen-Embryonen vor der Implantation.

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Nuclear Pore Flow Rates of Ribonucleic Acids in the Mature Rat Hepatocyte

In a previous note we described the transport efficiency of a nuclear envelope pore complex with respect to the nucleocytoplasmic exchange of macromolecules and particles by the nuclear pore flow rate (NPFR), i.e. the total mass or number of molecules of a certain substance which is transferred through an average pore per minute[1]. Knowing the structural characteristics of the nuclear envelope of a given cell, such values can be calculated, e.g., for the unidirectional flow of nucleocytoplasmically migrating RNAs from theoretically different situations: 1. NPFR of cytoplasmic RNAs can be determined from measurements of the cytoplasmic increase of the RNAs during a specific interval of cell cycle or differentiation. In such calculations, non-nuclear RNA synthesis as well as the RNA-degradation have to be taken into account. As an example of this type of calculation, the NPFR values for distinct time spans of the amphibian oogenesis have been determined[1,2]. 2. In exponentially growing cell populations NPFRs of RNAs can be computed from the average content of cytoplasmic RNAs and from the half-life times of the type of RNA in question[1]. Again, such values have to be corrected for non-nuclear RNA-synthetic processes. 3. For cells which live in steady state conditions, such as many highly differentiated ones, it is possible to calculate the NPFR values from determinations of the pool sizes of cytoplasmic RNAs and their half-lives.

A calculation of the latter type has now been made for the average liver cell of adult rat. Combination of turnover and pool size data of cytoplasmic RNAs with

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