# The ribonucleic acid content of some mammalian erythrocytes*

by

**Helion Povoa Jr.**

Biochemical Laboratory, Instituto Oswaldo Cruz, Rio de Janeiro, D.F.

It has been shown by Thorell (6) that the erythroblast is a cell with a high content of ribonucleic acid (RNA) and that, after maturation, the RNA disappears almost entirely, remaining only a small amount which is histochemically detectable (5).

According to Mandel and col., human erythrocytes contain RNA averaging 51 mg 100 ml., when determined by the phosphorus content. It must be pointed out that neither the technique nor the conversion factor was given by these authors (2). As expected, they have not found any desoxyribonucleic acid in human erythrocytes.

Due to the lack of data in the literature, we thought it of interest to report the data we obtained for the RNA content of some mammalian erythocytes.

*Material and Methods:*

5 ml of oxalated blood, collected as for the routine hematological examination, were centrifuged and the erythrocytes washed with 0.85% saline, until the supernatant had no color. An aliquot of 0.4 ml of erythrocytes was taken and washed with 5 ml of distilled water, successively rinsing the pipet to completely remove the red blood cells. 5 ml of 10% cold trichloracetic acid were added dropwise, at constant stirring with a glass rod, to prevent the formation of larger precipitates. After centrifugation, the protein precipitate was successively extracted (according to the technique of Schmidt and Thanhauser) (3) by 1% cold trichloracetic acid, water, ethanol (hot extraction) and ethanol-ether (3:1) repeatedly until a clear supernatant was obtained. After drying the residue with ether, the precipitate was extracted as recommended by Schneider (4): twice with 5% trichloracetic acid, during 15 minutes, at 90-95ºC. The final volume was adjusted to 6 ml with 5% trichloracetic acid, and an aliquot of 2 ml was pipetted off and heated with an equal volume of the orcinol-hydrochloric acid- ferric chloride reagent (1) (10 mg of orcinol recently dissolved in 1 ml of 0.1%

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* This work is dedicated to Prof. Henrique B. Aragão.

ferric chloride in concentrated hydrochloric acid). The mixture was heated in a water bath (100°C) for 45 minutes. After cooling to room temperature, the volume was adjusted to 10 ml with 5% trichloracetic acid and the green color read in a photocolorimeter at 650 milimicra. A blank was prepared with 2 ml of 5% trichloracetic acid. A pentose was used as standard solution and the results expressed as pentose or RNA (multiplying this value by 3.3). The standard deviation of the method was found to be = 3.1%.

*Results:*

The results are expressed in Table I. They show clearly that the red cells of rats presented a higher content of RNA (55.1 mg 100 ml) as compared with those of the other mammals studied, as men (33.4 mg 100 ml), guinea pigs and rabbits (25.8 and 24.3 mg 100 ml, respectively). In every case, the average mean was found to be significant.

TABLE I

RNA content of erythrocytes (mg/100 ml)

| Number | Rabbit | Rat | Man | Guinea pig | Horse | Sheep |
|---|---|---|---|---|---|---|
| 1 | 22.0 | 41.2 | 38.1 | 24.7 | 20.3 | 21.5 |
| 2 | 26.3 | 48.2 | 22.8 | 24.7 | 29.5 | 25.6 |
| 3 | 23.8 | 63.4 | 22.8 | 28.5 | 20.3 | |
| 4 | 23.2 | 63.4 | 27.0 | 25.0 | | |
| 5 | 27.3 | 73.0 | 25.0 | 22.8 | | |
| 6 | 25.3 | 79.3 | 46.1 | 25.4 | | |
| 7 | 20.9 | 24.7 | 47.6 | 19.0 | | |
| 8 | 27.3 | 50.7 | 37.8 | | | |
| 9 | 29.8 | 58.1 | | | | |
| 10 | 26.6 | 49.0 | | | | |
| 11 | 31.7 | | | | | |
| Average Mean.. | 25.8 | 55.1 | 33.4 | 24.3 | 23.3 | 23.5 |
| Standard Deviation..... | ± 3.2 | ±15.7 | ±10.2 | ± 2.7 | | |
| Variation Coefficient..... | ±12.5% | ±28.4% | ±30.5% | ±11.1% | | |
| Average Mean. | t=7.9 | t=3.5 | t=3.27 | t=9.0 | | |
| Significance..... | p<0.01 | p<0.01 | 0.01<p<<0.02 | p<0.01 | | |

## SUMMARY

RNA was determined in red blood cells of man and other mammals. Our report is based on 41 determinations. Red blood cells of rat showed the highest values in comparison with the blood cells of guinea pig, rabbit, horse and sheep which showed the lowest values, and man with intermediate ones.

The method used was a combination of Schmidt and Thanhauser and Schneider extractions with the final reactions of pentose with the orcinol reagent colorimetrically measured.



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## SUMÁRIO

O ácido ribonucleico foi dosado em hemátias de mamíferos, num total de 41 casos. Valores altos foram encontrados em hemátias de ratos em comparação com os de cobaia, coelho, cavalo e carneiro. Hemátias humanas apresentaram valores intermediários. Usou-se um método, combinando-se as extrações de Schmidt, Thanhauser e Schneider com a reação final da pentose com o orcinol, lendo-se a côr verde num fotocolorímetro, em 650 milimicra.


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