observed in total red cell volume. This probably reflected steady-state conditions at the time of autopsy. Total number of erythroid cells in the bone marrow of the thyroidectomized rats/100 g of body weight was 46% of the number in the normal controls. The calculated mean erythron life span and the mean time of iron fixed in red cell precursors were approximately the same for both normal and thyroidectomized rats.

Therefore, we have only the decrease in the number of erythroid precursors to explain the 'thyroidectomy anaemia' in the long term postoperative rat. This finding, in the absence of any significant difference in ferrokinetics, leads to the conclusion that erythropoiesis is decreased in the chronically thyroidectomized rat because of a decrease in the number of erythrogenic elements in the bone marrow. If the erythroid responsiveness of erythropoietic tissue to erythropoietin is the same in thyroidectomized as in normal rats, then the decrease in bone marrow erythroid precursors found in the former would result from a decrease in the erythropoietin production rate in these animals. Work is in progress to test this possibility[9].

Hematologic data from normal and thyroidectomized rats

	Normal	Thyroid-ectomized
Body weight, g	453.4	300.5
Hemoglobin, g/100 ml	13.2 (0.31)[a]	11.9 (0.26)
Hematocrit, %	45.5 (1.24)	38.9 (1.18)
Blood volume, ml/100 g body weight	4.72 (0.05)	4.39 (0.10)
Red cell volume, ml/100 g body weight	2.17 (0.03)	1.79 (0.06)
Plasma volume, ml/100 g body weight	2.54 (0.02)	2.60 (0.20)
% of total erythropoietic marrow present in right femur	7.50 (0.80)	6.30 (0.90)
Nucleated erythroid cells/100 g body weight ($\times 10^9$)	0.43 (0.11)	0.20 (0.09)
Plasma iron, μg/100 ml	123.70 (0.41)	105.50 (0.21)
Plasma Fe^{59} half time, min.	57	70
Plasma iron turnover rate, μg/day/100 g	47	39
Red cell iron utilization, %	66	64
Hemoglobin synthesis rate, μg/day/100 g	914.7	735.3
Mean erythron life span, days	57	58
Mean time of iron fixed in red cell precursors, h	27	26

[a] Standard error of the mean.

Resumen. El volumen de la masa roja circulante descendió en un 24% en ratas radioyodotiroidectomizadas después de 8 meses de administrado et I^{131}. Hubo un descenso similar en la sintesis diaria de hemoglobina/100 g de peso corporal. Los estudios de la cinética del hierro fueron semejantes en ambos grupos. No hubo aumento de la eritropoyesis inefectiva ni del periodo intermitótico medular. El número de células eritroides en la médula ósea de las ratas atiroideas mostró una disminución significativa con respecto a los animales controles, hecho que seria el responsable de la anemia post-tiroidectomia.

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Altered Wound Healing in X-Irradiated Rats: The Effect of Bone Marrow Shielding

The effect of total-body irradiation on wound healing has been the subject of recent investigation[1-4]. Studies in this and other laboratories[4] have demonstrated that the temporal relationship between the wound and the exposure to irradiation is of importance in the response to this combined injury. Our prior studies have shown that when the rat is wounded 4 days following irradiation there is an increase in mortality of the wounded irradiated animal and wound contracture is markedly delayed. The explanation for this phenomenon is unclear. The purpose of the present study was to determine the effect of bone marrow shielding on wound contracture following irradiation.

Female Walter Reed rats, 10–12 weeks of age were fed a standard pellet diet, allowed water ad libitum, randomly assorted and individually housed. 800 R in air was delivered by means of a 250 KVP X-ray machine at a dose rate of 64.3 R/min. Shielding was provided by open-ended lead cylinders of 1.5 cm thickness measuring 6.5 cm in diameter and 8 cm in length. A 20 cm long perforated plastic cylinder was fashioned so as to fit snugly over the lead cylinder, and was utilized to restrain the animal during irradiation. Following light ether anesthesia, the

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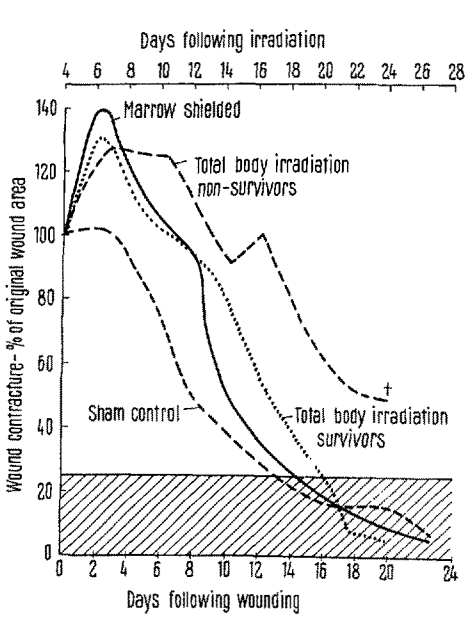
rats were immobilized by tying their hind limbs together and placing them in the shielding enclosures so that both hind limbs and the pelvis were shielded from the radiation source. Unshielded animals were treated in a similar manner without utilizing the lead cylinders. One group of animals was sham irradiated, one group was whole body irradiated and the third group was irradiated following bone marrow shielding as described above. From each group, one half of the animals were wounded by means of a full thickness excision of circular piece of dorsal skin approximately 23 mm in diameter on the fourth day following irradiation. Lateral and longitudinal dimensions of the wound were recorded at the time of wounding and every 2 days thereafter; the product of these 2 measurements was utilized as an index of wound contracture. Thirty day mortality was also recorded (Table).

The results of the wound contracture are presented in the Figure. Bone marrow shielding was associated with a significant diminution in mortality in both wounded and non-wounded animals. The rates of wound contracture show that the shielded animals had an initial delay similar to that shown by the non-shielded animals when compared with the sham irradiated controls. However, the subsequent rate of contracture of their wounds was quite rapid, and the gross appearance of their wounds resembled that of the sham irradiated, in that the granulation beds were red and the overlying exudate was non-hemorrhagic.

The irradiated-non-shielded animals could be divided into 2 groups; those which survived and those which went on to die. The surviving group had an average rate of contracture which approached that of the shielded. However, there was a difference in the appearance of their wound. They were characteristically hemorrhagic with thin, translucent granulation beds during the first 10–14 days. Subsequently, their wounds became healthier in appearance and indistinguishable from those of the control sham irradiated or the shielded. The non-shielded animals which went on to die had a severe delay in contracture and their wound never developed normal appearing granulation beds.

The mechanism by which bone marrow shielding induces a reversion toward normal of the wound contracture pattern in the irradiated wounded animal is unclear. The initial defect in wound contracture following irradiation is apparently a delay in adherence of the wound edge to the underlying granulation tissue bed. This defect may be secondary to dysfibroblastogenesis with a resultant diminished force of wound contraction. The more rapid reversion of the delay in wound contracture in the bone marrow shielded animal suggests that the bone marrow either prevents the deleterious effects of infection on wound contracture or alternatively supports wound contracture by a more direct mechanism. The bone marrow may be necessary to support normal fibroblastic proliferation, or the bone marrow may be the source of the lymphocyte which dedifferentiates into the fibroblast[5]. These latter possibilities are presently being investigated.

Group	Procedures	No. of animals	Mortality rate
1	Sham irradiated – not wounded	12	0%
2	Sham irradiated – wounded	12	0%
	800 R		
3	Whole body irradiated – not wounded	12	0%
4	with marrow shielding – wounded	12	17%
	800 R		
5	Whole body irradiated – not wounded	28	68%
6	not shielded – wounded	28	86%



Wound healing in X-irradiated rats, with and without marrow shielding. Cross hatched area indicates level of contraction below which measurements become inaccurate.

Zusammenfassung. Weibliche, 10–12 Wochen alte Ratten erhielten eine einmalige Ganzkörperbestrahlung (250 kV_{Sch}; 800 R freie Luft); bei einem Teil der Tiere waren das Becken und die Hinterbeine durch Bleizylinder abgeschirmt. Vier Tage später wurde der Hälfte der Tiere eine Wunde beigebracht. Sowohl bei den verwundeten wie nichtverwundeten Tieren führte Abschirmung des Knochenmarks zu starker Sterblichkeitsminderung. Die fast normale Schliessungsgeschwindigkeit der Wunde scheint vom intakten Knochenmark abhängig.

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