measured, together with 'background' readings for adjacent, cell-free regions. Estimates of macrophage size (maximum diameter, D) were made on the same cells using a PZO (Warsaw) vernier eyepiece (15 ×). Macrophages were identified on the basis of relative cell size and interference contrast. The latter facilitated the appreciation of nuclear morphology and nucleocytoplasmic ratio.

From the raw data, graphs were plotted showing the relationship between the two important descriptive parameters, IOPD (measured in machine units) and the cube of the maximum diameter (i.e., D^3) given in arbitraty units. Regression lines for the 3 population samples were computed by covariance analysis[11], using IOPD as the dependent variable. Differences between population regression coefficients were tested for significance by a comparison of their variance ratios. Sample differences in elevation were assessed by the same procedure. Standard errors for the regression coefficients were tested for significance using 't'values.

The statistical analyses were designed to ascertain whether a) regression lines were parallel, b) the regressions coincided, and c) there was a significant, positive relationship between the dependent (IOPD) and independent (D^3) variables for the normal and stimulated experimental populations.

Regressions for normal and FCA-induced macrophage populations are shown in the Figure. The regression coefficients (i.e. ,the slopes of the graphs) were found to be 0.045 (normal), 0.061 (5 days after FCA), and 0.044 (8 days after FCA). There was no significant difference between these values ($P > 0.05$), the population regression lines being parallel. Thus, the increase of cellular dry mass for a unit increase in D^3 was the same for normal and stimulated cells.

Adjusted means for the normal and 5 day-stimulated groups were not significantly different ($P > 0.05$). The regression lines for these populations (Figure A) were, therefore, one and the same. However, the variance ratios of the adjusted means for normal and 8-day-stimulated samples showed that the difference in sample elevations was significant ($P < 0.05$). This difference is related to differences in initial cellular dry mass: macrophages obtained 8 days after injection had a higher IOPD than normal cells of the same size (Figure B). Differences between 5- and 8-day-samples were not significant ($P > 0.05$). Finally, standard errors for the 3 regression coefficients pointed to a significant and positive relationship between cell size and cell mass, and for all populations the relationship was the same. Thus, the increase in size of activated macrophages is not due to any 'hydration' or loss of cytoplasmic density.

The difference in sample elevation for normal and 8-day-stimulated populations may be explained by ultrastructural changes of macrophage shape. FCA-induced peritoneal macrophages are rounder than normal[6] and diameter estimates for these cells may be open to smaller errors. The values for normal cells may be overestimates. This explanation is supported by the observation that the sample differences in elevation between the two FCA-induced populations were not significant.

Experiments using Feulgen photometry and tritiated thymidine labelling indicate that the increased mass of the activated cells does not originate from preparations for mitosis. Indeed, cells in G_2 and S phases of the mitotic cycle are less frequent in stimulated preparations than in normal ones[12].

Résumé. Les dimensions et la masse sèche de macrophages normaux et activés ont été mesurées en utilisant le «Vickers M86 scanning interferometer and integrating microdensimeter». Une analyse statistique a montré un rapport positif entre les deux paramètres descriptifs, ce qui infirme une suggestion précédente selon laquelle une augmentation des dimensions d'un macrophage est accompagnée d'une perte de densité cytoplasmique.

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Effect of Alkoxyglycerols on the Frequency of Injuries Following Radiation Therapy

Alkoxyglycerols occur in small quantities in many natural products. In the haemopoietic organs of mammals, particularly the bone marrow, they are relatively abundant. They also occur in relatively high concentrations in human mother's milk. They occur most abundantly in nature in the liver oil of certain species of shark[1–3]. The general formula for alkoxyglycerols is $CH_2OH \cdot CHOH \cdot CH_2O \cdot R$, where R is a longchain aliphatic radical.

The alkoxyglycerols have proved to be of medical interest[1,4–6]. To some extent they prevent leucopenia and thrombocytopenia. The administration of alkoxyglycerols to patients with cancer of the uterine cervix results in higher survival rates than if radiation treatment alone is given[1,4]. Furthermore the alkoxy-glycerols promote the growth of *Lactobacillus lactis*[1] and the formation of antibodies[4,6].

In order to throw light on the effect of alkoxyglycerols on the frequency of injuries following radiation therapy, we have studied 3 groups of patients with cancer of the uterine cervix (Table), one group which received alkoxyglycerols the week before (prophylactically), during, and 3 months after radiation treatment(I) a second one where administration of alkoxyglycerols occurred only during and 3 months after radiation treatment(II) and a third one, the control group, which received radiation treatment but no alkoxyglycerols(III). The groups I and II are from 1.1. 1964–15. 2. 1966, during which period 99% of the patients with cancer of the uterine cervix received alkoxyglycerols in connection with radiation treatment. The groups I and II are compared with the control group (III) composed of

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Injuries following radiation therapy

Treatment	No. of patients	No. of injuries (I)	I (%)	R Number	R (%)	C Number	C (%)	No. of patients with injuries	%	No. of patients with multiple injuries (M)	%
I	453	84	18.5	61	13.5	23	5.1	80	17.7	4	0.9
II	382	94	24.6	34	8.9	60	15.7	72	18.8	22	5.8
III	651	247	37.9	154	23.7	93	14.3	194	29.8	41	6.3

I: Administration of alkoxyglycerols prophylactically and during radiation treatment. II: Administration of alkoxyglycerols only during radiation treatment. III: Radiation treatment only. I, total injuries; R, injuries due to radiation treatment; C, Complex injuries due to tumour growth or to a combination of tumour growth and radiation treatment; M, more than one injury per patient, multiple injuries.

all patients from 1963 (345) and of all patients from 15.2.1966–31.12.1966 (306). The radiation techniques have principally been the same throughout the years 1963–1966.

The alkoxyglycerols are administerd orally in capsules 2 capsules 3 times a day, each capsule containing 0.1 g alkoxyglycerols, the total daily dosage thus being 0.6 g. The preparation is a concentrate of alkoxyglycerols from Greenland shark liver oil containing 75% free alkoxyglycerols (produced by AB Astra, working name AT 18).

In the calculation of frequency of injuries (bladder, rectum, ureters, intestine), the principles given by KOTTMEIER[7] and KOTTMEIER and GRAY[8] have been used in this study. Injuries producing mild subjectives changes accompanied by minimal objective changes in the mucosa (grade I according to the classification of KOTTMEIER) are considered as radiation reactions rather than injuries and have consequently been omitted. Grade II injuries are those accompanied by moderately severe objective changes, such as areas of necrosis, ulcers, moderate stenosis or those accompanied by protracted bleeding. Classified as grade III are bladder and ureter injuries with radiation fistulas and rectal and intestinal stenosis severe enough to require colostomy or resection. Grade IV are rectal and intestinal fistulas.

In earlier investigations only the injuries due to radiation treatment have in general been taken into consideration (pure radiation injuries, R). In this study injuries due to tumour growth or to a combination of tumour growth and radiation treatment have been included. They are called *complex injuries* (C) since it is impossible to decide whether these injuries are due to tumour growth alone, or to the combined action of tumour growth and radiation treatment. When determining the complex injuries, the same principles have been applied as for pure radiation injuries. Since complex injuries are included in this study we obtain higher percentages of injuries than in other investigations. Injuries which appear within 3 months time after fulguration or operation are excluded. Ileus which cannot be proved to be caused by stenosis is left out of consideration. In the Table we have given the total number of injuries (I), the injuries due to radiation treatment (R), the complex injuries (C) and multiple injuries (M), i.e. more than one injury per patient.

It follows from the figures given in the Table: 1. The percentage of injuries is considerably lower in the alkoxyglycerol groups than in the control group – especially for group I where alkoxyglycerols have been administered prophylactically. The total injuries have decreased with more than 50%. 2. The complex injuries (C) are reduced to about $^1/_3$ in the prophylactic group as compared with the control group, i.e. the prophylactic administration of alkoxyglycerols has reduced the growth of the tumour. 3. The multiple injuries (M) are less frequent in the prophylactic group compared with the control group (0.9% compared with 6.3%). 4. When alkoxyglycerols are administered only during and after radiation treatment (group II), no effect is observed on the complex injuries, while a significant decrease is found for the injuries due to radiation only (from 23.7 to 8.9). In this case the alkoxyglycerols do not seem to react on the tumour – but protect against radiation damage. 5. In group I the percentage of radiation injuries (13.5) is significantly higher than in group II (8.9), but still significantly lower than in the control group (23.7). When prophylactic treatment is given, about 2/3 of the complex injuries are eliminated and some of them might have been 'transformed' into radiation injuries.

The control group (III) is composed of 345 patients from 1963 and of 306 patients from 1966. The percentages of the total injuries (I) for these two years are (within the limits of experimental error) equal; namely for 1963, 38.8%, and for 1966, 36.9%, respectively[9]. A more detailed study will be published elsewhere.

Résumé. Les complications de traitement radiothérapique sont moins nombreuses pour les groupes I et II qui ont reçu des alcoxyglycérols que pour le groupe de contrôle III qui n'a été traité que par la radiothérapie. Le nombre de complications a diminué de plus de 50% pour le groupe I qui a reçu les alcoxyglycérols avant, pendant et après le traitement aux rayons.

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