gestellungen und längere Regelzeiten wichtig sind. Durch das Fehlen jeglicher mechanischer Teile ist diese Methode nicht nur preisgünstiger sondern auch sparsamer im Stromverbrauch.

Durch Einfügen des Relais (Rel., Figur 2) zur externen Steuerung über einen spannungsfreien Schalter (Schaltuhr) lässt sich der Regelgang über zwei Kontrolleuchten (L 1 und L 2) beobachten. Weiter schaltet K 2 (links) die Aufladung des Kondensators C 1 über R 7 und damit die Hellsteuerung des Verbrauchers (Last, bis 500 W) über den regelbaren Widerstand R 5 (2,2 M Ω) ein. Mit einem solchen Zeitglied kann eine Regelzeit von 35 min erreicht werden (Figur 3). Das Potentiometer R 2 (25 KΩ) bestimmt die Einsatzhelligkeit, d.h. die Helligkeit beim Beginn des Aufregelns oder Abregelns kann von 0 bis zu einem beliebigen Lux-Wert unter dem Maximum eingestellt werden. Die Regelzeiten verkürzen sich dann entsprechend. Schalten K 1, K 2 und K 3 über den externen Schalter um, dann wird der Kondensator C 1 langsam über die Widerstandskette R 3, R 5 und R 6 entladen, wobei die Entladungszeit und damit das Herabregeln wieder mit dem Potentiometer R 5 bestimmt wird. Bleibt die Einstellung gleich, dann sind die Dämmerungszeiten bei beiden Vorgängen fast gleich (Figur 3).

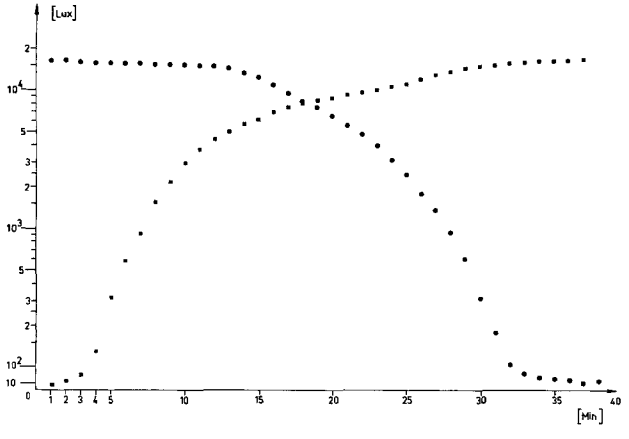

Fig. 3. Automatische Helligkeitsregelung des 2. Dämmerungsschalters. Bei R5 = 2,2 MΩ liessen sich die angegebenen Zeiten ermitteln.

Wir hoffen, mit diesen Schaltvorschlägen eine Anregung für natürlichere Bedingungen bei Aktivitätsversuchen gegeben zu haben, zumal solche Geräte für biologische Zwecke nicht im Handel erhältlich sind. Für Fragen des Nachbaues oder Beschaffung stehen wir gerne zur Verfügung. Die reinen Materialkosten betragen für beide Geräte ca. 60.– DM.

Summary. Two methods of automatic regulation of light are described. The start of dawn and dusk is made with an external contact to a switchclock. The duration of regulation is more than 30 min.

P. Schneider and R. Eisenhut

Institut für Angewandte Zoologie der Universität Bonn, An der Immenburg 1, D–53 Bonn 1 (Buudesrepublik Deutschland, BRD), 6. Mai 1974.

Specific Removal of DNA Antibody with an Immunoadsorbent

It has long been the ultimate aim of therapy in a variety of immunologic diseases to specifically remove the pathogenically important antibodies from the blood. Most therapeutic immunosuppression employs pharmacologic agents that suppress the immune response widely and nonspecifically. The advent of new technology has raised the possibility of removal of the specific antibodies which may be the fundamental pathogenic agents in a particular disease. Systemic lupus erythematosus (SLE) provides an example of a disease at least partially mediated by antibodies to DNA which, when combined with circulating DNA, may give rise to potentially pathogenic immune complexes and ultimately to significant tissue inflammation and destruction[1]. Therefore, the selective removal of antibodies specific for DNA would seem a logical therapeutic objective. Schenkein et al.[2] removed approximately 80% of the circulating antibody to bovine serum albumin in 30 to 60 min from passively immunized rabbits by circulating their blood through an immunoadsorbent consisting of BSA conjugated to bromacetyl cellulose. We therefore decided to examine the possibility of removing DNA antibodies in a similar system. Accordingly a circulation system utilizing an immunoadsorbent column and a constant flow rate hemodialysis pump was employed to examine the feasibility and practicality of the removal of antibody to DNA.

We herein demonstrate that an immunoadsorbent consisting of DNA encased in an agar matrix is capable of removing at least 70% of serum antibody to DNA in an in vitro system. Calf thymus DNA (Worthington Biochemicals) was dissolved in 0.01 *M Tris*-HCl, 0.001 *M* Na_3 EDTA, pH 7.4. The DNA was labelled with ^{125}I by a modification of the Commerford method[1,3], chromatographed over a hydroxyapatite column, and the fraction eluting with 0.2 *M* potassium phosphate buffer (pH 6.8) was used as native iodinated DNA. This was added as a marker to unlabelled DNA, and the mixture was conjugated to cellulose powder by the method of Alberts et al.[4]. 50% DNA-cellulose and 3% ionagar (Wilson Diagnostics) were mixed at a ratio of 1:3 at 56 °C. The mixture was drawn into a 25 cm glass cylinder with an internal diameter of 0.9 cm. A glass rod of 0.5 cm diameter was positioned in the middle of the column, and the cellulose agar mixture was permitted to harden at 4 °C for 60 min.

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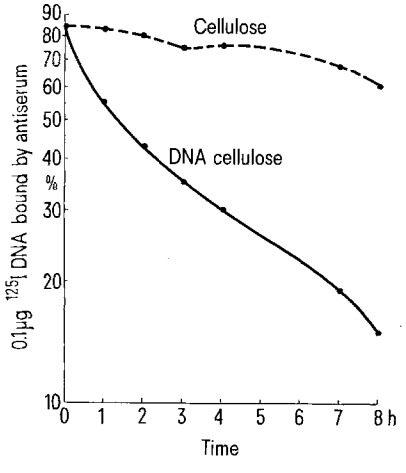
[2] I. Schenkein, J. Bystryn and J. W. Uhr, J. clin. Invest. *50*, 1864 (1971).
[3] S. L. Commerford, Biochemistry *10*, 1993 (1971).
[4] B. M. Alberts, F. J. Amodio, M. Jenkins, E. D. Gutmann and F. L. Ferris, Cold Spring Harbor Symp. quant. Biol. *33*, 289 (1968).

The glass rod was removed, leaving a circular channel through the middle of the column. A control column containing cellulose without DNA was prepared in an analogous manner. 40 ml of an antiserum to DNA, obtained from a patient with active SLE, was added to both the experimental and the control circuits. The ends of the columns were connected by polyethylene tubing to the Travenol hemodialysis roller pump. The serum in both experimental and control systems was circulated by one multichannel pump to ensure identical flow rates in both systems. The flow rate was adjusted to 70 ml per min and maintained at that rate throughout the entire experiment. The antiserum was allowed to circulate for 8 h at room temperature. Serial aliquots of serum were withdrawn from each circuit at intervals and assayed for the presence of ^{125}I-DNA in order to determine if DNA was being released from the immunoadsorbent during the experiment. In addition, their capacity to bind DNA in a modified ammonium sulfate precipitation assay[1] was measured.

DNA release from immunoadsorbent

Sample time	Total DNA released (%)
1	−0.1
2	0.9
3	−0.2
4	0.0
7	1.4
8	1.0



A steady decline in antigen binding is demonstrated in the circuit containing the DNA-cellulose column relative to minimal binding in the control (cellulose alone) system. DNA antibody was measured using an ammonium sulfate precipitation assay previously described[1]. The results are expressed as the mean percent of 0.1 µg ^{125}I-DNA which was bound by antibody and thus precipitable by half saturated ammonium sulfate corrected for the radioactivity in the precipitate of a normal serum.

The results are tabulated in the Figure. It is evident that there was a steady, decline in the DNA binding ability of the serum passed through the DNA cellulose column compared to the minimal change in the control circuit. The most rapid decline in binding in the experimental column appeared to occur in the first hour, during which there was a 29% fall in binding, and then a slower but steady drop continued over the next 7 h until 70% of antigen binding was removed. In contrast only 1% of the DNA binding was removed after 1 h on the control column, and there was a loss of only 23% of the binding ability over the 8-h period.

The ability of the column to retain the encased ^{125}I DNA was assayed by testing the aliquots of serum for ^{125}I DNA. The results shown in the Table demonstrate that little DNA was released from the experimental column at any time during the experimental procedure.

These experiments demonstrate that it is possible in vitro to remove at least 70% of the antibody to DNA in serum, utilizing an adsorbent into which the specific antigen is incorporated. In addition, the study shows that little DNA is liberated from the DNA-cellulose into the serum. Such a column, therefore, appears to be capable of maintaining its integrity throughout the course of the experiment.

The experiments suggest that it might be of value to examine a similar approach as a specific therapeutic measure in SLE. A composite sytem, with separate columns incorporating specific antigen and antibody, would likely be the most effective in the removal of pathogenic immune substances from the circulation. In addition, a system which permitted separation of cells from plasma and thus permitted contact of plasma alone with the immunoadsorbent might avoid problems of hemolysis and platelet depletion. Studies are now in progress investigating the practicality of removing specific pathogenic substances from animals with an experimental model of SLE using a similar system of immunoadsorption.

Résumé. Une colonne immunoadsorbante d'ADN-cellulose contenu dans une matrice d'agar a servi à extraire d'une manière spécifique des anticorps sériques anti-ADN. Approximativement 70% des anticorps sériques anti-ADN ont été adsorbés durant une période de 8 h, avec une libération minime, par la colonne d'ADN marquée I^{125}. Ces résultats permettent d'espérer une approche spécifique du traitement du lupus erythémateux disséminé.

D. S. TERMAN[5], I. STEWART, ANDRÉE HOFFMANN, R. CARR and R. HARBECK

University of Colorado Medical Center and Veterans Administration Hospital, 1055 Clermont Street, Denver (Colorado 80220, USA); and National Jewish Hospital and Research Center, Denver (Colorado, USA),
1 July 1974.

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