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VAN DIE REDAKSIE : EDITORIAL

DIE DEKGLASIE VAN JAN INGEN-HOUSZ

Ons wil graag die aandag vestig op 'n nietige en goedkoop apparaatjie wat deur sy beskeie bydrae die geneeskunde grootliks verryk het, naamlik die dekglasie. Hierdie glasstukkie is in verskillende vorms, groottes en diktes verkrygbaar teen 'n paar sente per half-ons pakkie. Ons vergun ons selde die tyd om die dekglasie en sy uitvinder te bewonder want dit is nog altyd die groot en ingewikkelde wat die mens se aandag boei, hoewel ons vooruitgang as 'n beskawing waarskynlik eerder op die eenvoudige as op die skouspelagtige apparatuur berus. Ons huidige denke is meer beïnvloed deur die resultate van ligmikroskopie as deur die elektronmikroskopie.

Die ontdekker van die dekglasie is Jan Ingen-Housz. Hy was 'n bekende navorser van sy tyd wat goed bevriend was met die meer bekende Fontana.[2] Hulle het saam studies en gasanalises onderneem wat later vir Ingen-Housz se studies op fotosintese van groot waarde was. Die geniale insig van Ingen-Housz blyk uit die feit dat hy die dekglasie in 'n afsonderlike publikasie beskryf het[1] in 1785 en hy meld dat die deel wat oor die dekglasie handel van belang mag wees vir baie ander werkers, terwyl die res van sy publikasie bedoel is vir ‚diegene nie ervare in die gebruik van die mikroskoop nie'.

Sy probleem was die konveksiteit van die druppel op die voorwerpglasie. Vanweë oppervlak-spanning en Brown se beweging het dooie partikels só beweeg dat hulle vir lewende organismes aangesien kon word. Waar hy egter met alkoholiese media gewerk het, het die snelle verdamping ook baie gehinder. Hy het dus twee glasies oormekaar geplaas, geskei deur papierstutte aan die ente. Na verdere eksperimente is gevind dat die dun mikastrook ‚soos algemeen in gebruik in die verpakking van mikroskoop voorwerpglasies' meer bevredigend is. Sy finale besluit egter, na die Engelse vertaling van Hoff,[2] is: ‚But what surpasses by far these sheets of mica are the very finest sheets of glass which are trampled under foot at all glassworks'.

Die feit dat dekglasies die druppels uitsprei en dunner maak, maar tog oral ewe dik in die betrokke preparaat, en die feit dat verdamping nou oor ure in plaas van minute plaasvind, was onmiddellik van grootste belang. Die feit dat die preparaat nou nie meer met die asemhaling van die waarnemer beweeg het nie, terwyl lewende organismes nogtans vrylik kon beweeg, was 'n groot stap vooruit.

Ons kan net 'n oomblik nadink oor hoe die gebruike van dié instrumentjie uitgebrei het: Underwood[3] beskou die metode van bloedtellings soos ontwerp deur Vierordt in 1852 as een van die grootste ontwikkelings in die kwantitatiewe metode in geneeskunde. (Afgesien van rooi- en witseltellings, word alle mikroskopiese kwantitasie op ongeveer hierdie beginsel gedoen.) Dit was egter eers na Thoma die telkamer ontwerp het en Alferow die los dekglasie in gebruik gebring het dat dié metode van kliniese waarde geword het.[4] (Selfs die jongste Coultertellers word nog gestandardiseer teen die telkamerbevinding.[5])

Met die huidige weefselkultuur-studies op die voorgrond dien dit onthou te word dat die vroegste weefselkultuurmetode bestaan het uit 'n druppel voedingsmedium onder 'n dekglasie met petroleumjellie afgeseël. Die ‚vlieënde dekglasie-metode' van Maximow het 'n fundamentele bydrae tot kennis van sel- en weefselfisiologie gelewer.[6]

Vir die morfologiese studie van bloedselle is die dekglasiemetode verkieslik bo die meer algemeen gebruiklike smeermetode, en differensiële tellings is ook meer akkuraat vanweë beter verspreiding van die selle.[4]

Dit hoef skaars genoem te word dat ons histologiese museums nie-bestaande sou wees as snitte nie onder dekglasies afgeseël kon word nie en die verlies aan studiemateriaal en veral die latere herbeoordeling van ingewikkelde patrone sou skaars denkbaar wees sonder die dekglasie.

Die belangrike venstertegniek, wat met sukses deur Maximow en Bloom in diere gebruik is, is deur Rebuck gewysig vir gebruik op mense en dié metode het reeds aansienlike bydraes tot ons kennis van die sellulêre gebeure tydens inflammasie gelewer. Basies berus dit op dekglasies as die ‚venster' van waarneming.[6]

Soos die geval met die wiel (waarop ons hedendaagse beskawing rol) dink ons nie wat die gemis daaraan sou beteken nie. In die geval van dekglasies, anders as in die geval van die wiel, kan ons egter hulde bring aan sy ontdekker, Jan Ingen-Housz. Sou dit moontlik wees om te bepaal watter van sy werk meer tot die wetenskap bygedra het — sy fotosintese-studies of sy dekglasies? Ons meen die dekglasies.

1. Ingen-Housz, J. (1785): *Nouvelles expériences et observations sur divers objects de physique*. Paris: Barrois.
2. Hoff, H. E. (1962): Bull. Hist. Med., **36**, 365.
3. Underwood, E. A. (1951): Brit. Med. Bull., **7**, 265.
4. Wintrobe, M. M. (1962): *Clinical Hematology*. New York: Lea & Febiger.
5. Miale, J. B. (1962): *Laboratory Medicine Hematology*. St. Louis: C. V. Mosby.
6. Riis, P. (1959): *Cytology of the Inflammatory Exudate*. Copenhagen: Munksgaard.

ELECTRON MICROSCOPY

The electron microscope has developed in the short period of 25 years to become a fairly common item of laboratory equipment with a resolving power nearly one thousand times as great as that of its optical precursor.[1] It is possible to study structure, for example, at a new dimension, that of millionths of a millimetre instead of millimetres. New problems have inevitably arisen in considering objects at the limits of the resolving power, and thought has

been stimulated regarding functional interpretation of structure both in experimental and pathological material. The electron microscope is a natural development of the desire to correlate structure and function.

It was J. J. Thomson who demonstrated the relationship between the electron and the cathode ray which made it possible to conceive the use of a beam of electrons, whose wavelength may be as little as 0·06 Å, as a source for microscopy. Busch, in 1926, showed on mathematical grounds that an electron beam might be treated as a light beam, by using magnetic lenses to replace the glass lenses of the optical system, and that the laws governing such systems, a light beam and glass lenses or an electron beam and magnetic lenses, should be similar. In 1932 Ruska produced an electron microscope, and from this time the new technique was applied to metallurgy, physical chemistry, and biology. The use of the electron microscope in the study of human biology is now on a sound footing and expanding rapidly. Ultra-thin sections of tissue are required for investigation except in special instances, such as examination of particulates. Special fixatives and methods of embedding are used, and absolutely fresh tissue material needs to be used. For the cutting of the ultra-thin sections needed for the electron microscope, glass knives made from plate or 'pyrex' glass are used by most workers. Diamond knives and special steel blades are also used.

The detailed nature of intercellular relationships, and the clear recognition and separation of unitary structures, other than the nucleus, within the cell itself, has been extensively investigated.[1,2] It has to be emphasized that the electron-microscope picture is a static one; the seemingly fixed pattern and the beautiful pictures obtained are frames from a constantly moving picture. The various organelles in the cell cytoplasm cannot be described here, but among the best recognized may be mentioned the mitochondria, the endoplasmic reticulum, the microsomes, the Golgi complex, the centriole, and the intracellular caveolae. The chromosomes have not so far revealed structural differentiation which would throw light on their structure. It would appear that some new technique of preparation needs to be developed for further progress to be made.

Most tissues of the mammalian orders, including many of the human tissues, have been examined under the electron microscope. Some of the observations useful and stimulating to students of medicine and biology have been published in monograph form.[1] To cite a few examples of the facts now established by this technique the following may be mentioned. Many of the controversial points in histological structure, such as the continuity of the plasmalemma of the cardiac-muscle cell and the structure of the eosinophil cell, have been placed on a firm foundation. Examination of the kidney has been one of the most fruitful applications of electron microscopy. In the motor end-plates in the muscles one point that has been clarified, among others, is the complete separation between the nerve ending and the muscle fibre, by a distance of only about 200 Å; the synaptic area is in fact complex. Sensory nerve terminations and endings, except those in the eye and ear, have not yet received full investigation. Examination of the central nervous system has helped to elucidate some problems, but, by its increased resolution, the electron microscope has also produced further evidence of the extreme complexity of the arrangement, even where there appear to be relatively few simple units. Similarly, with regard to the special senses, further problems have been opened up with the description of greater details of the structure of the organs.

We are becoming more and more indebted for information to electron micrographs, but although many of the old controversial points have been cleared up, new problems have arisen. There is still much interesting research to be done, and the stage is set for a big advance in the realm of human disease.

1. Causey, G. (1962): *Electron Microscopy*. Edinburgh: E. & S. Livingstone.
2. Editorial (1962): S. Afr. Med. J., **36**, 449.