INHIBITION END-POINTS GIVEN BY (a) HUMAN AND (b) HOG *H*-SUBSTANCE WITH THE SO-CALLED ANTI-*O* SERA OF DIFFERENT ORIGIN

Origin of <i>H</i> -substance	Human serum (2*)		Immune rabbit (6*) (<i>v</i> -human <i>H</i> -substance)		Natural eel serum (8*)		Immune chicken serum (1*) (<i>v</i> <i>Shigella shigae</i>)		Immune goat serum (1*) (<i>v</i> <i>Shigella shigae</i>)		Natural cow serum (4*)	
Human	Titre	Activity	Titre	Activity	Titre	Activity	Titre	Activity	Titre	Activity	Titre	Activity
Hog	1 × 10 ⁵ 4 × 10 ⁵	100% 0.4%	1 × 10 ⁵ 256 × 10 ³	100% 25%	1 × 10 ⁵ 4 × 10 ⁵	100% 400%	8 × 10 ³ 128 × 10 ³	100% 1600%	3 × 10 ³ 3 × 10 ³	100% 100%	16 × 10 ³ 128 × 10 ³	100% 800%

* Number of specimens examined

serum gave similar results, hog *H*-substance being a more potent inhibitor of *O*-cell agglutination with these reagents than is the human *H*-substance. The single specimen of goat serum tested, although giving strong agglutination of *O* cells at a dilution of 1:100, is nevertheless poorly inhibited by both human and animal *H*-substances and must be considered a relatively unsatisfactory reagent for following the course of isolation and purification of these materials from tissues or body fluids.

It is evident from these results that considerable care should be taken in selecting a serum as a standard test reagent for the determination of the relative activity of the *H*-substances of human and animal origin. The relative specific activity of the preparations of the human and hog *H*-substances as determined by human or rabbit sera would seemingly be contradicted by results obtained with the corresponding eel, cow or chicken sera. It is evident that each kind of serum possesses its own measure of *H* specific character. The human, rabbit and eel anti-*H* sera combine equally well, as measured by the inhibition titre, with human *H*-substance. The human anti-*H* serum, however, is almost specific for human *H*-substance, and behaves differently with hog *H*-substance, with which it shows poor reactivity. Rabbit, and especially eel, sera, on the other hand, react readily with hog *H*-substance as well as with human *H*-substance. Indeed, it appears that natural eel sera show closer serological fit, and in consequence a stronger affinity, for hog *H*-substance than do any other sera tested. The cow, chicken and goat serum reagents investigated show relatively poor serological affinity for the human *H*-substance. It is to be noted, however, that cow and chicken sera, although reacting weakly with human *H*-substance, show a relatively pronounced and at the same time specific affinity for hog *H*-substance.

The hog *H*-substance was exposed during its isolation from individual stomach linings to prolonged peptic digestion¹², and it was, therefore, conceivable that its original specificity had been modified and that the differences revealed by the serological experiments described arose completely or in part through exposure of the native material to the conditions associated with peptic digestion. Human *H*-substance was accordingly treated with crystalline pepsin under conditions of pH, time and temperature similar to those to which the hog *H*-substance was submitted. Subsequent serological examination of the human *H*-substance after this treatment showed it had not developed the serological behaviour recorded in the table for the hog *H*-substance.

The result of these experiments, which have been carried out with essentially homogeneous specific substances, indicate that the human and hog *H*-substances as isolated are not identical, and additional unpublished evidence of a more chemical nature has been obtained which supports this conclusion. Qualitatively, these substances possess a degree of

common specificity the quantitative estimate of which varies greatly according to the serological reagent used to measure it. The human, rabbit and eel serum reagents appear to be equally suitable for measuring the activity of preparations of human *H*-substances and are far superior for this purpose to the chicken, cow or goat sera investigated. On the other hand, those natural eel sera which possess an agglutinin for human *O* cells are the most sensitive reagents for measuring the activity of hog *H*-substance.

It is of interest to consider to what extent the different behaviour of the sera examined is influenced by the animal species from which the agglutinin is obtained.

The serological relationships revealed by these preliminary investigations should be confirmed for a wider range of sera where possible by means of the quantitative precipitation techniques developed by Heidelberger¹³ and by Kabat¹⁴. Full details of the experiments described will be published elsewhere as part of a larger investigation on the complexity of the human blood groups.

We acknowledge with thanks specimens of natural eel and immune chicken serum from Dr. R. Grubb, of the University of Lund, and a liberal supply of goat serum from Dr. E. A. Kabat, of New York. One of us (E. F. A.) is indebted to the Medical Research Council for a studentship.

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¹³ Heidelberger, M., and Macpherson, C. F. C., *Science*, **97**, 405 (1943); **98**, 63 (1943).

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WELFARE OF ANIMALS IN THE LABORATORY

ALL experimental workers worthy of the name will welcome Major C. W. Hume's pamphlet, entitled "How to Befriend Laboratory Animals", which has been published by the Universities

Federation for Animal Welfare*. The aims of the Federation are well known; it exists to enlist in Great Britain the influence of university men and women on behalf of the humane treatment of animals, wild and domestic; to promote interest in this at home and abroad; to lessen the pain and fear inflicted upon animals by man; to obtain and disseminate accurate knowledge relating to the welfare of animals; and to promote legislation for their humane treatment. It is noteworthy that the welfare of all animals is included in this charter and that accuracy of the knowledge disseminated is a primary aim.

In this pamphlet, the sanity of which will commend it to a wide circle of readers, Major Hume outlines the history of the use of animals for experimental work and the development of the movement against vivisection. He gives—all too briefly, some will think—the reasons why experiments upon animals are made, states the risks to which the animals are exposed and estimates how much laboratory animals suffer in Great Britain and elsewhere. Then follows a section, written with all the author's knowledge and experience, about the ethics of a problem which is never absent from the minds of experimental workers. The criterion by which the experimental worker should decide whether or not experiments upon animals are justified is, suggests Major Hume, the question: "Should I myself be willing to endure that degree of suffering in order to attain the object in view?" If, says Major Hume, the answer is "No", then the animals must not be used. Great Britain, he goes on to say, has "no little reason to be proud of the way she has handled the problem of animal experimentation", but improvement is, as everyone will agree, always possible. Major Hume suggests that many more Home Office vivisection inspectors are needed for the promotion of a uniform standard of humane treatment. Existing precedents should be constantly reviewed in relation to the pain rule, and zoologists, veterinarians and judicious animal-protectionists should be consulted more often. The less popular species of animals need specially considerate attention.

Dr. F. J. Vinter, the secretary of the Federation, has suggested that experiments should be classified according to the degree of their severity into four or five categories; instead of the present system of licences accompanied by certificates which extend the work permitted by the licences alone, there should be licences graded according to the categories of the severity of the experiments, and licences for work which inflicts pain or comes into the more severe categories should be progressively more difficult to obtain. Among other improvements suggested by Major Hume are medals for distinguished service in animal rooms, centralization of the breeding and supply of laboratory animals (a development which is already in progress) and better animal accommodation. Work on the psychology of the animals and further study of the techniques of anaesthesia and euthanasia are also desirable.

This pamphlet should be widely read. It is essential that accurate knowledge of all the controls that nowadays govern the use of animals for experimental work should be disseminated as widely as possible.

G. LAPAGE

* How to Befriend Animals. By Major C. W. Hume. Pp. 1-12. (The Universities Federation for Animal Welfare, 284 Regent's Park, London, N.3, 1949.) 3d.

CARNEGIE TRUST FOR THE UNIVERSITIES OF SCOTLAND

ANNUAL REPORT FOR 1948-49

THE forty-eighth annual report of the Carnegie Trust for the Universities of Scotland for the year 1948-49* points out that, since, so far as the large majority of Scottish students is concerned, the sums devoted in the past towards payment of fees are no longer required, the time has come when the Trustees must consider how they can employ the consequent surplus most advantageously for the Scottish universities. In addition to the sum of £54,100 under the quinquennial allocation for the year, £26,820 was devoted to a wide variety of objects in furtherance of postgraduate study and research, and it is considered that all the signs point to a steady increase in the needs of postgraduate study and research schemes, the fostering of which the Executive Committee regards as one of its most important and valuable functions. In addition to the increased fellowship, scholarship and grant scheme and subventions to the universities for purposes of travel and maintenance of university staffs engaged in research, the report refers to increased assistance given in the purchase of instruments and apparatus for specific pieces of research, to guarantees on a large scale against loss on the publication of books of outstanding merit which by their nature are not likely to have large sales, and to assistance to learned societies in Scotland in the publication of transactions. The Executive Committee proposes also to give increased assistance to students about to go on to advanced studies.

In the report upon the work of investigators under the research scheme during the year, which is appended, reference is made to Dr. T. S. Hutchison's study of the effect of cold working on the magnetic properties of pure metals, and Mr. F. B. Stern's work on the X-ray analysis of single crystals. Mr. J. H. Robertson has continued his X-ray investigation of the molecular configuration of strychnine, Mr. W. E. F. Naismith has completed a study of the optical properties of the chloro-nitroso compound previously synthesized and resolved, and Mr. K. C. Reid has made good progress with his investigation of the furyl analogues of benzoin derivatives. Progress is also reported in Mr. S. V. Ruff's work on α -amarin, a constituent of elemi resin, in Mrs. N. F. Storey and Miss B. Cairns' search for new antimalarial compounds, by the synthesis of benzacridines, benzcarbolines and quinoquinolines, and in Mr. W. H. Stafford's syntheses in the fluorenone series. In medicine the outstanding feature is Dr. Z. Godlowski's investigation on the location of the allergic reaction by the use of radioactive isotopes. Mr. J. B. Wilson has investigated amino-acid absorption from mammalian gut, Miss M. E. Rowatt the metabolism of *Lactobacillus plantarum*, and Dr. C. C. Forsyth the dietetic treatment of diabetes mellitus. Dr. E. Reid has continued his work on the diabetogenic principle of the anterior pituitary body and has found a satisfactory method of obtaining essentially pure preparations of the hormone, which he has shown to consist predominantly of a single protein. Dr. D. C. Gibb has continued her study of the unattached seaweed *Ascophyllum mackaii*, and

* Carnegie Trust for the Universities of Scotland. Forty-eighth Annual Report (for the Year 1948-49) submitted by the Executive Committee to the Trustees on 27th February 1950. Pp. iv+68. (Edinburgh: Carnegie Trust for the Universities of Scotland, 1950.)