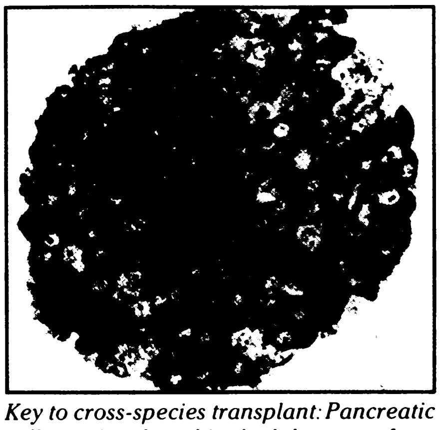
Successful Islet Transplants

Insulin produced by genetic engineering and by chemical synthesis techniques will aid, but provide no panacea for those diabetics dependent on injections of the hormone. Pain and inconvenience aside, daily injections do a poor job of mimicking the sensitive monitoring that normally takes place in the body — insulin is released intermittently throughout the day and night in response to changes in blood sugar levels. The incomplete control of sugar levels in diabetics taking insulin injections is generally blamed for associated vision, kidney and heart problems.

Transplanting insulin-providing cells into diabetics would be a welcome treatment. With no intervention by the patient, the cells could sense blood glucose levels and provide just the right amount of insulin. The major obstacles to such a treatment are the rejection of foreign cells by the recipient's body and the scarcity of appropriate tissue for transplantation. Experiments on animals now give cause for optimism that those obstacles can be overcome. Researcher Paul E. Lacy says transplants for human diabetics may be three to five years away.

Insulin-producing cells from rats have been transplanted across a species barrier and have controlled blood sugar levels in diabetic mice for several months, Washington University scientists report in the July 11 SCIENCE. Lacy, Joseph M. Davie and Edward H. Finke used a three-pronged approach to evade the mouse's immune system without long-term administration of immunosuppressive drugs. The procedure extends the technique, which previously allowed the scientists to transplant pancreatic cells between rats of distant strains (SN: 4/21/79, p. 261).

One key to the successful transplants is a laboratory interim for cells. Instead of hurrying fresh material from one animal to the other, Lacy and co-workers incubate pancreatic tissue for a week. They choose incubation conditions that allow the islet cells, which make insulin, to thrive, but that kill white blood cells, which are effective at triggering transplant rejection.


SCIENCE/Magnification X350

Key to cross-species transplant: Pancreatic cells are incubated in the laboratory for a week before being given to the recipient.

Two other prongs of the successful transplant scheme involve use of antibodies to suppress immunity at the time of transplant. In the most successful cross-species experiment, the recipient mouse was injected with antibodies both to mouse and to rat white blood cells. The mouse antibodies prevent an immediate immune response, and rat antibodies may destroy remaining "passenger" white blood cells among the islet cells.

The rat cells are introduced into the mouse circulation and they lodge in the liver. Even there they can successfully control blood sugar levels. In seven out of ten mice receiving the full transplant treatment, sugar levels were still under control after 116 days. In contrast, islets transferred immediately after dissection from the rat with no antibody injections given were all rejected within 12 days.

The next step will be to transfer cells from pigs into mice, Lacy says. Use of islets from animals will be necessary for eventual widespread clinical transplants, and new methods must be developed for extracting islet cells from large mammals. Lacy says his group now plans to investigate placing islets in safer sites, such as muscle or spleen, rather than in liver. □

The question of a quintuple quasar

And then there were five. Possibly. Five images of the quasar catalogued as PG1115+08. That is the suggestion made by Keith Hege of the University of Arizona at last week's meeting of the Astronomical Society of the Pacific in Tucson. He derives it from a study of the quasar's image by the technique known as speckle interferometry, which he did using the Multiple Mirror Telescope on Mt. Hopkins near Amado, Ariz.

PG1115+08 first came into the news as a triple quasar: that is, three identical quasars close together in the sky or three images of one and the same quasar (SN: 7/5/80, p. 4). Triple or quintuple, if it is multiple images, it is probably an example of what is called gravitational lens effect, a situation in which a dense unseen body bends the light from the visible one. If it is that, as Hege remarked, it represents the beginning of what may be a whole new method for learning something about unseen matter in the universe.

Hege began by seeing what PG1115+08 looked like in four different colors using image tubes and TV. The quasar has three plainly visible images designated A, B and C. The C image shows an excess of red light compared with the others. Hege suggests that this reddening could come from passage of the quasar's light through a dark galaxy like the one discovered in the case of the double quasar, 0957+56 A and B, the first alleged example of a gravitational lens effect.

In these cases the hypothesis is that the galaxy acts to bend light rays in a fashion analogous to that of a glass lens. The galaxy's effect on the light is mediated through the gravitational field that it generates. The field sharply increases the curvature of space-time in the neighborhood. Light rays are constrained to follow the curvature, so they take sharp bends. If this galaxy lies between the earth and the quasar, and the geometry of the relationship is just right, the lightbending will produce multiple images of the quasar for the observer on earth. Astronomers describe the situation as analogous to looking at a point of light through the base of a wine glass.

Suspecting that there might be more than three images, Hege subjected PG1115+08 to the form of analysis called speckle interferometry. This technique gets its name from the scatter of speckles that appears when a bright astronomical object is photographed with fast film. As everyone knows, who has looked, the images of astronomical objects continually bounce around because of the turbulence of the air. The jumps may be as many as fifty a second, but with a bright object fast film can capture the image as an individual spot each time it jumps. These speckles contain information that gets washed out of the usual astronomical time exposure, which is a blurring together of this speckle pattern. The proper computer analysis can put the speckles together coherently and bring out this information.

From the speckle analysis of PG1115+08, Hege concludes that there may be as many as five separate images. The image called A appears to be three images superimposed on one another. The assembled astronomers were taking that cautiously, but whether they eventually accept the five images or not, Hege's work is important as an extension of speckle interferometry to objects as faint as magnitude 15 (PG1115+08's magnitude). A few years ago most astronomers would have said the technique couldn't go fainter than magnitude 8 or 9. At the same time the work represents a demonstration of what can be done with the great lightgathering power of the newly commissioned MMT. □