

HEALTH

Israeli brain scientists spark hopes for more efficient bionic limbs

By ISRAEL21c staff October 19, 2007

For patients who have lost a limb, prosthetic devices frequently come as mixed blessing. Aesthetically, they may provide a valuable boost to self-esteem and confidence. But heavy, uncomfortable and difficult to use, most will seldom provide a level of sensitivity sufficient to render them anything other than an additional encumbrance.

For a group of researchers at Hebrew University, though, one novel approach to the measurement of brain activity has suggested how one day a metal-and-plastic limb might operate just as effectively as its flesh-and-blood prototype - and, in the process, teach us more about how the brain interacts with the body.

In an article recently published in *The Journal of Neuroscience*, neurophysiologists Eran Stark and Prof. Moshe Abeles describe how their new method for measuring and deciphering the electrical activity of nerve cells avoids many of the drawbacks of conventional approaches. Current techniques involve either the placement of a mesh of electrodes on the scalp, or the implantation of fine intra-cortical wires to measure electrical activity from within the brain tissue itself. Problems arise, though, when the signals arising from the cortical surface are too uniform to provide sufficient accuracy for the operation of a prosthetic limb, or when the intra-cortical implants trigger the formation of scar-like masses of glia cells, thus masking the very activity they aim to measure.

That's where the new research proves so important. The approach involves measuring the activity of all nerve cells located at an intermediate distance (100-200 micrometers) from a recording electrode. In this way, multiple independent readings can be obtained from many adjacent points - a crucial step in the determination of highly accurate measurements. Such accuracy might allow for a future robotic limb able to precisely obey its user's neuronal commands, or a device implanted in a paralysed limb which artificially stimulates existing muscles to move in a natural manner.

In testing the approach, the researchers trained monkeys to perform what are known as "prehension" movements, reaching and grasping various objects located at different positions. Such actions are complex, requiring the brain to simultaneously regulate

direction of reach, performed mainly by the arm, and the type of grasp, performed mainly by the fingers. Using the new techniques, the group found that the upcoming reach direction and grasp type could be predicted at an accuracy of about 90% and, in some cases, at a near-perfect accuracy (above 99%). Overall, the rate of prediction error was two to three times lower than that encountered in existing methods of brain activity measurement.

For the scientific community, the researchers noted, the study comes as an exciting step in the deciphering of the link between brain activity and behavior. But for those dealing with injury or paralysis, the development may yet prove even more moving.

