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'One-drop' blood test study funded by Alzheimer's and Down syndrome organizations

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There is increasing evidence that the brain changes of Alzheimer's disease begin decades before memory and thinking problems occur, prompting the need for better methods of early detection for this progressive, fatal brain disease. Consequently, there is a growing school of thought that the most effective future Alzheimer's drug therapies will be administered to those who are at high risk of the disease before cognitive symptoms appear.

To bolster development of a simple, inexpensive, noninvasive test that can detect the risk of Alzheimer's disease, the Alzheimer's Association, the Crnic Institute for Down Syndrome, and the Global Down Syndrome Foundation ("Global") are funding two studies of potential new blood tests for Alzheimer's, including one that uses just one drop of blood:

- One study will evaluate whether examining changes in ribonucleic acid (RNA) found in one drop of blood can accurately identify people who will develop Alzheimer's in individuals with Down syndrome who are at high risk for the disease. The study is being led by Marwan Sabbagh, M.D., Director of the Alzheimer's and Memory Disorders Division at the Barrow Neurological Institute in Phoenix, and Matt Huentelman, Ph.D., Associate Professor in the Neurogenomics Division Unit at the Translational Genomics Research Institute in Phoenix.

- Another study will test whether a specific set of blood proteins can identify who is at risk for developing Alzheimer's in a unique, high -risk population, individuals with Down syndrome. The study is being led by Nicole Schupf, Ph.D., M.P.H., Dr.Ph.H., Professor of Epidemiology at Columbia University Medical Center in New York City, and Sid O'Bryant, Ph.D., Director of the Center for Alzheimer's and Neurodegenerative Disease Research at the University of North Texas Health Science Center in Fort Worth.

"Prevention of Alzheimer's dementia may be more effective and easily achieved than attempting to treat the disease once symptoms already exist and irreversible damage to the brain has already occurred," says Dean Hartley, Ph.D., Director of Science Initiatives for the Alzheimer's Association. "For this approach to be successful, we must be able to simply and accurately assess risk early in the disease process. The Alzheimer's Association and the Global Down Syndrome Foundation hope that these two exciting projects drive that effort forward."

"Autopsy is still the only way to definitively diagnose Alzheimer's disease," said Michelle Sie Whitten, President and CEO of the Global Down Syndrome Foundation. "If these researchers are successful we will be one step closer to catching Alzheimer's in its early stages and hopefully then be able to treat people with the disease earlier and actually prevent dementia from occurring, when new treatment options become available."

The grant awards are part of $1 million in new funding for Down syndrome-related Alzheimer's disease research. Four projects will receive $250,000 each through the joint funding effort.

Nearly all adults with Down syndrome begin developing the brain changes of Alzheimer's in their 30s. By age 55 or 60, it is estimated

55-70% will develop dementia. Because people with Down syndrome are at high risk for Alzheimer's, answers to important research questions about the disease may be developed more quickly in this population than by studying people with sporadic, late-onset Alzheimer's, where symptoms appear most often after age 65 - and in many cases not until the 70s or 80s.

"It used to be common for individuals with Down syndrome to die in their 30s, but because of medical advances they are now regularly living into their 50s and 60s. The irony is that they are now facing dementia due to Alzheimer's disease," says Huntington Potter, Ph.D., Director of Alzheimer's Research at the Crnic Institute for Down Syndrome and a Professor of Neurology at the University of Colorado, Denver. "At the same time, questions about Alzheimer's may be answered more quickly by studying this disease in people with Down syndrome because of their high risk for Alzheimer's and the earlier onset. Through this approach, people with Down syndrome have the opportunity to further our understanding of Alzheimer's disease and we have the opportunity to help this population."

Scientists are not sure exactly why individuals with Down syndrome are at high risk for Alzheimer's disease but past research shows that a gene on chromosome 21 codes for the amyloid precursor protein (APP) that gets cut into fragments that accumulate into the hallmark amyloid brain plaques of Alzheimer's. People with Down syndrome are born with an extra copy of chromosome 21.

"The hope for our study is that the identification of RNA biomarkers for Alzheimer's could be used in a non-invasive blood test that requires just one drop of blood to assess an individual's risk of developing the disease, similar to the way a person with diabetes checks their blood sugar," says Sabbagh. "If we can learn early on that a person is at risk, the goal would be to start preventative therapies immediately. This could be a game

changer."

"Our research could provide new information about potential biomarkers, including protein changes detected in blood, that could more accurately and easily predict the risk for Alzheimer's disease in people with Down syndrome," says Schupf. "If successful, we believe there is a chance that these biomarkers could also be used to assess Alzheimer's risk in all groups of people."

The Alzheimer's Association is the largest nonprofit funder of Alzheimer's research, having awarded more than $350 million to over 2,300 projects since 1982. The Association currently supports more than 350 ongoing research projects in 21 countries totaling more than $82 million.

The Global Down Syndrome Foundation raises funds for the Crnic Institute for Down Syndrome to underwrite critical research benefiting people with Down syndrome. To date, $5.7 million in research grants has been given to 33 investigators.

The two other research projects the Alzheimer's Association and Global are funding through the joint grant award effort are:

- A test of a potential Alzheimer's drug treatment that reduces levels of toxic protein fragments in the brain of a mouse model of Down syndrome. The project is led by William Mobley, M.D., Ph.D., Chair of the Department of Neurosciences at the University of California, San Diego (UCSD) and Executive Director of UCSD's Down Syndrome Center for Research and Treatment.
- A study to determine whether a protein called Dyrk1A influences the build-up of brain proteins that lead to the formation of plaques and tangles that are key features of Alzheimer's in a

mouse model of Down syndrome. Dyrk1A is created by one of the genes on chromosome 21 and is overabundant in the brains of people with Down syndrome. The study is led by Fei Liu, Ph.D., Head of Molecular Neuroscience for the Research Foundation for Mental Hygiene, Inc. at the New York State Institute for Basic Research in Staten Island.

Provided by Alzheimer's Association