Iris-Tatjana Kolassa – extreme stress takes a toll on cells

Molecular psychology has huge potential for the future. The discipline has used imaging methods for diagnostic purposes for a long time, but Iris-Tatjana Kolassa, a 33-year-old psychologist from Ulm, is convinced that in future it will increasingly use molecular biology and medicine methods. The idea of remaining blinkered in her own discipline is a notion that is utterly foreign to Kolassa; whenever she senses synergies, whether it be with toxicologists, nanoscientists, neurologists or sports scientists, she is interested in working with other disciplines.

Prof. Iris-Tatjana Kolassa

Kolassa's recent research has shown that her major research priorities – stress and ageing – are more closely linked than she at first thought. She hypothesizes that stress leads to premature ageing and that it also has a noticeable effect on the cellular level. Kolassa hopes that her findings will soon be published in one of the renowned scientific journals and she is also looking for further evidence to substantiate her hypothesis.

Early independence

The psychologist has been head of the Department of Clinical and Biological Psychology at Ulm University since October 2010. She has had an outstanding academic career and has received numerous prizes and scholarships. She was introduced to science at the University of Konstanz, not far from Ulm. In the Centre for Junior Research Follows, which later became the "Future College", she was able to carry out independent work very early on. She received all the support imaginable at the centre, which she still refers to as "the best place to become a junior researcher".

"I always had my own ideas," said Kolassa who is a self-confident researcher as well as the mother of twins. Coming from a family of chemists, she decided to enter the realm of brain research, and commenced her psychology studies at the University of Konstanz in 1997 where psychology is very much oriented towards the natural sciences, with a particular focus on biology. In contrast to many fellow students, Kolassa decided to go abroad during her studies, rather than as a doctoral or postdoctoral student. She did two research internships and her degree thesis at the University of Minnesota in Minneapolis, graduated in Konstanz in 2002 and then moved on to Jena to do her doctorate on imaging methods.

After her doctorate, Kolassa finally decided that she wanted to do something she really enjoyed. She started working in the field of stress research and some time later became involved in research into ageing, which enabled her to return to the University of Konstanz at Lake Constance. She worked in an interdisciplinary environment and became an up-and-coming researcher who had long been aware that (epi)genomic research had entered the field of psychology. She maintains contact and works with many researchers around the world, on the basis, as she says, that "why should I spend my postdoctoral research period abroad if I can get the people here". She initially worked in the Department of Clinical Psychology, then became head of a group of junior researchers in the Department of Clinical and Neuropsychology before spending 18 months as head of an Emmy Noether research group in the field of psychology until September 2010.

Extreme stress also shows in cells

What kind of effects does extreme, traumatic stress have on the human brain, the immune system, the endocrine system and on the cellular level? Kolassa is particularly interested in the biological, and in particular molecular, alterations that occur after situations of extreme stress. She is also interested in finding out whether therapeutic interventions are able to reverse such alterations. Kolassa is trying to find answers by focusing particularly on posttraumatic stress disorder (PTSD), which is a severe anxiety disorder that can develop after exposure to events that may involve the threat of death to oneself or to someone else, and which results in psychological trauma. PTSD can develop after exposure to natural catastrophes, wars, genocide, sexual assault or fire. Kolassa has also carried out studies on normal stress like exam stress. She found that exposure to this type of stress has more heterogeneous effects on the human body than traumatic stress which can have dramatic effects on the human body. Kolassa explains that such dramatic effects are similar to the playing-dead reflex which is observed in a wide range of animals.

Outpatient Clinic for Survivors of Violence and Trauma in Uganda
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PTSD entails secondary diseases

When genocide such as the 1994 mass murder in Rwanda occurs, human individuals experience a broad range of traumatic events. Kolassa is investigating the potential effects such events have on human health in the long term and what implications this has for an entire traumatized nation such as the Rwandan nation. Researchers from Konstanz established an NGO (non-governmental organization; www.vivo.org) in Uganda that operates a clinic where 15 therapists treat the severely traumatized genocide survivors. Kolassa found that around 40 per cent of all traumatized survivors develop PTSD. She also found that all individuals who have been exposed to more than 15 traumatic events suffer from PTSD.

Psychologically, PTSD symptoms include recurrent re-experiencing of the trauma through troublesome memories, flashbacks and nightmares. Physical signs include hyperarousal and hypervigilance to threat; PTSD patients may react with emotional deadness, something behavioural scientists call passive prevention and which can have symptoms similar to those of depression. PTSD

Stones mark traumatic experiences, flowers mark nice experiences. Genocide survivors can be treated with narrative exposure therapy (NET).
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massively affects a person's daily life, but can be treated quite well, at least when the disorder is the result of a single trauma. Treatment takes much longer in individuals who have experienced complex, in particular sexual, traumas.

Kolassa's research hypothesis assumes that extreme and long-term traumatic stress affects body memory: "Our body not only remembers the traumatic effects in the brain, but also in every cell of the body," said Kolassa explaining that stress leads to a biochemical imprint of the dramatic events experienced. This then leads to physical symptoms such as pain. The alterations can be measured. The number of T-cells that combat infections decreases, which in turn increases a person's susceptibility to infections. The number of regulatory T-cells is reduced by around 50 per cent, which increases a person's susceptibility to autoimmune diseases. "We know that traumatic stress or stress in general increases the risk of developing autoimmune diseases, infections in general, cancer as well as other endocrine and metabolic diseases." Kolassa was instrumental in discovering that people with PTSD have an elevated risk of developing autoimmune diseases. "PTSD sufferers who do not undergo treatment have a relatively high risk of contracting an autoimmune disease," concludes Kolassa. She and her team have recently found out that people with PTSD also have a higher risk of developing certain tumour diseases.

She is of the opinion that people with PTSD in Uganda or Rwanda need to have psychological treatment to prevent secondary diseases. Kolassa: "We found that some of the secondary diseases can be treated effectively in people undergoing PTSD treatment." The researchers have found that as few as 10 therapeutic sessions help reduce the disease symptoms, including on the cellular level. They also found that cellular processes that were altered as a result of stress returned to normal after therapy.

Stress and ageing correlate

The WIN project has shown that constant motion promotes healthy ageing.
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There is increasing evidence that excessive traumatic stress also favours premature ageing. The psychologist from Ulm developed an interest in ageing research when reading about a call by the Heidelberg Academy of Sciences relating to the human life cycle. In cooperation with a chemist from Konstanz and a neurologist from Ulm, Kolassa initiated a WIN project on "Neuroplasticity and immunology of cognitive impairment in old age". The project has a runtime of five years and ends in 2012.

Kolassa also points out that lifelong physical activity, a healthy diet, mental activity and little stress promote healthy ageing. Epidemiological studies have shown that the risk of developing Alzheimer's increases with physical inactivity. Intervention studies have shown that physical activity has a preventive effect and that the cognitive decline slows down. Dementia sufferers in a nursing home "benefit considerably from a 10-week period of physical activity," said Kolassa relating to a study carried out in a Konstanz-based nursing home. The study has for example shown that physical activity and sensory training trigger neurons to produce secondary messenger substances that promote neural survival and prevent the death of the cells. Although little is yet known about the effect physical and mental activity have on neuroplasticity, it has long become clear that it has a positive effect on healthy ageing.

Kolassa believes that doing sport is currently the best thing people can do against dementia. Like

many other Alzheimer's researchers, Kolassa knows from the WIN project that basic research (in this special case, the use of amyloid beta antibodies as Alzheimer's biomarkers) often leads to an increase in knowledge.

Expanding research into stress to other fields

In other projects, Kolassa is investigating the effect of traumatic stress on cell ageing processes such as DNA repair (a project carried out in cooperation with Alexander Bürkle, Dept. of Molecular Toxicology, University of Konstanz) and telomere length (a project carried out in cooperation with Lenhard Rudolph, Institute of Molecular Medicine and Max Planck Research Group on Stem Cell Ageing, University of Ulm). In addition to these cooperative projects, Kolassa also works with other researchers to investigate the transgenerational effects of traumatic stress on the behavioural and biological level (epigenetics).

Just recently, Kolassa has established a biological laboratory for her research and although it is currently just a pipe dream, she is also thinking about establishing a molecular psychological laboratory. She is very pleased that her efforts to combine molecular biology with the field of psychology are also recognized on the international level. In May 2012, the 33-year-old will be awarded the Janet Taylor Spence Award For Transformative Early Career Contributions from the Association for Psychological Science (APS), a prize that distinguishes approaches like hers, namely novel and creative approaches to psychological research.

Kolassa intends to also apply her research on stress to more complex traumatic disorders, including borderline personality disorders. Moreover, she will specifically focus on research into transgenerational transfer in order to find out what a traumatized mother transfers to her child on the biological level and whether it is possible to prevent such transgenerational diseases. Kolassa believes that one of best studies was one of her first ones, which was the result of a cooperative project with the Swiss researcher de Quervain, where it was found that a specific genetic variation leads to a better emotional memory - for better or for worse. She hopes to continue her research into the genetics of PTSD in another study and particularly focus on finding out whether a successful therapeutic outcome is related to a person's genetic constellation.

At the moment she does not have the money she would need to focus on all her ideas. "So there is nothing for it but to sit down and write applications," said Kolassa with a smile, demonstrating determination and high tolerance of frustration. "I would like to work on all the topics that interest me and I am sure that I will manage to find a way."

Literature:

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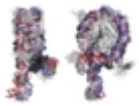

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