

The Smoke that Kills Smell and Fades Memories

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Looking through the college magazine, Dr Tripathi, a retired college principal couldn't recognize many faces including some of his favourite students during his tenure. Tripathi sir started feeling uncomfortable about his situation since his retirement from service. Sometimes he forgets the name of his wife, children and grandchildren and at times a sudden panic strikes him without a reason. The person who never forgot a route that he once drove on, now blacks out in the middle of the road every now and then. He used to have a good memory and never had problems remembering. However, after being persuaded by his relatives he reluctantly agreed to consult a doctor about his problem. They fixed an appointment with a renowned neurologist in town. On the day of the appointment, he was taken to the clinic and the doctor was briefed about the problem. After listening, the doctor decided to conduct MRI and CT Scan tests. Also, he was asked to answer a few personal questions in writing drawing from his current experiences. And made to draw a clock marked with readings. He was asked to visit the doctor the next day for test results and reports.

The following day when he visited the doctor, he was told that he is suffering from Alzheimer's Disease (AD) and needed to take immediate medication. Tripathi's world came crashing down as he was aware of the consequences of the so called "forgetful disorder" The doctor informed that the medication can only stop memories from being erased for a short time but the inevitable cannot be avoided. On the way back home, he was cursing the situation he was in, especially for someone who spent most of his time reading and teaching.-

* Ms. Anjali Raj, Ph.D. Scholar from JSS College of Pharmacy, Mysuru, is pursuing her research on "Alzheimer's Disease and Olfaction." Her popular science story entitled "The Smoke that Kills Smell and Fade Memories" has been selected for AWSAR Award.

He was wondering how and why it happened and what will be his future now. Could it be the smoking but then he thought that smoking would protect his brain.

A decade ago, it was a general belief even to scientists that cigarette smoking though it is harmful to the body, is beneficial to the brain due to certain ingredients contained in cigarettes. Many reports at the time gave smoking a heroic posture for the memories of human being and to boost the levels of intellect. However, later the hero of the story turned out to be the villain when Alzheimer's Association declared cigarette smoke (CS) as one of the causative factors for dementia including Alzheimer's Disease (AD).

On reaching home, Tripathi started to browse the internet to find out the possible causes of his disease before he forgets. AD had a lot of definitions by many sources but he knew that Webster's Dictionary would give him a better insight. Unfortunately, the History professor failed to understand much of the associated technical terms. He found the words "plaques and tangles" being highlighted and understood that these things are currently in his brain too. What are these things and how are they harmful?

On further research he found that plaques and tangles are actually manifestations of certain types of proteins called Amyloid Beta and Tau, both of which are otherwise produced naturally, but in the disease condition tends to accumulate heavily and cause death to the neurons. He also found out that just like how we verbally communicate, the neurons communicate through impulses using messengers called neurotransmitters, which are also affected negatively in this condition. Obviously, he came across the association's warning against smoking and scolded himself for his carelessness.

In his quest to find out about the effects of smoking, Tripathi stumbled upon the fact that it could cause AD. It was a starting point.

We needed evidence to convince many Tripathis that this villain is not a local "rowdy" but actually a "monster" who will snatch everything including health, wealth and peace of mind. Since scientific evidence always holds strong but we couldn't use human subjects, we decided to rely on animals (mice (rodents)) to gather proof.

A widely used cigarette brand among the Indian population was selected and the animals were made to inhale it while kept in a non-ventilated chamber. We also discovered that this smoke kills our sense of smell more drastically than even the memories. Interestingly, a parallel investigation led us to the fact that the human brain shares an intense relationship with the nose and it can access the higher center directly where the information remains stored for a much longer time and any injury or trauma to the brain affects the sense of smell first. Hence, we took the lead and studied the inhalation effects of cigarette smoke on memory through its effects on smell for a period of four months (as revealed from prior information). Animals were subjected to find out behavioral aspects, they were trained beforehand for some specific tasks. As expected the culprit was caught red handed in causing memory degradation as well as weakening of the sense of smell.

But what sparked the curiosity was that smoke faded the sense of smell much before it affected the memories in the exposed animals. This element is easier to prove in an animal than humans because animals use sense of smell to perform most of their activities. The post-mortem

study revealed more interesting details which included the detection of the so called “plaques” both in the memories specific area of the brain called Hippocampus and also in the structural connection of smell to brain called olfactory bulb. Most importantly, the plaque density was higher in the bulb than Hippocampus and some of the earlier mentioned chemical messengers said to involve in maintaining good memory (which also includes smell since they are stored as memories to an extent) were found in less level in both the structures.

Results of our investigation indicated to smoking being harmful not only to memory but also to our sense of smell, which could pose a serious problem. Since we also “smell threats” and deal with them without noticing it consciously. Without a proper sense of smell, we may not be able to taste and subsequently enjoy food.

Our study has been backed with several reports which proved that 85 – 90% of AD cases (irrespective of the cause) reportedly are suffered from an initial loss of smell but this fact is generally neglected. Probably every smoker complains of a reduced sense of taste but most of the time never identifies/ignores their loss of smell which actually occurs much earlier and can indicate to a possible memory loss/dementia. We don't know whether Dr Tripathi experienced any such smell variations or not but if he could have atleast been careful with his body responses quite a while ago and reported to the doctor earlier, medication could have prevented him from advancing to AD. Our body always warns us well in advance that it needs help, but more than half of us don't take it seriously and delay to act upon it.

Our lab aims at identifying alternative mechanisms to neuro-degenerative disease, mainly Alzheimer's disease and also actively research on alternate/combined therapies to treat the disease with minimal side effects to patients, all in animal models. The research team for the above work included Anjali Raj (Research Scholar), Dr S.N.Manjula and Dr M.V.S.S.T. Subba Rao from JSS Academy of Higher Education and Research, in Karnataka.