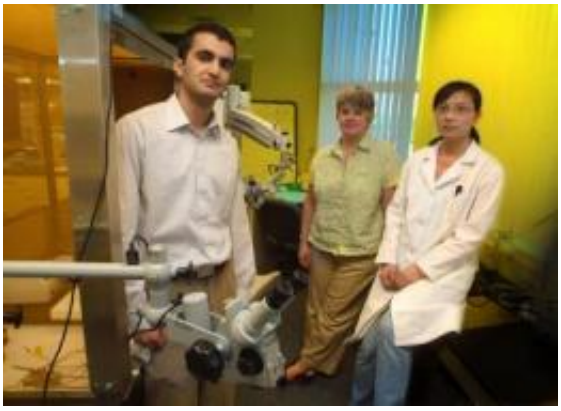
Age dramatically delays recovery of the sense of taste

April 21 2010



Arkadiy Yagdorov (from left) and Drs. Lynnette McCluskey and Lianying He from the Medical College of Georgia are finding new information about why recovery of the sense of taste following injury is delayed with age. Credit: Phil Jones, MCG campus photographer

Age dramatically delays the time if takes to recover the sense of taste following a significant nerve injury, Medical College of Georgia researchers said.

When old rats received nerve injuries similar to ones that can occur in ear or dental surgery, their taste buds took essentially twice as long to recover function as their younger counterparts, Dr. Lynnette McCluskey, neuroscientist in the MCG Schools of Graduate Studies and Medicine reported during the Association for Chemoreception Sciences annual

meeting April 21-25.

"This is probably something that has a huge quality-of-life impact," said McCluskey, who uses taste buds to study regeneration of sensory nerves that enable touch, vision and hearing as well as taste. Similar studies have shown that age only slightly delays recovery time for neurons that enable movement.

"We did not expect that much of a difference based on the literature for motor neurons so these changes are way more severe than anybody predicted," McCluskey said. "Now we need to find out why before we can start to address ways to improve it."

In younger rats, injury to the chorda tympani nerve, which innervates the front of the tongue, typically prompts an infusion of immune cells called neutrophils to the injury site as well as surrounding tissue. Short-term, the neutrophils, which are like a front-line demolition crew pulverizing tissue for removal, can actually hinder the function of nearby nerves. But soon a similar number of white blood cells called macrophages move in to call off the neutrophils and start cleaning things up. Within 45 days, the witherd taste bud is regenerated, the nerve has recovered and taste is intact. "The nerve grows back, stimulates those cells to regenerate and it hooks up perfectly," McCluskey said.

But older rats experience a much bigger invasion of neutrophils although McCluskey notes it doesn't seem to impact nearby nerve function as with younger rats. "That was better than we expected," she said. They also have proportionately fewer subsequent macrophages moving in which she suspects may be part of the reason for the significantly delayed recovery.

In a paper published this month in Neuroscience, she and co-authors suggest that a balanced response between neutrophils and macrophages

enhance recovery. In adult rats, they documented the usual, rapid neutrophil response at the immediate site of a taste system injury and in nearby tissue. When they blocked the neutrophil response, nearby nerve function was unaffected and when they increased neutrophils, it decreased function - at least initially - in injured and nearby uninjured nerves.

"It's a really tightly controlled interplay between these populations of neutrophils and macrophages. If you mess with it, you are going to change nerve function," McCluskey said. "Ultimately we have to look upstream at some of the adhesion molecules that get upregulated and tell neutrophils to come in."

She knows neutrophils are bad for nerve function when they are present but wants to determine if they have some lasting impact as well, particularly when there are a lot of them. She also wants to know why they are not nearly as mobile in the older rats.

Most old rats eventually recovered their sense of taste but not until at least 85 days after injury. Interestingly taste buds and nerves were present much earlier but apparently not functioning. "That was the really surprising part," McCluskey said. "We don't know if the nerve is completely normal in terms of morphology but it's there." The problem may be that the nerve and taste bud are slower to reconnect, so one of her follow-up studies will be looking at affected nerves as well as well as the form and function of axons, or arms, nerves use to reach out to another cell.

Several studies indicate that taste perception declines with age, even though taste bud numbers hold fairly steady. "People say things don't taste like they used to; they start putting on more salt," McCluskey said. Complicating factors may be a decreased sense of smell and medications that can alter taste.

Provided by Medical College of Georgia