RESEARCH EXPLAINS WHY HIGH FAT DIET COULD REDUCE BRAIN'S ABILITY TO REGULATE FOOD INTAKE

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The development of medicines for the condition may be aided by a better understanding of the brain's function and the intricate mechanisms that underlie overeating, a behaviour that can result in weight gain and obesity.

Because obesity is linked to an increased risk of cardiovascular illnesses and type 2 diabetes, it is a global public health concern. Around half of the adults in England are obese, and 63 per cent of those are regarded to be over a healthy weight. When they leave elementary school, one in three kids is obese.

Dr Kirsteen Browning, Penn State College of Medicine, US, said, "Calorie intake seems to be regulated in the short-term by astrocytes. We found that a brief exposure (three to five days) to a high fat/calorie diet has the greatest effect on astrocytes, triggering the normal signalling pathway to control the stomach. Over time, astrocytes seem to desensitise to highfat food. Around 10-14 days of eating a high fat/ calorie diet, astrocytes seem to fail to react and the brain's ability to regulate calorie intake seems to be lost. This disrupts the signalling to the stomach and delays how it empties."

Astrocytes initially react when high-fat/ calorie food is ingested. Their activation triggers the release of gliotransmitters, chemicals (including glutamate and ATP) that excite nerve cells and enable normal signalling pathways to stimulate neurons that control how the stomach works.

This ensures the stomach contracts correctly to fill and empty in response to food passing through the digestive system. When astrocytes are inhibited, the cascade is disrupted. The decrease in signalling chemicals leads to a delay in digestion because the stomach doesn't fill and empty appropriately.

The vigorous investigation used behavioural observation to monitor food intake in rats (N=205, 133 males, 72 females) which were fed a control or high fat/calorie diet for one, three, five or 14 days. This was combined with pharmacological and specialist genetic approaches (both in vivo and in vitro) to target distinct neural circuits. Enabling the researchers to specifically inhibit astrocytes in a particular region of the brainstem (the posterior part of the brain that connects the brain to the spinal cord), so they could assess how individual neurons behaved to studying rats' behaviour when awake.

Human studies will need to be carried out to confirm if the same mechanism occurs in humans. If this is the case, further testing will be required to assess if the mechanism could be safely targeted without disrupting other neural pathways.

The researchers have plans to further explore the mechanism. Dr Kirsteen Browning said, "We have yet to find out whether the loss of astrocyte activity and the signalling mechanism is the cause of overeating or that it occurs in response to the overeating. We are eager to find out whether it is possible to reactivate the brain's apparent lost ability to regulate calorie intake. If this is the case, it could lead to interventions to help restore calorie regulation in humans."