Earmuffs measure blood alcohol levels through the skin

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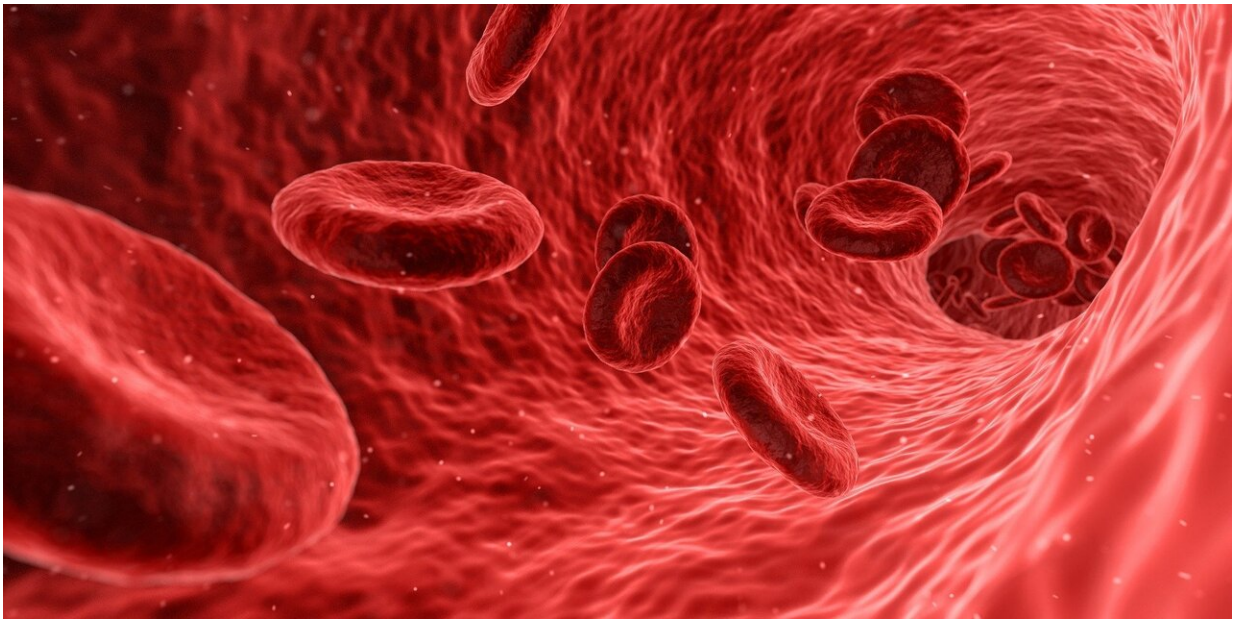

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A new device that fits over a person's ears and enables non-invasive measurement of real-time changes in blood alcohol levels through the skin is presented in a proof-of-principle study in *Scientific Reports*.

The device, devised by Kohji Mitsubayashi and colleagues, consists of a modified pair of commercial earmuffs that collect gas released through the skin of a person's ears, and an ethanol vapour sensor. If the sensor

detects ethanol vapour, it releases light, the intensity of which allows for ethanol concentrations to be calculated.

The authors used their device to continuously monitor ethanol vapour released through the ears of three male volunteers, who had consumed alcohol with a concentration of 0.4 g per kg body weight, for 140 minutes. The ethanol concentrations of the volunteers' breath were also measured at regular intervals using an additional ethanol vapour sensor and a device containing reagents that change colour when exposed to ethanol.

The authors observed that changes in the concentration of ethanol released through the ears and breath were similar over time for all volunteers. As previous research found that ethanol concentrations in the breath and blood are correlated, this indicates that the device could be used instead of a breathalyser to estimate blood alcohol levels. The average highest concentration of ethanol released through the ears was found to be 148 parts per billion, double the concentration previously reported to be released through the skin of the hand. Previous devices have used the hand to measure blood alcohol levels as a less invasive alternative to breath, as these devices do not require a tube to be inserted into the mouth. The findings suggest that the ears may be a more suitable location for this.

The authors propose that the device could be used to measure other gases released through the skin, for example in disease screening.

More information: External ears for non-invasive and stable monitoring of volatile organic compounds in human blood, *Scientific Reports* (2021). DOI: 10.1038/s41598-021-90146-1