



## Does noise pollution weaken the immune system?

**Excess noise** is a common cause of stress and its impact on health is a concern for environmental policy makers. An analysis of current research in this area raises the question of whether noise-induced stress could increase the likelihood of illness by weakening the immune system.

**The European Noise Directive**<sup>1</sup> requires Member States to draw up strategic noise maps to show the level of noise in specific areas. One aim of these maps is to assess the number of people exposed to a level of noise that causes annoyance and sleep-disturbance. This synthesis of current research examines the effects of noise exposure on the physiological systems of stress and the possible ways this might have an impact on the immune system.

Cortisol is a hormone that is involved in the body's response to stress and anxiety. It increases blood pressure and blood sugar, and reduces the ability of the immune system to respond to disease or injury. Previous research indicates that both ongoing and temporary exposure to noise can increase cortisol levels.

Traffic noise can cause an increase of stress hormones, including cortisol, in the body and these noise-induced effects can also occur during sleep. If noise exposure is repeated, the effects can develop into persistently raised levels of cortisol. Since cortisol levels can be easily detected in saliva, the study suggests that this could be a simple and cost-effective measure for analysing stress in response to noise.

However, the relationship between the amount of exposure to noise and cortisol levels is not as simple as may first appear. For example, high noise levels may act directly as a stressor, but the effects of low noise levels may depend on the meaning and disturbing nature of the noise, rather than its actual volume or persistence.

There is a natural cycle to cortisol levels in the body, with levels dropping at night-time. This can also be disturbed by noise, so that the natural decrease does not occur, causing prolonged stress during the night. This means that exposure to day-time noise could also contribute to sleep-disturbance through its after-effects; it may not be just night-time noise that affects sleep.

The complexity is increased further by individual differences. The author cites a study that investigated sleep-disturbance in rats exposed to chronic noise. The study found that the psychological and biological make-up of an individual rat may determine their vulnerability to noise. Further research with humans and general stress indicates there are two groups of people: "high reactors", who are significantly affected by stress and show an increase in heart rate and blood pressure, and "low reactors" who show little or no change in these areas.

Research into the impacts of stress on health has demonstrated that individuals exposed to general stress show an increase in infection rates (from 74 to 90 per cent) and clinical colds (27 to 48 per cent). Other health problems such as diabetes, stomach ulcers and plaque build-up in the arteries are also linked to stress. Since the physiological response to noise as a stressor is similar to the response to general stress it could be inferred that noise may affect health in the same way, possibly through the immune system. However, a direct link between noise exposure and negative effects on the immune system is yet to be fully investigated.

1. See <http://ec.europa.eu/environment/noise/directive.htm>

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