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# Antibiotics may act as growth/obesity promoters in humans as an inadvertent result of antibiotic pollution?

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**Summary** The growth promoting effects of antibiotics were first discovered in the 1940s. Since then, many antimicrobials have been found to improve average daily weight gain and feed efficiency. The total production of antibiotics can be estimated between 100,000–200,000 tons annually and the human population is being influenced, directly or indirectly (from the environment) by this amount of drug. The twentieth-century increase in human height and the obesity of the population is roughly observed since the mass consumption of antibiotics 40–50 years ago. The association between antibiotic consumption and the increase of human growth/obesity is suspected.


For more than 50 years, physicians worldwide considered antibiotics as rapid and effective management of many of the most common infection of the most common conditions. By 1954, two million pounds of antibiotics were manufactured annually in the US, but this figure climbed dramatically to 50 million pounds today [1]. In 1996, about 10,200 tons of antibiotics were produced by EU countries of which 50% was applied in veterinary medicine and as growth promoters in animals [2]. The growth promoting effects of antibiotics were first discovered in the 1940s. Since then, many antimicrobials have been found to improve average daily weight gain and feed efficiency. According to data supplied by the European Federation of Animal Health (FEDESA), in 1999, 13,288 tons of antibiotics were used in the EU and in Switzerland, of which 65% was used in humans, 29% was used in the veterinary and 6% as growth promoters [3]. In the US about 16,200 tons were produced in 2000 of which 70% was used in livestock farming. This is eight times the amount used in human medicine [4]. It is estimated, that total antibiotic market consumption world-wide to lie between 100,000 and 200,000 tons [5].

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Prophylactic use of antibiotics in animals, where mass flock exposure to antibiotics is used to prevent an epidemic and serve as growth promoters as well certainly affects antibiotic resistance. The European Union has recently banned the antibiotic *growth promoters* like avoparcin, virginiamycin, tylosin and spiramycin. The results later showed that phasing out of animal growth promoters in Denmark did not have any major effect on animal health [6,7].

Antibiotic use and antibiotic resistance are clearly connected and thoroughly analyzed, but recent publications debate the usefulness of phasing out antibiotics from animal fodder and drinking water, doubting the relationship between antibiotic consumption in animals and the development of antibiotic resistance in humans [8–12].

Unused therapeutic drugs are sometimes deposed of into the sewage system. If the drugs are not degraded or eliminated during sewage treatment, in soil or in other environmental compartments, they will reach surface water and ground water, and, potentially, drinking water. Unmetabolized antibiotic substances are often passed into the aquatic environment and wastewater. Antibiotics used for veterinary purposes or as growth promoters are excreted by the animals and end up in manure. Manure is used as an agricultural fertilizer, and the antibiotics filter through the soil and enter ground water. However, very little is known about occurrence, fate and risk associated with antibiotics entering the environment after being used in human and veterinary medicine and as growth promoters [13].

The extensive use of antibiotics throughout the World, may raise the possibility, that the tons of the antibiotics consumed either as therapeutics in humans and animals, or growth promoters mixed to animal fodder, might have a different effect on the mankind, not only promoting antibiotic resistance, but influencing human growth and possible obesity as well. The mechanism of the growth promoting effect is supposedly associated with the inhibition of the gut flora of the animals by the antibiotics [14], but the exact mechanism has not been clearly elucidated. Due to the permanent antibiotic load from the environment and the human consumption, similar interference can develop in the human intestine also, without any major clinical syndrome and as a consequence similar ''growth promoting'' effect can develop in humans also.

Official Japanese statistics report, that since the beginning of the twentieth century the average standing height of Japanese boys aged 6, 12, and 18 years in 1981–85 was about 10 cm greater than boys of the same age, in 1901–1910, which phenomenon can not be explained only by nutritional changes [15]. Similar changes were observed in other countries also [16]. Even babies are getting bigger and this feature is attributed to socio-demographic factors [17], but can we totally disregard the ''growth promoting'' effect of the antibiotics? One might be aware that human growth is influenced by several circumstances, factors, but this suspected association might warrant further researches. To prove the hypothesis, direct human experiments can not be conducted, but if we can agree, that vast animal ''trials'' proved the growth promoting effect of the antibiotics, we can not disregard the possibility of similar consequences in humans as well.

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