

# Tattoos Associated with Increased Risk of Lymphoma

Mass Mimesis of Green Ink May Not be Safe Long Term

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*As summertime approaches, one cannot help but notice the every increasing appearance of visible tattoos, mainly in forest green ink. Unlike tie-dye shirts, bell-bottoms, new hairstyles and other fads, tattoos represent a permanent form of mass mimicry or mimesis. Most people with tattoos give less than a compelling reason for this life-long commitment.*

The skin is loaded with lymphocytes and one can only wonder does the ink or one of its chemical components stimulate these cells to become cancerous. After multiple individual case reports of lymphoma in tattoo enthusiasts, Nielsen et al has published this disturbing report from Lund, Sweden.

"The study population consisted of 11,905 individuals, and the response rate was 54% among cases ( $n = 1398$ ) and 47% among controls ( $n = 4193$ ). The tattoo prevalence was 21% among cases and 18% among controls. Tattooed individuals had a higher adjusted risk of overall lymphoma (IRR = 1.21; 95% CI 0.99-1.48). The risk of lymphoma was highest in individuals with less than two years between their first tattoo and the index year (IRR = 1.81; 95% CI 1.03-3.20). The risk decreased with intermediate exposure duration (three to ten years) but increased again in individuals who received their first tattoo  $\geq 11$  years before the index year (IRR = 1.19; 95% CI 0.94-1.50). We found no evidence of increasing risk with a larger area of total tattooed body surface. The risk associated with tattoo exposure seemed to be highest for diffuse large B-cell lymphoma (IRR 1.30; 95% CI 0.99-1.71) and follicular lymphoma (IRR 1.29; 95% CI 0.92-1.82)."

# Tattoos as a risk factor for malignant lymphoma: a population-based case-control study

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## Summary

**Background** The popularity of tattoos has increased dramatically over the last few decades. Tattoo ink often contains carcinogenic chemicals, e.g., primary aromatic amines, polycyclic aromatic hydrocarbons, and metals. The tattooing process invokes an immunologic response that causes translocation of tattoo ink from the injection site. Deposition of tattoo pigment in lymph nodes has been confirmed but the long-term health effects remain unexplored. We used Swedish National Authority Registers with full population coverage to investigate the association between tattoo exposure and overall malignant lymphoma as well as lymphoma subtypes.

**Methods** We performed a case-control study where we identified all incident cases of malignant lymphoma diagnosed between 2007 and 2017 in individuals aged 20–60 years in the Swedish National Cancer Register. Three random age- and sex-matched controls per case were sampled from the Total Population Register using incidence density sampling. We assessed exposure through a questionnaire in 2021, and data on potential confounders were retrieved from registers. We used multivariable logistic regression to estimate the incidence rate ratio (IRR) of malignant lymphoma in tattooed individuals.

**Findings** The study population consisted of 11,905 individuals, and the response rate was 54% among cases ( $n = 1398$ ) and 47% among controls ( $n = 4193$ ). The tattoo prevalence was 21% among cases and 18% among controls. Tattooed individuals had a higher adjusted risk of overall lymphoma (IRR = 1.21; 95% CI 0.99–1.48). The risk of lymphoma was highest in individuals with less than two years between their first tattoo and the index year (IRR = 1.81; 95% CI 1.03–3.20). The risk decreased with intermediate exposure duration (three to ten years) but increased again in individuals who received their first tattoo  $\geq 11$  years before the index year (IRR = 1.19; 95% CI 0.94–1.50). We found no evidence of increasing risk with a larger area of total tattooed body surface. The risk associated with tattoo exposure seemed to be highest for diffuse large B-cell lymphoma (IRR 1.30; 95% CI 0.99–1.71) and follicular lymphoma (IRR 1.29; 95% CI 0.92–1.82).

**Interpretation** Our findings suggested that tattoo exposure was associated with an increased risk of malignant lymphoma. More epidemiologic research is urgently needed to establish causality.

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For those who made the potentially unwise choice of a tattoo, these data suggest active surveillance for new persistent rashes, fever, night sweats, recurrent viral illness, or swollen lymph nodes as signs of incipient lymphoma.

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