

Low selenium status increases the risk of hepatic cancer

Study



Study with participation of the Charité
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In a press statement issued in July (N° 245), the WHO presented the latest findings with regard to selenium status and cancer risk. A large-scale prospective European trial investigated the impact of the selenium status on the hepatic cancer risk.^[1]

The trial delivers two important findings:

1. The selenium status of Europeans is suboptimal.
2. A lower selenium level ($\leq 80.5 \mu\text{g/l}$ selenium in the serum) is associated with a significantly higher risk of hepatic cancer.

Apart from hepatitis, alcohol or aflatoxins, a suboptimal selenium status would be an additional risk factor for hepatic cancer.

Hepatic cancer

In 2012, there were approx. 782,000 new cases of hepatic cancer worldwide. Almost 746,000 of those afflicted with hepatic cancer died from the disease in 2012. This represents 9.1 % of all deaths caused by cancer in 2012. Hepatic cancer is thereby the second most frequent cause of death from cancer. In the EU, 52,000 new hepatic cancer cases occurred in 2012 and 49,000 of all afflicted with the disease died. The prognosis of hepatic cancer is very poor with a total relationship of mortality to incidence of 0.95.^[2]

EPIC

EPIC (European Prospective Investigation into Cancer and Nutrition) is a large-scale prospective cohort trial with more than 520,000 participants from ten European countries. For the embedded case control study, the selenium status of 261 cancer cases was prospectively compared with 261 controls.^[1] In addition, the serum selenium and the selenoprotein P concentration was investigated.

The case group included 121 patients with hepatocellular carcinoma (HCC), 100 patients with gallbladder and hepatic duct cancer (GBTC) as well as 40 with intrahepatic bile duct cancer (IHBC).

Significantly lower selenium status with hepatic cancer

Patients with HCC and GBTC showed significantly lower serum selenium values (HCC: 71.3 vs. 85.2 $\mu\text{g/l}$; $p < 0.001$; GBTC 82.1 vs. 85.9; $p = 0.041$).^[1] For selenoprotein P, the transport protein for selenium, a significant difference to the control group could only be demonstrated for HCC (4.3 vs. 5.4 mg/l ; $p < 0.001$). In total, there was a strong significant correlation between the serum concentration of selenium and selenoprotein P ($r = 0.62$; $p \leq 0.001$).

Suboptimal selenium status increases hepatic cancer risk almost tenfold

The comparison between a serum selenium concentration of $\leq 80.5 \mu\text{g/l}$ and $\geq 94.5 \mu\text{g/l}$ showed a significant reduction of the relative risk for HCC by 82 % (OR 0.18; 95 % CI 0.05–0.66; $p = 0.016$). This means that an increase of the serum selenium value by 20 $\mu\text{g/l}$ reduces the HCC risk by 59 % (OR 0.41; 95 % CI 0.23–0.72). Even more significant is the relationship for selenium transport protein selenoprotein P. A suboptimal selenoprotein P concentration increased the hepatic cancer risk tenfold ($\leq 4.9 \text{mg/l}$ vs. $\geq 6.4 \text{mg/l}$: OR 0.09; 95 % CI 0.03–0.32; $p < 0.0001$).

Suboptimal selenium status – selenium deficiency

The classification of the selenium status into tertiles ($\leq 80.5 \mu\text{g/l}$ vs. $80.6–94.4 \mu\text{g/l}$; $\geq 94.5 \mu\text{g/l}$ serum selenium concentration) significantly shows that no massive selenium deficiency must be present for an increased cancer risk. At the same time, a significantly improved protection is only achieved at a serum selenium concentration of $\geq 94.5 \mu\text{g/l}$ (Table 1).

The reference range for selenium in Germany lies between $80–120 \mu\text{g/l}$ selenium in the serum.^[3] A selenium deficiency in the serum begins at values below $80 \mu\text{g/l}$. The selenium status for Germans on the average lies even lower (men $74.3 \mu\text{g/l}$, women $73.2 \mu\text{g/l}$ selenium in the serum).^[4] However a reduction of hepatic cancer risk can be expected only at serum selenium concentrations in the upper reference range.

Association between selenium status and hepatic cancer risk			
Serum selenium concentration	HCC OR (95% CI)	Selenoprotein P-concentration	HCC OR (95% CI)
$\leq 80.5 \mu\text{g/l}$	Reference	$\leq 4.9 \text{ mg/l}$	Reference
$80.6–94.4 \mu\text{g/l}$	0.88 (0.35–2.21)	$5–6.3 \text{ mg/l}$	0.43 (0.18–0.99)
$\geq 94.5 \mu\text{g/l}$	0.18 (0.05–0.66)	$\geq 6.4 \text{ mg/l}$	0.09 (0.03–0.32)
p-trend	0.016	p-trend	<0.0001
per $20 \mu\text{g/l}$	0.41 (0.23–0.72)	per 1.5 mg/l	0.37 (0.21–0.63)

Hughes DJ et al. Am J Clin Nutr. 2016 Aug; 104(2): 406-14. [Prediagnostic selenium status and hepatobiliary cancer risk in the European Prospective Investigation into Cancer and Nutrition cohort.](#)

Table 1

Bibliography

1. Hughes DJ et al. Am J Clin Nutr. 2016 Aug; 104(2): 406-14. [Prediagnostic selenium status and hepatobiliary cancer risk in the European Prospective Investigation into Cancer and Nutrition cohort.](#)
2. Ferlay J et al. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. (2013).
3. [Prescribing information selenase®](#), biosyn Arzneimittel GmbH, as of Nov. 2012.
4. Hughes DJ et al. Int J Cancer. 2015 Mar 1; 136(5): 1149-61. [Selenium status is associated with colorectal cancer risk in the European prospective investigation of cancer and nutrition cohort.](#)

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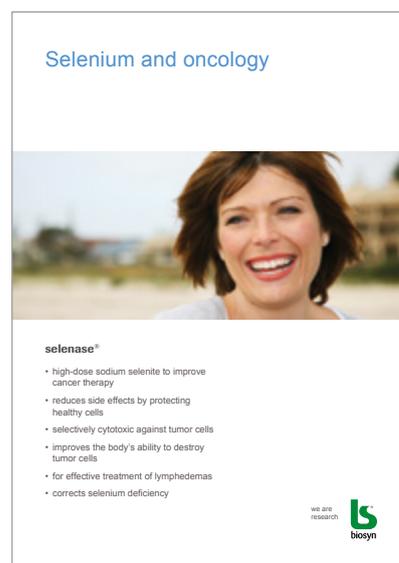
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