

Horizontaler Gentransfer

Bei Prokaryonten (Bakterien und Archäen) ist der horizontale Gentransfer die Regel, sozusagen das Tagesgeschäft.

Bei Eukaryonten (den zellkernhaltigen Lebewesen; Pflanzen, Tieren, Pilzen) ist der horizontale Gentransfer in der Regel nur unter erschwerten Bedingungen (z.B. Genbeschuss) möglich. Die dadurch entstandenen Chimären sind in der Regel weniger stabil. Sie sind weniger lebensfähig als das Original. Mehrere Ausnahmen aber sind bekannt: der horizontale Gentransfer bei Fadenwürmern, bei Taufiegen, bei einer Art von Rädertieren und im Zusammenhang mit Pflanzen, Tieren und Pilzen. Im Medizinbetrieb werden entsprechende Ereignisse umschrieben mit: Memory Zellen, Autoimmun-Krankheiten, Tumore und [Krebsstammzellen](#).

Makroskopisch führt ein horizontaler Gentransfer bei Eukaryonten in der Regel zu einer Störung des Zusammenhalts, zu Kohärenz-Problemen, zu Entzündungsreaktionen, zu Krankheit und zur Aktivierung von Reparaturmechanismen, im günstigsten Fall zu einem neuen Gleichgewicht (einer neuen Insel der Ruhe), zu Veränderungen im physischen und psychischen Gleichgewicht, im günstigsten Fall z.B. in dem erhofften Effekt bei aktiven Impfungen zu einer neuen Immunitätslage.

Einer der zahlreichen Ordnungsmechanismen ist der [Methylzyklus](#). Der Methylzyklus schaltet Fremd-Gene stumm.

In prokaryotes (bacteria and archaea) horizontal gene transfer is the rule, so to speak, the daily business.

In eukaryotes (the nucleated beings; plants, animals, fungi) horizontal gene transfer regularly is possible usually under difficult conditions only (e.g. gene-bombardment). The resulting chimeras are in generally less stable. They are less viable than their original. At least three suspected exceptions are still known: the horizontal gene transfer in nematodes, fruit flies, in a species of rotifers and seen only in connection with eukaryotes. Medically such events are denoted by the following transcriptions: memory cells, autoimmune diseases, tumors, [cancer stem cells](#).

Macroscopically, horizontal gene transfer usually leads in eukaryotes to a disruption of cohesion, coherence problems, inflammatory reactions, resulting to disease and activation of repair mechanisms and, at best, to a new equilibrium („island of calm“) with changes in the physical and mental behaviors, to immunity, for example in an active vaccination to the hoped immunization.

One of the numerous mechanisms of discipline is the methyl cycle. The [methyl cycle](#) switches foreign genes silent.

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“Our findings suggest that natural genetic exchange of DNA from dead and even extinct organisms to contemporary bacteria can take place over hundreds of thousands of years. Hence damaged and degraded DNA may be a previous unrecognized driver of bacterial evolution with implications for evolutionary theory.”

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“Yet gene-acquisition rates in *B. burgdorferi* s.l. are among the lowest in bacterial pathogens, resulting in high genome stability and few lineage-specific genes. Genome adaptation of *B. burgdorferi* s.l. is driven predominantly by copy-number and sequence variations of lipoprotein genes. New genomic groups are likely to emerge if the current trend of *B. burgdorferi* s.l. population expansion continues.”

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« Our work demonstrates that a family of horizontally acquired toxins honed to mediate interbacterial antagonism confers previously undescribed antibacterial capacity to eukaryotes. We speculate that the selective pressure imposed by competition between bacteria has produced a reservoir of genes encoding diverse antimicrobial functions that are tailored for co-option by eukaryotic innate immune systems. Eukaryotes can acquire new functions through the exchange of genetic material with other domains of life. »

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„It seems that the entire history of life is an incessant game of tug-of-war between such mobile genetic elements (MGEs) and their cellular hosts. MGEs pervade the biosphere. In all studied habitats, from the oceans to soil to the human intestine, the number of detectable virus particles, primarily bacteriophages, exceeds the number of cells at least tenfold, and maybe much more. Furthermore, MGEs and their remnants constitute large portions of many organisms' genomes—as much as two-thirds of the human genome and up to 90 percent in plants such as corn ».

Crisp A et al. (2015) **Expression of multiple horizontally acquired genes is a hallmark of both vertebrate and invertebrate genomes.** doi:10.1186/s13059-015-0607-3, Genome Biology. 16, 50 <http://genomebiology.com/2015/16/1/50>

„We argue that HGT has occurred, and continues to occur, on a previously unsuspected scale in metazoans and is likely to have contributed to biochemical diversification during animal evolution.“

Crisp A et al. (2015) **Expression of multiple horizontally acquired genes is a hallmark of both vertebrate and invertebrate genomes.** *Genome Biol*, 16, 50.

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[Chrostek E](#), [Pelz-Stelinski K](#), [Hurst GDD](#), [Hughes GL](#) (2017) **Horizontal Transmission of Intracellular Insect Symbionts via Plants.** *Front Microbiol*. 8, 2237. doi: 10.3389/fmicb.2017.02237. eCollection 2017. <https://www.ncbi.nlm.nih.gov/pubmed/29234308> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5712413/>

„Transmission of symbionts through plants likely represents an underappreciated means of infection, both in terms of symbiont epidemiology and the movement of symbionts to new host species.“

Bernard Q, Smith AA, Yang X, Koci J, Foor SD, Cramer SD, Zhuang X, Dwyer JE, Lin YP, Mongodin EF, Marques A, Leong JM, Anguita J, Pal U (2018) **Plasticity in early immune evasion strategies of a bacterial pathogen.** *Proc Natl Acad Sci U S A*. pii: 201718595. doi:10.1073/pnas.1718595115. <https://doi.org/10.1073/pnas.1718595115>

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“We also discovered a remarkable plasticity in BBA57-mediated spirochete immune evasion strategy because its loss, although resulting in near clearance of pathogens at the inoculum site, triggers nonheritable adaptive changes that exclude detectable nucleotide alterations in the genome but incorporate transcriptional reprogramming events. Understanding the malleability in spirochetal immune evasion mechanisms that ensures their host persistence is critical for the development of novel therapeutic and preventive approaches to combat long-term infections like Lyme borreliosis.”

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http://www.xerlebnishaft.de/borrel_inflam_lymphom_neopl.pdf

➔ **Biogene Amine und Peptide** <http://www.kabilahsystems.de/biogeneamineundpeptide.pdf>

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