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Natural GMOs: a history of research

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"*Agrobacterium*" — mediated transformation underlies the production of most modern lines of transgenic plants. At the same time, in nature, plants are described that have been transformed by "*Agrobacterium*" without human intervention. They are called natural GMOs.

Such plants were first described by White in 1983 [1] within the genus *Nicotiana* L., and the phenomenon of horizontal gene transfer from "*Agrobacterium*" to plants was considered unique for representatives of this genus for a long time. Only in 2012, another genus of natural GMOs was found. It was *Linaria* Mill. In 2019, the list of species of natural GMOs was increased by an order of magnitude and is constantly updated until now [2].

Several stages can be identified in the history of natural GMO research: 1. Description of individual examples of natural GMOs. 2. Estimation of the frequency of the horizontal gene transfer from "*Agrobacterium*" to plants based on the analysis of NGS data. 3. Description of the diversity of cT-DNA in terms of composition and copy number [3]. 4. Studies of the functions of individual pGMO genes [4]. 5. Phylogenetic studies of natural GMOs [5].

During the analysis of cT-DNA of natural GMOs, it became clear that they differ in the composition and intactness of transgenes, which can be interpreted from the point of view of the lack of a common function in all cT-DNAs. Genes that were not previously found in known "*Agrobacterium*" strains, are identifiedIn cT-DNAs, indicating a greater biodiversity of "*Agrobacterium*" than previously thought [2]. Many cT-DNA genes are intact and expressed. For some it was possible to identify products [4]. All these discoveries lead us to understanding of the role of horizontal gene transfer from "*Agrobacterium*" to plants during their evolution.

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