基因改造飼料原料用於家畜禽的普及與影響

美國穀物協會 駐臺代表張學義 譯

原作者：A. L. Van Eenennaam 與 A. E. Young
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摘要：就全球來看，食用家畜禽消耗 70%至 90%的基因改造（genetically engineered，簡稱為 GE）農作物。本文摘要總結有關家畜禽攝食含有基因改造農作物原料及由基因改造衍生品配製的飼料對於該家畜禽的生長與健康的科學文獻。它還探討以基因改造農作物飼料餵飼商業畜群的現場經驗，並論及基因改造和非基因改造飼料的全球貿易供應情況。大量的實驗研究一致顯示，餵飼基因改造農作物飼料的動物的性能和健康都與餵飼等同基因之非基因改造農作物飼料的動物的性能和健康一致。美國畜牧產業每年生產超過 90 億隻食用家畜禽，而 95%以上的這些家畜禽的飼料含有基因改造農作物原料。由公開管道收集自 1983 年起之家畜禽生產力和健康之數據，早於基因改造農作物被引進種植之 1996 年，隨後延續到 2011 年，亦即是基因改造農作物飼料被大量使用的期間。這些代表超過一千億隻家畜禽的數據，在採用基因改造農作物飼料之後在家畜健康和生產力方面並沒有顯示不利或擾亂的趨勢。沒有研究顯示餵飼基因改造農作物飼料畜禽產品的營養價值有任何差異。因為去氧核醣核酸(DNA)和蛋白質都是被消化膳食的正常成分，在攝食基因改造農作物飼料之後，在奶、肉、蛋中沒有可檢測的或可計量的微量的基因改造成分。就全球來看，栽培基因改造玉米和大豆的國家是主要的家畜禽飼料出口國。監管之非同步核准（Asynchronous regulatory approvals，即基因改造農作物在出口國種植的核准，係在進口國同意用於食品和飼料的核准之前）已擾亂到貿易。這在未來可能
會日益成為問題，因為有不少具有改變產出性狀(output traits)可用以改進家畜禽飼料的“第二代”基因改造農作物正處於開發和申請核准的階段。此外，能改造標靶基因組的先進技術逐漸出現，而且目前尚不清楚這些技術是否屬於當前基因改造監管所涵蓋的範圍或是否會造成監管的疏失。在基因改造農作物的監管架構和先進育種技術的管理都急需國際協調一致，以避免畜禽飼料原料國際貿易的紛擾在今後日益擴大。

Prevalence and impacts of genetically engineered feedstuffs on livestock populations

Van Eenennaam AL, Young AE.
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Abstract: Globally, food-producing animals consume 70 to 90% of genetically engineered (GE) crop biomass. This review briefly summarizes the scientific literature on performance and health of animals consuming feed containing GE ingredients and composition of products derived from them. It also discusses the field experience of feeding GE feed sources to commercial livestock populations and summarizes the suppliers of GE and non-GE animal feed in global trade. Numerous experimental studies have consistently revealed that the performance and health of GE-fed animals are comparable with those fed isogenic non-GE crop lines. United States animal agriculture produces over 9 billion food-producing animals annually, and more than 95% of these animals consume feed containing GE ingredients. Data on livestock productivity and health were collated from publicly available sources from 1983, before the introduction of GE crops in 1996, and subsequently through 2011, a period with high levels of predominately GE animal feed. These field data sets representing over 100 billion animals following the introduction of GE crops did not reveal unfavorable or perturbed trends in livestock health and productivity. No study has revealed any differences in the nutritional profile of animal products derived from GE-fed animals. Because DNA and protein are normal components of the diet that are digested, there are no detectable or reliably quantifiable traces of GE components in milk, meat, and eggs following consumption of GE feed. Globally, countries that are cultivating GE corn and soy are the major livestock feed exporters. Asynchronous regulatory approvals (i.e., cultivation approvals of GE varieties in exporting countries occurring before food and feed approvals in importing countries) have resulted in trade disruptions. This is likely to be increasingly problematic in the future as there are a large number of “second generation” GE crops with altered output traits for improved livestock feed in the development and regulatory pipeline. Additionally, advanced techniques to affect targeted genome modifications are emerging, and it is not clear whether these will be encompassed by the current GE process-based trigger for regulatory oversight. There is a pressing need for international harmonization of both regulatory frameworks for GE crops and governance of advanced breeding techniques to prevent widespread disruptions in international trade of livestock feedstuffs in the future.