APPLICATIONS OF CRISPR/CAS9 IN LIVESTOCK: REVIEW AND SUCCESSFUL CASE STUDIES

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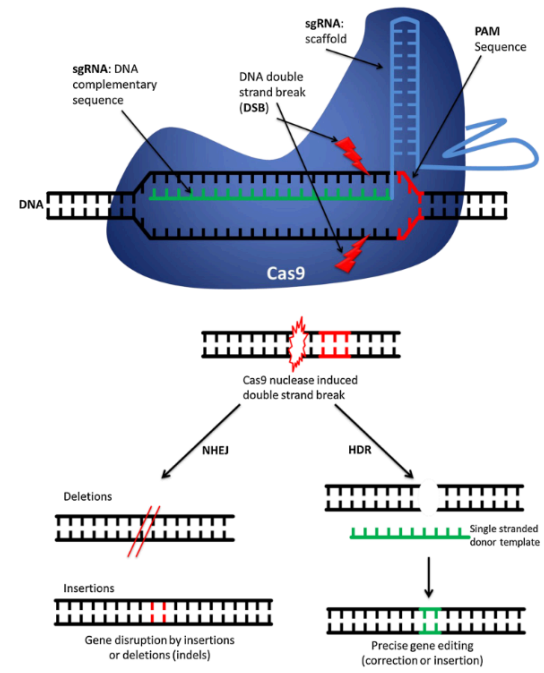
OBJECTIVES

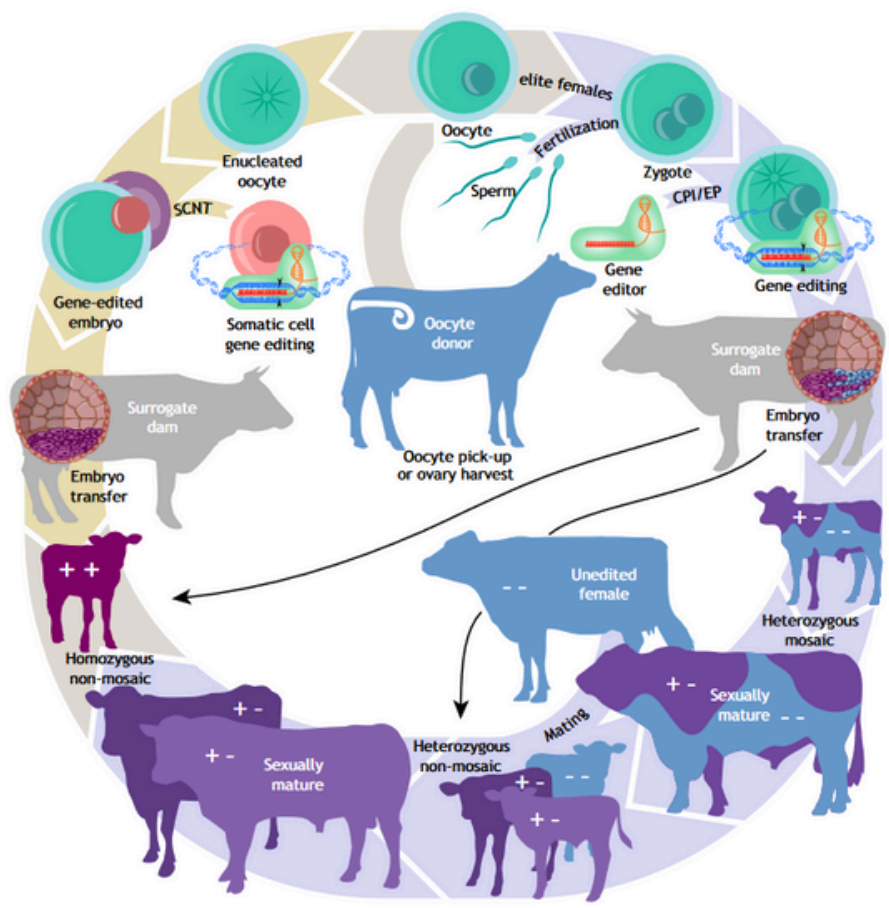
- Bibliographic review of CRISPR/Cas9.
- Introduce different methods of CRISPR/Cas9 in animals.
- Examples of successful cases in livestock.



- The Cas9 protein binds to the sgRNA scaffold.
- The presence of sgRNA and PAM leads to a DSB by Cas9 protein.
- Repair mechanisms are activated: NHEJ (non-homologous end joining) or homology-directed repair (HDR).

Source: Application of CRISPR/Cas9 genome editing to the study and treatment of disease, by Pellagatti et al. (2015)

DELIVERY SISTEMS: SCNT - CPI



Source: Genome editing with somatic cell nuclear transfer (SCNT) and zygoe editing (cytoplasmic injection, CI) from Bishop & Van Eenennaam (2020)

SUCCESSFUL CASE STUDIES

PRODUCTION

Gene	Species	Phenotype
Myostatin KO	Ruminants, porcine	Muscle growth
FGF5 + Myostatin KO	Cashmere goats	Hair growth
ASIP	Chinese merino sheep	Wool coloration
BLG	Goats	Milk allergens

HANDLING

Polledness	Cattle	Horns growth

DISEASE RESISTANCE

Gene	Species	Disease
CD163	Porcine	PRSSV
Aminopeptidase N	Porcine	PEDV + TGEV + PDCoV
NRAMP1	Cattle	Tuberculosis

XENOTRANSPLANTATION AND ANIMAL MODELS

α1,3,GT + CMAH + B4GALNT2	Porcine	Immune rejection
Alb	Porcine	Human albumin

CONCLUSION

- Improving productive and reproductive traits.
- Animal welfare.
- Ethics repercussions.
- Public perception and acceptance of consuming products from genetically modified animals.