بسم الله الرحمن الرحيم

Polymorphisms and RFLPs

By

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Revision: Prokaryotic Gene Expression and Recombinant Protein Production

- Production of Recombinant DNA
- Bacterial transformation
- Screening for target clone
- Prokaryotic gene expression protocol
- Uses of recombinant proteins

Objectives: Polymorphisms and RFLPs

- Polymorphisms Vs mutations
- RFLPs
- Single nucleotide polymorphisms (SNPs)
- Variable number tandem repeat (VNTR)
- Medical applications

Background information: Definitions

Alleles:

Different forms of the same gene on a specific locus

Genotype:

The set of alleles that make up the genetic constitution

Phenotype:

The observable expression of a genotype

Polymorphisms Vs Mutations

Genetic polymorphisms:

Common alleles > 1%

Mutations:

Rare alleles < 1%

Polymorphisms: Sites

Inter-genes or intronic:

Detected by DNA sequence analysis

Gene coding sequences:

Different protein variants

Distinct phenotypes (may be)

DNA regulatory regions:

may affect phenotypes

Polymorphisms: Detection At DNA level

- DNA sequence analysis
- Restriction fragment length polymorphisms (RFLPs):

  Inherited variations in DNA sequences

  ↓ Restriction enzyme

  Different sizes of DNA fragments

RFLPs: Causes

Single nucleotide polymorphisms (SNPs):

Gain or loss of a restriction site

more frequent than VNTR

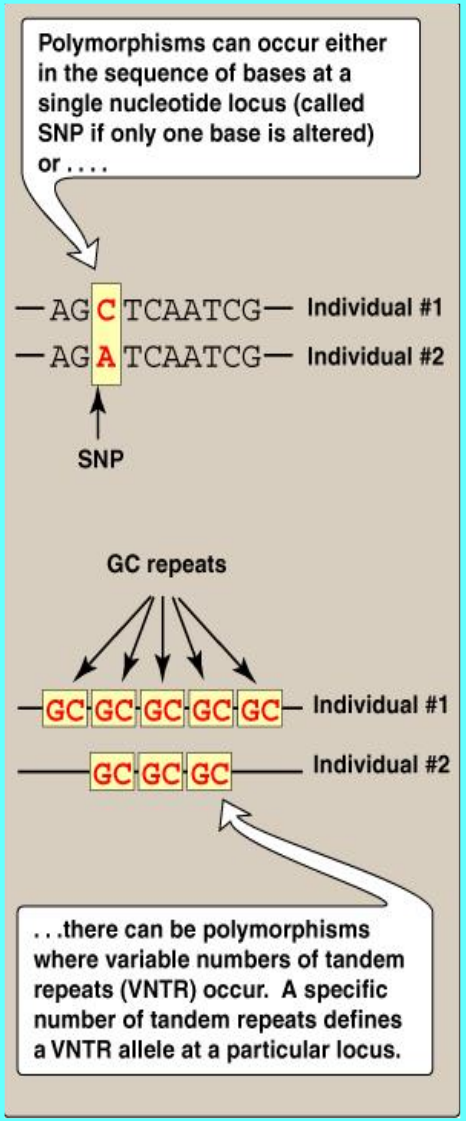
Variable number tandem repeat (VNTR):

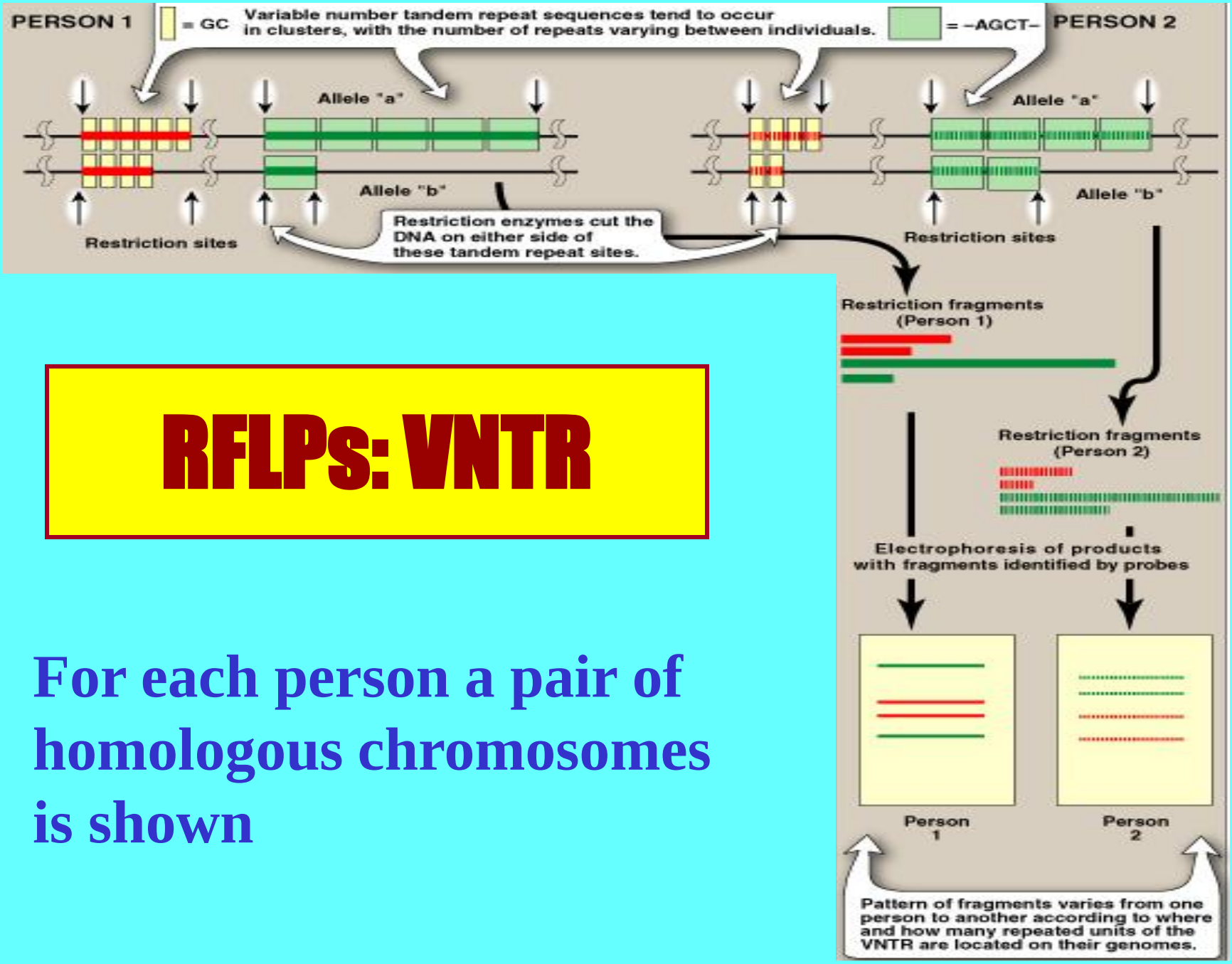
Alteration of number of nucleotides between restriction sites:

2 unrelated individuals: different pattern

Identical twins: identical pattern

SNP and VNTR


Polymorphisms can occur either in the sequence of bases at a single nucleotide locus (called SNP if only one base is altered) or . . . .
AGCTCAATCG
Individual #1
AGATCAATCG
Individual #2
SNP
GC repeats
GC GC GC GC GC
Individual #1
GC GC GC
Individual #2
. . .there can be polymorphisms where variable numbers of tandem repeats (VNTR) occur. A specific number of tandem repeats defines a VNTR allele at a particular locus.



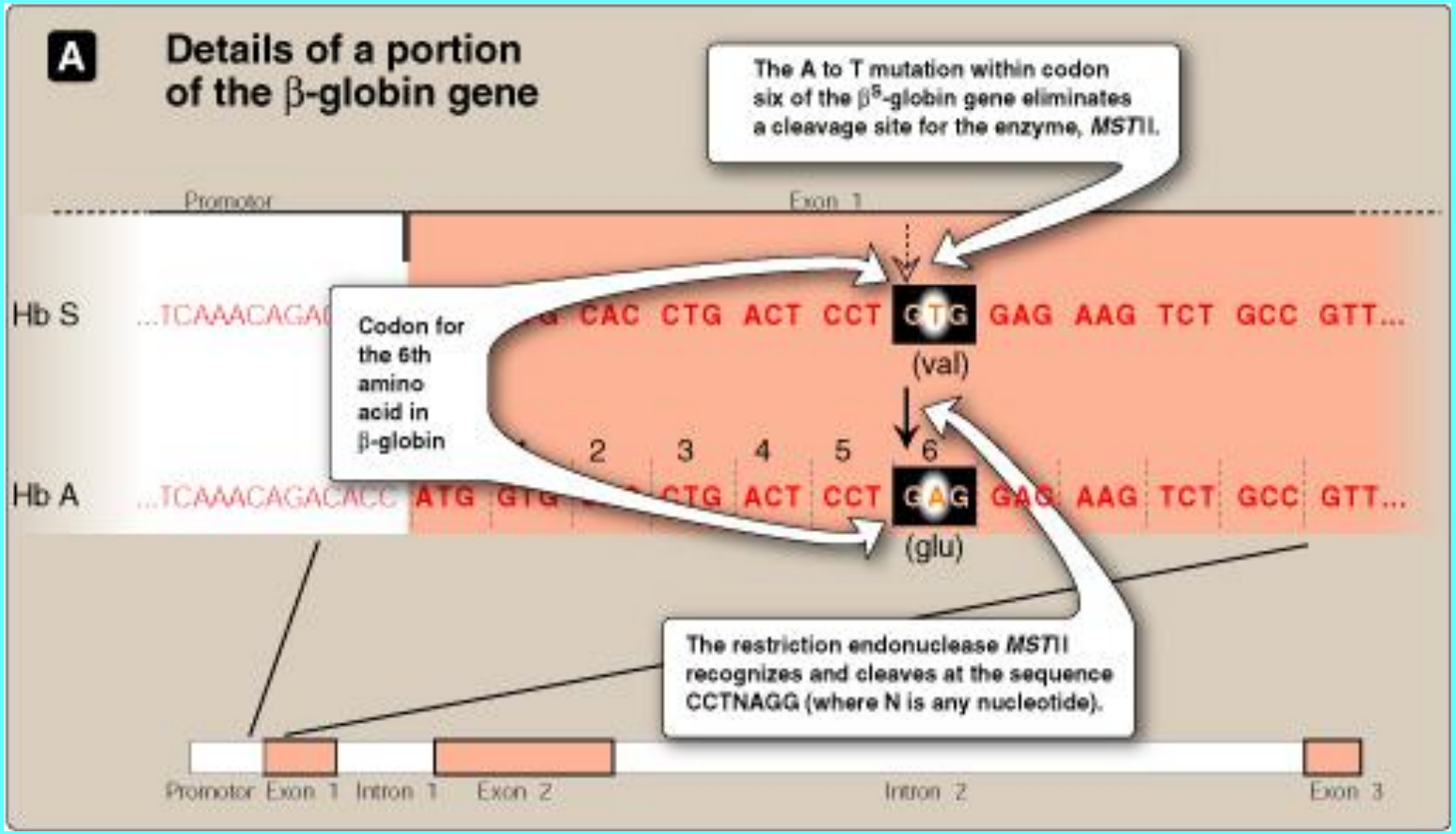
RFLPs: VNTR

For each person a pair of homologous chromosomes is shown

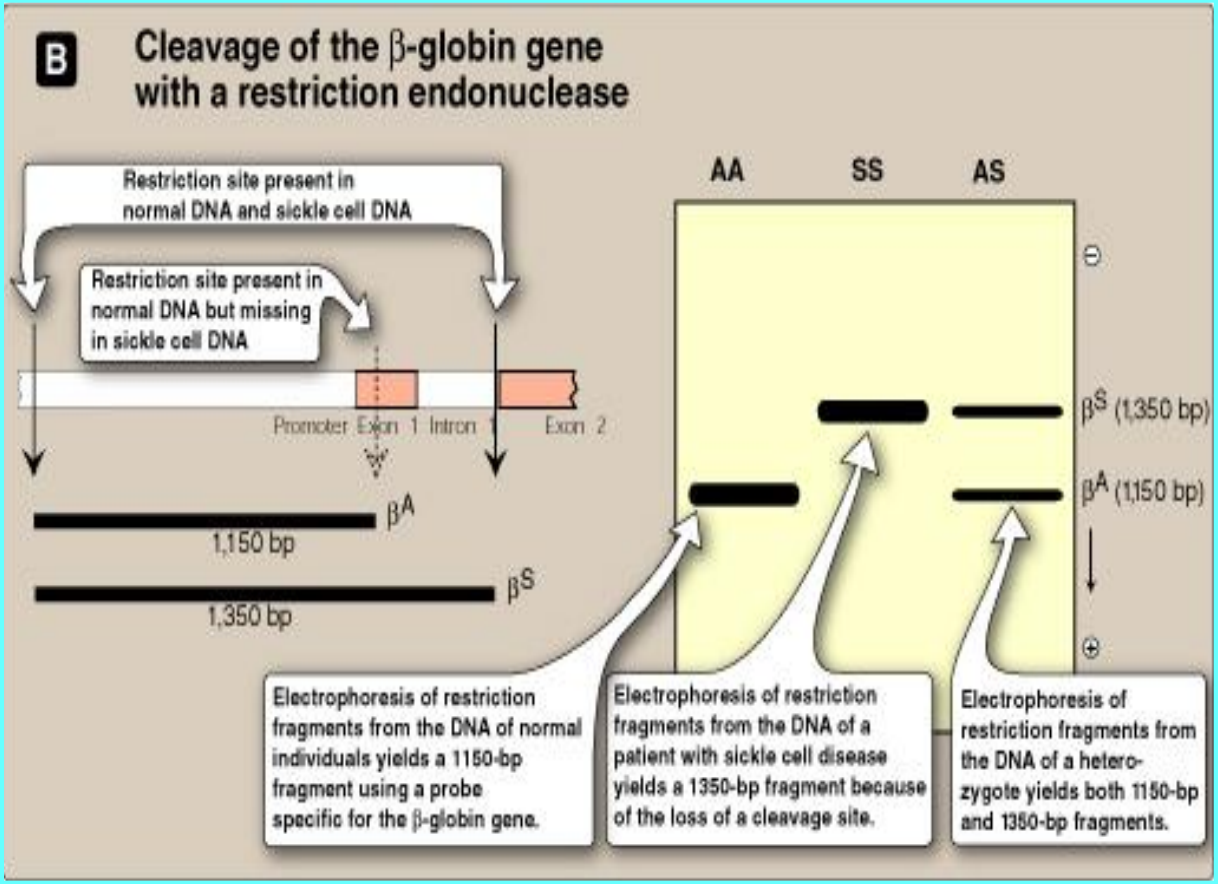
RFLPs: Medical applications

- Mapping a gene to a particular region of a chromosome
- Tissue typing for organ transplantation
- Paternity testing and forensic applications
- Prenatal diagnosis of genetic diseases

RFLPs: Prenatal Diagnosis of sickle cell anemia - 1



RFLPs: Prenatal Diagnosis of sickle cell anemia - 2



Thank You