2.3 Biotypes

While genotypes are different in their genomes, biotypes can be identified on the basis of phenotypic characteristics. BVDV can exhibit two different biotypes: a cytopathic one (cp BVDV) and a non-cytopathic one (ncp BVDV)...
Biotypes
Fibroblast cell culture infected with non-cytopathic BVDV (stained with 3-Amino-9-Ethylcarbazole [AEC])Fibroblast cell culture infected with cytopathic BVDV (stained with 3-Amino-9-Ethylcarbazole [AEC])

While genotypes are different in their genomes, biotypes can be identified on the basis of phenotypic characteristics. BVDV can exhibit two different biotypes: a cytopathic one (cp BVDV) that damages cells in a cell culture (vacuolization and lysis), and a non-cytopathic one (ncp BVDV), that does not affect cells in this way. Ncp BVDV is more frequent in nature and accounts for most of the damage caused by BVD. Ncp BVDV codes for a non-structural protein named NS23, cp BVDV in contrast for two separate proteins NS2 and NS3. NS3 is considered a marker protein of cp BVDV.

Since ncp BVDV is commonly isolated from acute infections (today, about 90% of all symptomatic acute infections are supposed to be caused by ncp BVDV) and induces persistent infections, whereas cp BVDV is the causative agent of Mucosal Disease (in combination with a persistent ncp BVDV), ncp BVDV was thought of as a pathogen that causes only mild diseases. However, this assumption was proven wrong by an outbreak of "severe acute BVD" (ncp BVDV-2) in the early nineties. The biotype on hand does indeed not account for the virulence of a pathogen: Both biotypes, cytopathic as well as non cytopathic, may produce mild or aggressive strains (e.g., all highly virulent BVDV-2 are non-cytopathic).

Cp viruses arise from ncp viruses by mutation (insertion of cellular sequences, gene duplications, deletions, single nucleotide changes and others), the new cp virus being antigenetically identical with the original ncp virus (this is an important factor in the pathogenesis of Mucosal Disease). The reversed case (mutation from cp to ncp) was once described [32], however it remains controversial. {multithumb}