Volume 17 Number 19 1989 Nucleic Acids Research

Nucleotide sequence of infectious bursal disease virus genome segment A delineates two major open reading frames

U.Spies, H.Müller and H.Becht

Institut für Virologie, Justus-Liebig-Universität Giessen, Frankfurter Strasse 107, D-6300 Giessen, FRG

Submitted September 1, 1989 EMBL accession no. X16107

The genome of infectious bursal disease virus (IBDV) consists of two segments of double stranded RNA. We have determined the sequence of the larger segment A, encoding 3 structural polypeptides, of IBDV strain Cu-1 (1). Sequencing of overlapping cDNA clones revealed the presence of two major open reading frames (ORFs): in addition to a large ORF (nucleotides 96 to 3132), we found a small ORF (nucleotides 62 to 497), overlapping the large ORF. Another start codon, at position 30, lies between a perfect Kozak consensus sequence; this ORF is terminated at position 60, prior to the start codons of the major ORFs. Only one ORF has been described recently in genome segment A of IBDV strain 002-73 (2). Two ORFs have also been described for segment A of infectious pancreatic necrosis virus, a serologically unrelated other member of the birnavirus family (3).

```
GGGGACAGGC CGTCAAGGCT TGTTCCAGGA TGGGACTCCT CCTTCTACAA CGCTATCATT GATGGTTAGT AGAGATCAGA CAAACGATCG CAGCGATGAC AAACCTGCAA GATCAAACCC  120
AACAGATTGT TCCGTTCATA CGGAGCCTTC TGATGCCAAC AACCGGACCG GCGTCCATTC CGGACGACAC CCTGGAGAAG CACACTCTCA GGTCAGAGAC CTCGACCTAC AATTTGACTG  240
TGGGGGACAC AGGGTCAGGG CTAATTGTCT TTTTCCCTGG ATTCCCTGGC TCAATTGTGG GTGCTCACTA CACACTGCAG AGCAATGGGA ACTACAAGTT CGATCAGATG CTCCTGACTG  360
CCCAGAACCT ACCGGCCAGT TACAACTACT GCAGGCTAGT GAGTCGGAGT CTCACAGTGA GGTCAAGCAC ACTTCCTGGT GGCGTTTATG CACTAAACGG CACCATAAAC GCCGTGACCT  480
TCCAAGGAAG CCTGAGTGAA CTGACAGATG TTAGCTACAA TGGGTTGATG TCTGCAACAG CCAACATCAA CGACAAAATT GGGAACGTCC TAGTAGGGGA AGGGGTCACC GTCCTCAGCT  600
TACCCACATC ATATGATCTT GGGTATGTGA GGCTTGGTGA CCCCATTCCC GCAATAGGGC TTGACCCAAA AATGGTAGCC ACATGTGACA GCAGTGACAG GCCCAGAGTC TACACCATAA  720
CTGCAGCCGA TGATTACCAA TTCTCATCAC AGTACCAACC AGGTGGGGTA ACAATCACAC TGTTCTCAGC CAACATTGAT GCCATCACAA GCCTCAGCGT TGGGGGAGAG CTCGTGTTTC  840
AAACAAGCGT CCACGGCCTT GTACTGGGCG CCACCATCTA CCTCATAGGC TTTGATGGGA CAACGGTAAT CACCAGGGCT GTGGCTGCAA ACAATGGGCT GACGACCGGC ACCGACAACC  960
TTATGCCATT CAATCTTGTG ATTTCAACAA ACGAGATAAC CCAGCCAATC ACATCCATCA AACTGGAGAT AGTGACCTCC AAAAGTGGTG GTCAGGCAGG GGATCAGATG TCATGGTCGG 1080
CAAAAGGGAG CCTAGCAGTG ACGATCCATG GTGGCAACTA TCCAGGGGCC CTCCGTCCCG TCACGCTAGT GGCCTACGAA AGAGTGGCAA CAGGATCCGT CGTTACGGTC GCTGGGGTGA 1200
GCAACTTCGA GCTGATCCCA AATCCTGAAC TAGCAAAGAA CCTGGTTACA GAATACGGCC GATTTGACCC AGGAGCCATG AACTACACAA AATTGATACT GAGTGAGAGG GACCGTCTTG 1320
GCATCAAGAC CGTCTGGCCA ACAAGGGAGT ACACTGACTT TCGTGAATAC TTCATGGAGG TGGCCGACCT CAACTCTCCC CTGAAGATTG CAGGAGCATT CGGCTTCAAA GACATAATCA 1440
GGGCCATAAG GAGGATAGCT GTGCCGGTGG TCTCCACATT GTTCCCACCT GCCGCTCCCC TAGCCCATGC AATTGGGGAA GGTGTAGACT ACCTGCTGGG CGATGAGGCA CAGGCTGCTT 1560
CAGGAACTGC TCGAGCCGCG TCAGGAAAAG CAAGAGCTGC CTCAGGCCGC ATAAGGCAGC TGACTCTCGC CGCCGACAAG GGGTACGAGG TAGTCGCGAA TCTATTCCAG GTGCCCCAGA 1680
ATCCCGTAGT CGACGGGATT CTTGCTTCAC CTGGGGTACT CCGAGGTGCA CACAACCTCG ACTGCGTGTT AAGAGAGGGT GCCACGCTAT TCCCTGTGGT TATTACGACA GTGGAAGACG 1800
CCATGACACC CAAAGCATTG AACAGCAAAA TGTTTGCTGT CATTGAAGGC GTGCGAGAAG ACCTCCAACC TCCATCTCAA AGAGGATCCT TCATACGAAC TCTCTCTGGA CACAGAGTCT 1920
ATGGATATGC TCCAGATGGG GTACTTCCAC TGGAGACTGG GAGAGACTAC ACCGTTGTCC CAATAGATGA TGTCTGGGAC GACAGCATTA TGCTGTCCAA AGATCCCATA CCTCCTATTG 2040
TGGGAAACAG TGGAAATCTA GCCATAGCTT ACATGGATGT GTTTCGACCC AAAGTCCCAA TCCATGTGGC TATGACGGGA GCCCTCAATG CTTGTGGCGA GATTGAGAAA GTAAGCTTTA 2160
GAAGCACCAA GCTCGCCACT GCACACCGAC TTGGCCTTAA GTTGGCTGGT CCCGGAGCAT TCGATGTAAA CACCGGGCCC AACTGGGCAA CGTTCATCAA ACGTTTCCCT CACAATCCAC 2280
GCGACTGGGA CAGGCTCCCC TACCTCAACC TACCATACCT TCCACCCAAT GCAGGACGCC AGTACCACCT TGCCATGGCT GCATCAGAGT TCAAAGAGAC CCCCGAACTC GAGAGTGCCG 2400
TCAGAGCAAT GGAAGCAGCA GCCAACGTGG ACCCACTATT CCAATCTGCA CTCAGTGTGT TCATGTGGCT GGAAGAGAAT GGGATTGTGA CTGACATGGC CAACTTCGCA CTCAGCGACC 2520
CGAACGCCCA TCGGATGCGA AATTTTCTTG CAAACGCACC ACAAGCAGGC AGCAAGTCGC AAAGGGCCAA GTACGGGACA GCAGGCTACG GAGTGGAGGC TCGGGGCCCC ACACCAGAGG 2640
AAGCACAGAG GGAAAAAGAC ACACGGATCT CAAAGAAGAT GGAGACCATG GGCATCTACT TTGCAACACC AGAATGGGTA GCACTCAATG GGCACCGAGG GCCAAGCCCC GGCCAGCTAA 2760
AGTACTGGCA GAACACACGA GAAATACCGG ACCCAAACGA GGACTATCTA GACTACGTGC ATGCAGAGAA GAGCCGGTTG GCATCAGAAG AACAAATCCT AAGGGCAGCT ACGTCGATCT 2880
ACGGGGCTCC AGGACAGGCA GAGCCACCCC AAGCTTTCAT AGACGAAGTT GCCAAAGTCT ATGAAATCAA CCATGGACGT GGCCCAAACC AAGAACAGAT GAAAGATCTG CTCTTGACTG 3000
CGATGGAGAT GAAGCATCGC AATCCCAGGC GGGCTCTACC AAAGCCCAAG CCAAAACCCA ATGCTCCAAC ACAGAGACCC CCTGGTCGGC TGGGCCGCTG GATCAGGACC GTCTCTGATG 3120
AGGACCTTGA GTGAGGCTCC TGGGAGTCTC CCGACACCAC CCGCGCAGGT GTGGACACCA ATTCGGCCTT ACAACATCCC AAATTGGATC CGTT                              3214
```

Acknowledgements: We wish to thank M.A. McCrae, A. Teigler, and J. Mandler for help and discussion. This work was supported by the Deutsche Forschungsgemeinschaft and is presented in partial fulfillment of the requirement for Dr. rer. nat. at the Justus-Liebig-Universität Giessen of U. Spies.

References: 1) Becht, H. (1980) Curr. Top. Microbiol. Immunol. 90, 107-121. 2) Hudson, P.J., McKern, N.M., Power, B.E., Azad, A. A. (1986) Nucleic Acids Res. 14, 5001-5012. 3) Duncan, R., Nagy E., Krell, P.J., Dobos, P. (1987) J. Virol. 61, 3655-3664.