

|            |             |             |               |              |                          |
|------------|-------------|-------------|---------------|--------------|--------------------------|
| -----      | -----       | QALAAAGQ    | IEKQFGKGS I   | MRLGDRSM     | Escherichia coli         |
| -----      | -----       | KRALSAALSQ  | IEKQFGKGSV    | MRMGDRYI E - | Xanthomonas campestris   |
| ---MSQNSL  | RLYEDKSVDK  | SKAL EAALSQ | IE RSFGKGS I  | MKLGSNENV I  | Rhizobium phaseoli       |
| -----      | ---MSKLAEK  | LKAVAAVAS   | IEKQFGKGSV    | MTLGGAREQ    | Myxococcus xanthus       |
| -----      | ---MAIDEDK  | QKALSLAIKQ  | IDKVF GKGS I  | VRLGDKVQE    | Helicobacter pylori      |
| -----      | MAINTDTSGK  | QKALTMVLNQ  | IE RSFGKGA I  | MRLGDATRM-   | Anabaena variabilis      |
| -----      | ---MAGTDR   | EKALDAALAQ  | IE RQFGKGA V  | MRMGDRITNE   | Streptomyces lividans    |
| -----      | -----MSDR   | QAALDMALKQ  | IEKQFGKGS I   | MKLGEKTD T-  | Bacillus subtilis        |
| -----      | ---MANIDKDK | LKAL EMAMGQ | IEKQFGKGSV    | MKLGEQGAP -  | Clostridium perfringens  |
| MSKLKEKREK | AVVGIERASK  | EEAL ELARVQ | IEKAF GKGS L  | IKMGESPVGQ   | Borrelia burgdorferi     |
| -----      | ---MSVPDR   | KRALEAAI AV | IEKQFGA GS I  | MSLGKHSAAH   | Chlamydia trachomatis    |
| -----      | ---MASSEK   | LKALQAAMDK  | IEK SF GKGS I | MKMG E- EVVE | Bacteroides fragilis     |
| -----      | MAEE        | KIPTVQDEK   | IEKTF GKGA I  | MNMGANTYE -  | Porphyromonas gingivalis |
| -----      | ---MPEEKQK  | KSYLEKALKR  | IE ENFGKGS I  | MLGDETQVQ    | Thermotoga maritima      |
| --MSKDATKE | ISAPTDAKER  | SKAL ETAMSQ | IEKAF GKGS I  | MKLGAESKL -  | Deinococcus radiodurans  |
| -----M     | ARVSENLSK   | MKALEYALSS  | IEKRFGKGA V   | MPLKAYETV -  | Aquifex pyrophilus       |

|            |              |             |             |             |                          |
|------------|--------------|-------------|-------------|-------------|--------------------------|
| DVETISTGSL | SLDIALCAGG   | LPMGRIVEIV  | GPSSSGKTT L | TLQVIAAAQR  | Escherichia coli         |
| AVEVPTGSL  | MLDIALGIGG   | LPKGRVVEIV  | GPSSSGKTT L | TLQAIAECQK  | Xanthomonas campestris   |
| EIETISTGSL | GLDIALGVGG   | LPKGRIIEIV  | GPSSSGKTT L | ALQTI AESQK | Rhizobium phaseoli       |
| KVAVIPSGSV | GVDRALGVGG   | VPRGRVVEVF  | GNSSSGKTT L | TLHAIAQVQA  | Myxococcus xanthus       |
| KIDAISTGSL | GLDLALGIGG   | VPKGRIIEIV  | GPSSSGKTT L | SLHIIAECQK  | Helicobacter pylori      |
| RVETISTGAL | TLDLALG-GG   | LPRGRVIEIV  | GPSSSGKTT V | ALHAIAEVQK  | Anabaena variabilis      |
| PIEVIPTGST | ALDVALGVGG   | I PRGRVVEVV | GPSSSGKTT L | TLHAVANAQK  | Streptomyces lividans    |
| RISTVPSGSL | ALDTALGIGG   | VPRGRIIEIV  | GPSSSGKTT V | ALHVI AAAQK | Bacillus subtilis        |
| QMDAVSTGCL | DLDLALGIGG   | VPKGRIIEIV  | GPSSSGKTT V | ALHVVAAAQK  | Clostridium perfringens  |
| GIKSMSSGSI | VLDEALGIGG   | VPRGRIIEIF  | GPSSSGKTT L | TLQAIAEVQK  | Borrelia burgdorferi     |
| EISTIKTGAL | SLDLALGIGG   | VPKGRIIEIF  | GPSSSGKTT L | ATHIVANAQK  | Chlamydia trachomatis    |
| QVEVPTGSL  | ALNAALGVGG   | VPRGRIIEIV  | GPSSSGKTT L | AIHAIAEAQK  | Bacteroides fragilis     |
| DVSVIPSGSI | GLDLALGVGG   | VPRGRIIEIV  | GPSSSGKTT L | AIHAIAEAQK  | Porphyromonas gingivalis |
| PVEVPTGSL  | AIDIALTG VGG | VPRGRIVEIF  | GQSSSGKTT L | ALHAIAEAQK  | Thermotoga maritima      |
| DVQVSTGSL  | SLDIALGVGG   | IPGGRITEIV  | GPSSSGKTT L | ALAI VAQAQK | Deinococcus radiodurans  |
| EVETIPTGSL | SLDIALTG VGG | IPKGRIIEIF  | GVSSSGKTT L | ALHVI AEAQK | Aquifex pyrophilus       |

|             |            |             |              |              |                          |
|-------------|------------|-------------|--------------|--------------|--------------------------|
| EGKTCAFIDA  | EHALDFIYAR | KLGVDIQNL   | CSQPD TGEQA  | LEICDALARS   | Escherichia coli         |
| LGGTA AFIDA | EHALDFIYAA | KLGVNVDDL   | LSQPD TGEQA  | LEIADMLVRS   | Xanthomonas campestris   |
| KGGICAFVDA  | EHALDFVYAR | KLGVDLQNL   | ISQPD TGEQA  | LEITDTLVRS   | Rhizobium phaseoli       |
| AGGVA AFIDA | EHALDVSYAR | KLGV RVEEL  | VSQPD TGEQA  | LEI TEHLVRS  | Myxococcus xanthus       |
| NGGVCAFIDA  | EHALDVHYAK | RLGVDTQNL   | VSQPD TGEQA  | LEI LEHTIRS  | Helicobacter pylori      |
| EGGI AAFVDA | EQALDFTYAS | ALGVDIQNL   | VSQPD TGE SA | LEI VDQLVRS  | Anabaena variabilis      |
| AGGQVAFVDA  | EHALDFEYAK | KLGVDIQNL   | LSQPD NGEQA  | LEI VDM LVRS | Streptomyces lividans    |
| Q-RTSAFIDA  | EHALDFVYAQ | KLGVNIEEL   | LSQPD TGEQA  | LEIAEALVRS   | Bacillus subtilis        |
| LGGAAAVIDA  | EHALDFVYAK | RLGVNIDDLV  | VSQPD TGEQA  | LEITEALVRS   | Clostridium perfringens  |
| EGGI AAFIDA | EHALDFVYAK | ALGVNVAE LW | LSQPD TGEQA  | LEIAEALIRS   | Borrelia burgdorferi     |
| MGGVAAVIDA  | EHALDFVNYA | LIGANI NDLM | ISQPD CGEDA  | LSIAEALARS   | Chlamydia trachomatis    |
| AGGI AAFIDA | EHAFDRFYAA | KLGVVDNLF   | ISQPD NGEQA  | LEIAEQLIRS   | Bacteroides fragilis     |
| AGGLAAIIDA  | EHAFDRTYAE | KLGVNVNDLW  | ISQPD NGEQA  | LEIAEQLIRS   | Porphyromonas gingivalis |
| MGGVAAFIDA  | EHALDFVYAK | NLGVDLKSL   | IAQPD HGEQA  | LEI VDELVRS  | Thermotoga maritima      |
| AGGTCAFIDA  | EHALDFVYAR | ALGVNADELL  | VSQPD NGEQA  | LEIMELLVRS   | Deinococcus radiodurans  |
| RGGVA VFIDA | EHALDFKYAK | KLGVVDNLF   | ISQPD VGEQA  | LEIAESLIRS   | Aquifex pyrophilus       |

**FIGURE 5.16.** Example of a multiple sequence alignment, showing alignment of a portion of the RecA proteins from different bacterial species. Amino acids conserved across most or all of the species are highlighted in red. Letters are the abbreviations of different amino acids (see Fig. 2.23).