The Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids of the European Food Safety Authority was requested to evaluate 56 flavouring substances in the Flavouring Group Evaluation 21, Revision 2, using the Procedure in Commission Regulation (EC) No 1565/2000. Seven of the substances (FL-no: 15.060, 15.086, 15.090, 15.099, 15.114, 15.119 and 15.133) were considered to have genotoxic potential. The remaining 49 substances were evaluated through a stepwise approach (the Procedure) that integrates information on structure-activity relationships, intake from current uses, toxicological threshold of concern, and available data on metabolism and toxicity. The Panel concluded that 26 substances (FL-no: 15.038, 15.039, 15.044, 15.050, 15.051, 15.052, 15.058, 15.061, 15.062, 15.063, 15.067, 15.068, 15.069, 15.071, 15.078, 15.080, 15.082, 15.084, 15.085, 15.087, 15.089, 15.098, 15.108, 15.115, 15.116 and 15.118) do not give rise to safety concerns at their levels of dietary intake, estimated on the basis of the MSDI approach. For the remaining 23 candidate substances (FL-no: 15.037, 15.040, 15.042, 15.043, 15.045, 15.054, 15.055, 15.064, 15.070, 15.072, 15.074, 15.076, 15.077, 15.088, 15.091, 15.092, 15.093, 15.094, 15.096, 15.097, 15.106, 15.107 and 15.129), of the 49 substances evaluated through the Procedure, no appropriate NOAEL was available and additional data are required. Besides the safety assessment of these flavouring substances, the specifications for the materials of commerce have also been considered. For two substances an identity test lacking and for one has the stereoisomeric composition to be specified.