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**Heavy flavor production in p+p and A+A collisions**

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The production of heavy flavor mesons and heavy quarkonium in p+p collisions provides unique opportunities to explore the dynamics of the strong interaction. Their production and hadronization mechanism in vacuum and in the quark-gluon plasma are among the most outstanding questions in QCD. We review recent theoretical progress along this direction, highlighting several selected topics such as heavy meson or quarkonium production inside jets, production and polarization of heavy quarkonium in Non-Relativistic QCD and Color Evaporation Model, as well as the medium modification of heavy mesons in heavy ion collisions, and etc.