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Cocycle twists of bialgebras in a Yetter–Drinfel'd category

Let H be a Hopf algebra over a field k. In this talk we discuss bialgebras in the category ${}^H_H\mathcal{YD}$ of left-left Yetter–Drinfel'd modules over H. These are of interest in the following problem. Define a splitting datum to be a 4-tuple (A, H, π, σ) where A is a bialgebra, $\sigma\colon H \to A$ is a bialgebra map and $\pi\colon A \to H$ is an H-bilinear coalgebra map such that $\pi\sigma = \mathrm{Id}_H$. The set of coinvariants R of π is a coaugmented coalgebra in the category ${}^H_H\mathcal{YD}$ but is not, in general, a bialgebra unless the projection π is also an algebra map. In any case, we can write $A \cong R\#_\xi H$, a modification of a Radford biproduct, with ξ trivial when π is an algebra map. We ask the following question: If ξ is not trivial, can we twist A by a cocycle so that $A^\gamma \cong R'\#H$ where R' is a bialgebra in ${}^H_H\mathcal{YD}$, i.e., can we twist A so that the twist is isomorphic to a Radford biproduct?