For any $H, G$ countable discrete groups with $H$ abelian and $G$ acting on $H$ by automorphisms, we define the generalized q-gaussian algebras $A \rtimes \Gamma_q(G, K)$, where $A = L(H)$ and $K$ is an infinite dimensional separable Hilbert space. We then prove that if the pairs $H, G$ and $H', G'$ satisfy a certain "strong rigidity" assumption, the commutator subgroups $[G, G]$ and $[G', G']$ are ICC, the actions $G \rtimes A$, $G' \rtimes B$ are ergodic and $G, G'$ belong to a fairly large class of groups (including all non-amenable groups with the Haagerup property) then $A \rtimes \Gamma_q(G, K) = B \rtimes \Gamma_q(G', K')$ implies that $A$ and $B$ are unitarily conjugate inside $M = A \rtimes \Gamma_q(G, K)$ and $R_G \cong R_{G'}$, where $R_G$, $R_{G'}$ are the countable, p.m.p. equivalence relations implemented by the actions of $G$ and $G'$ on $A$ and $B$, respectively.

(Received July 15, 2014)