Evaluation of Antibacterial Activity of Inorganic Materials
and Application of Natural Inorganic Materials to Controlling Microorganisms

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Summary
Antibacterial activities of inorganic materials and their possible application for controlling microbes in food processing are described. About 30 kinds of ceramic powders, such as metallic oxides and carbides, were examined for their antibacterial activity by a conductimetric assay, in which the conductivity change caused by bacterial metabolism was detected. Ten powders were found to inhibit bacterial growth. CaO and MgO, in particular, exhibited strong antibacterial activity. The damage to bacteria by these powders was evaluated using antibiotics, and their action mechanisms were found to be related to alkalinity and active oxygen species. The main components of scallop-shell, which creates serious problems such as emission of offensive odorous and soil pollution from heavy metals contained the viscera, is CaCO3. Dolomite includes CaCO3 and MgCO3 as main components. Through heat treatment, the components, CaCO3 and MgCO3 were converted to CaO and MgO, respectively. The heated scallop-shell and dolomite powders also exhibited antibacterial activities, which increased with heating temperature. The occurrences of antibacterial activity were due to generation of CaO and MgO. The heated scallop-shell was applied to fresh vegetables, shredded cabbage, and could reduce the viable bacterial cells. The use of these materials in food processing is therefore not only to be a source of minerals but also to prolong the shelf life of foodstuffs. If these materials are discarded as refuse in open air, CaO and MgO reforms into CaCO3 and MgCO3 respectively, by absorbing CO2 from air. In recent years, the development of antimicrobial agents that are very safe for the natural environment has been a goal. These materials are expected to be utilized in environmental preservation as well as in food processing and medical treatments.