Adenosine Triphosphate Content of Mast Cells in Relation to Histamine Release Induced by Anaphylactic Reaction

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Pure populations of actively sensitized rat peritoneal mast cells were incubated in vitro with antigen to study the relation of the adenosine triphosphate (ATP) content of the cells to anaphylactic histamine release. When the ATP content was reduced to different levels by oligomycin, a good correlation was found between the ATP content and the amount of histamine released – a drastic reduction of ATP causing almost complete inhibition of histamine release. We have also studied whether there is any change in the ATP content of mast cells in relation to histamine release. When untreated sensitized mast cells were exposed to antigen no change in ATP could be demonstrated during the release, apparently due to rapid regeneration of ATP. In another group of experiments the cells were therefore first treated with oligomycin or 2-deoxyglucose to reduce the rate of ATP synthesis. This produced a moderate reduction in the ATP level so that histamine release could still occur. When these cells were incubated with antigen a further decrease in the ATP content was observed in close time relation to histamine release, thus pointing to the direct involvement of ATP in the release process. When a similar experiment was performed in presence of 2 % (v/v) ethanol, histamine release was blocked and there was no change in the ATP level. It was shown by desensitization experiments that ethanol did not block antigen-antibody reaction. Antigen-antibody reaction by itself in the absence of histamine release thus did not change the ATP content of the mast cells.