Smithsonian Institution
DEC 26 1916
National Museum.

AMERICAN
JOURNAL OF BOTANY

VOL. III NOVEMBER, 1916 NO. 9

# SPECIFIC ACTION OF BARIUM

W. J. V. OSTERHOUT

In order to arrive at a satisfactory theory of living matter it is necessary to know the specific manner in which individual substances affect metabolism. Usually our attempts to arrive at this kind of knowledge are very unsatisfactory. When plants grow in water cultures we can say what elements are indispensable but as a rule we can not tell with certainty by inspecting a plant what particular element is lacking in the nutrient medium in which it grew. Similarly when plants are killed or injured by poisons we can seldom by inspection say exactly what particular agent produced the effect. It would seem however that precisely this sort of knowledge should be sought for on account of its theoretical and practical importance.

In the course of investigations in the action of salts the writer has found cases in which this kind of information is apparently obtainable. One of the most striking of these is observed when certain species of *Spirogyra* are subjected to the action of barium.

The *Spirogyra* used in most of these investigations was a large form of the *crassa* type. On placing this in .0001 *M* $BaCl_2$ there was a peculiar and very characteristic contraction of the chloroplasts in the center of the cell. In the neighborhood of the nucleus the chloroplasts contracted so strongly that they formed a very compact green mass, like a closely twisted rope. The diameter of this mass was about one fourth to one third of that of the cell. At the ends of the cell little or no contraction occurred. At the same time the wavy outline of the chloroplasts disappeared so that their edges became relatively even and smooth (this however is not a specific effect of barium).

An interesting feature of this process is that the protoplasm does not contract away from the cell wall but remains in place. It is

[The **Journal** for October (3: 393–480) was issued Oct. 20, 1916.]

therefore evident that this process is different from false plasmolysis, although false plasmolysis may occur later if the exposure be sufficiently prolonged.

None of the other salts examined produced the characteristic contraction at such dilutions. $SrCl_2$ produced it at a higher concentration (.001 *M* and higher) but $CaCl_2$ and $MgCl_2$ did not produce it even at concentrations which plasmolyzed; the same is true of $MnCl_2$, $CdCl_2$, $NiCl_2$, $CoCl_2$, NaCl, KCl and $NH_4Cl$. As long as we work with very dilute solutions the effect of barium appears to be specific.

Even if it should turn out that other salts can produce this effect (the action of trivalent kations was not investigated) the striking fact remains that calcium and magnesium, which are chemically closely related to barium, do not produce it at all.

It would appear that further investigation of this and similar cases is desirable in order to discover what constituents of protoplasm make this specific action possible.

HARVARD UNIVERSITY,
LABORATORY OF PLANT PHYSIOLOGY

Osterhout, W. J. V. 1916. "Specific action of barium." *American journal of botany* 3(9), 481–482. https://doi.org/10.1002/j.1537-2197.1916.tb05430.x.

**View This Item Online:** https://www.biodiversitylibrary.org/item/181695
**DOI:** https://doi.org/10.1002/j.1537-2197.1916.tb05430.x
**Permalink:** https://www.biodiversitylibrary.org/partpdf/312672

**Holding Institution**
Smithsonian Libraries and Archives

**Sponsored by**
Biodiversity Heritage Library

**Copyright & Reuse**
Copyright Status: Not in copyright. The BHL knows of no copyright restrictions on this item.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.

This file was generated 22 September 2023 at 08:45 UTC