

# Microscopic appearances of commonly implanted food particles

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## Abstract

**Background:** Pathologists come across various structures in the microscopic sections that are unrelated to the tissues. Artifacts can occur in the tissue from the time the area is prepared for biopsy, during fixation, grossing, processing, sectioning and staining of the specimen. Food substances may get entrapped into the oral tissues and can lead to misdiagnosis. The aim of this study was to observe the microscopic appearances of commonly implanted food particles.

**Methods:** Fourteen food samples were procured from a local market in Chennai, India. This included guava, chilli, chickpeas, channa dal (split chickpeas), cucumber, brinjal, carrot, capsicum, cabbage and urad dal and brown chickpea. The food samples were fixed in 10% formalin for 24 h and were subsequently processed. Hematoxylin and eosin staining was performed, and the sections were observed under the microscope.

**Results:** Each specimen revealed unique, distinct histology of each food type. Channa dal microscopically in hematoxylin- and eosin-stained sections revealed round-to-oval structures with central pale eosinophilic lobulation. Capsicum showed round-to-polygonal structures of different shapes and sizes with clear central areas. Urad dal microscopically showed cluster of 5–6 eosinophilic structures separated by regular partitions.

**Conclusion:** It is important to study the microscopic appearances of commonly implanted food particles to prevent any diagnostic dilemmas. Further studies are required involving various other food particles and their microscopic appearances.

**Keywords:** Artifacts, food particles, histopathology, microscopic appearances, pathology

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## INTRODUCTION

Pathologists come across various structures in the microscopic sections that are unrelated to the tissues. The ability of the pathologist to interpret a biopsy depends upon both the quantity and quality of the

specimen. Artifact refers to an artificial structure or tissue alteration on a prepared microscopic slide as a result of an extraneous factor.<sup>[1]</sup> These can lead to alternation in normal histology and cytological features which can lead to misdiagnosis.<sup>[2]</sup>

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These substances may either be actually lying within the tissue or can get implanted into the tissue during biopsy procedure or during laboratory handling.<sup>[3]</sup> Artifacts can occur in the tissue from the time the area is prepared for biopsy, during fixation, grossing, processing, sectioning and staining of the specimen.<sup>[2]</sup> Some artifacts are easily distinguishable from normal or diseased tissue components and some are difficult to distinguish from such entities.<sup>[4]</sup> Foreign-body artifacts often make the interpretation of the biopsy specimen difficult.<sup>[2]</sup>

The oral cavity has been reported to be susceptible to many foreign-body implantations which may be metallic-like amalgam restoration or nonmetallic-like vegetable matter.<sup>[5]</sup> The food particles may get implanted in the periapical region through extraction sockets, deep periodontal pockets, unfilled root canals and grossly decayed tooth.<sup>[5]</sup> The implanted food organic matter can be partially digested and altered by action of the host response and the residual cellulose; hyaline matter may act as stimulus and trigger a reactive phenomenon.<sup>[5]</sup> These may induce a granulation tissue formation, for example., pulse granuloma or vegetable granuloma.<sup>[6]</sup>

It is important to be familiar and aware of the histological appearances of the foods that are frequently encountered as impacted in oral tissues.<sup>[7]</sup> The aim of this study was to observe the microscopic appearances of commonly implanted food particles.

## MATERIALS AND METHODS

The study was approved by the Scientific Review Board, Saveetha Dental College and Hospitals, SIMATS, Chennai. Fourteen food samples were procured from a local market in Chennai, India. This included guava, chilli, chickpeas, channa dal (split chickpeas), cucumber, brinjal, carrot, capsicum, cabbage and urad dal and brown chickpea.

The pulses were sectioned in such a way that both the seed coat and cotyledons are visible. Wedge-shaped section was cut out from potato, guava, chilli, cucumber, brinjal and carrot.

The food samples were fixed in 10% formalin for 24 h. These samples were then dehydrated in propanol for half an hour followed by two changes of acetone, half an hour each. The dehydrated tissue was cleared in two changes of xylene for half an hour. Tissue was left overnight in paraffin wax for impregnation. After paraffin infiltration, embedding was done using paraffin wax. The tissues obtained were subsequently sectioned. Hematoxylin and

eosin staining was performed, and the sections were observed under the microscope.

## RESULTS

Each specimen revealed unique, distinct histology of each food type. Channa dal microscopically in hematoxylin- and eosin-stained sections revealed round-to-oval structures with central pale eosinophilic lobulation [Figure 1]. Guava, i.e., *Psidium guajava* L., showed few eosinophilic acellular elongated structures within lightly stained matrix [Figure 2]. Brinjal, i.e., *Solanum melongena* L., microscopically consists of polygonal pale eosinophilic structures with central clear areas, and at the periphery, it showed oval-to-polygonal structures with central highly eosinophilic area surrounded by clear halo [Figure 3].

Chickpea, i.e., *Cicer arietinum*, revealed round-to-oval structures with a vacuolated appearance. Few elongated

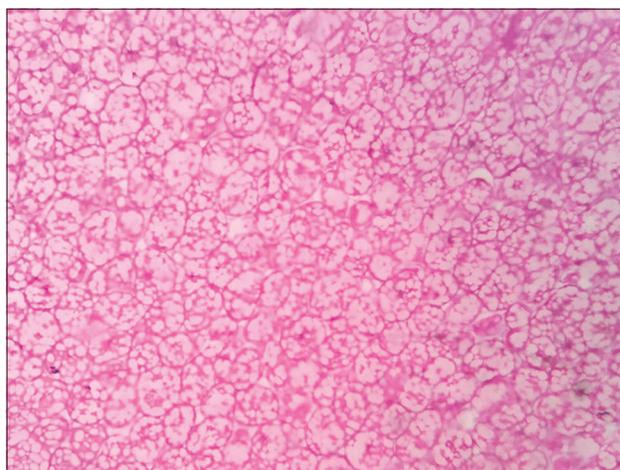


Figure 1: Microscopic appearance of channa dal

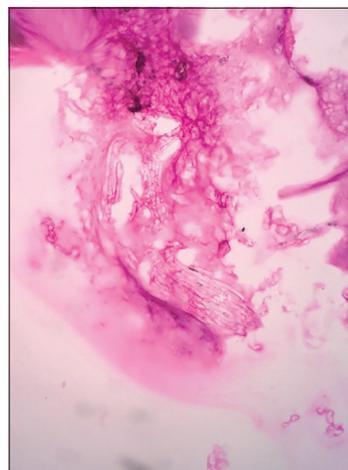
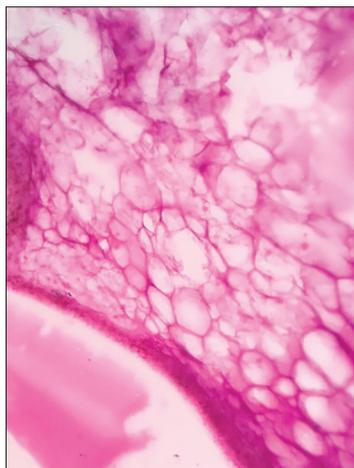


Figure 2: Microscopic appearance of guava

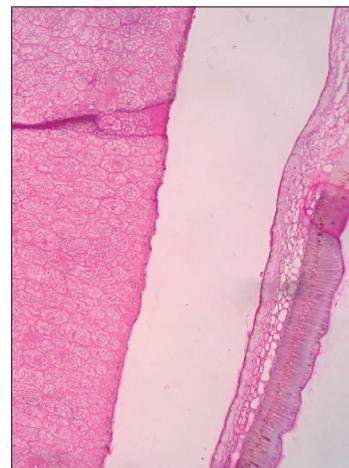
**Table 1: Microscopic appearances of the commonly implanted food particles**

Food sample	Appearances	Similar tissues
Channa Dal	round to oval structures and central pale eosinophilic lobulations	Acini alveoli of lungs.
Guava	Eosinophilic elongated structures Eosinophilic matrix	parasites myxoid matrix
Brinjal	Polygonal eosinophilic structures with central clear areas Oval to polygonal structures with central highly eosinophilic area surrounded by clear halo	Adipose tissue, organism.
Chickpea	round to oval structures with a vacuolated appearance elongated eosinophilic structures	bacilli and endospores
Capsicum	round to polygonal structures with clear central areas	Adipose tissue
Urad Dal	Eosinophilic structures separated by regular partitions	organisms
Carrot	polygonal shaped stained eosinophilic structures	Epithelial cells
Brown Channa	tall columnar structures oval structures with central eosinophilic areas surrounded by a clear halo.	cystic lining, worms endospore.
Green chilli	polygonal to round structures with ill defined borders and empty centre.	Adipose tissue
Cucumber	tall columnar polygonal to round cells with central clear areas.	adipose tissue.
Cabbage	Eosinophilic matrix	Mucous material

**Figure 3:** Microscopic appearance of brinjal

haphazardly arranged eosinophilic structures were also evident. Capsicum, i.e., *Capsicum annuum*, showed round-to-polygonal structures of different shapes and sizes with clear central areas. Urad dal microscopically showed cluster of 5–6 eosinophilic structures separated by regular partitions. These structures are mildly eosinophilic with dark central areas. Carrot, i.e., *Daucus carota*, in hematoxylin- and eosin-stained sections showed polygonal-shaped darkly stained eosinophilic structures with fuzzy outlines arranged in sheets.

Brown channa (brown chickpea) showed tall columnar structures and round-to-oval structures with central eosinophilic areas surrounded by a clear halo [Figure 4]. Green chilli, i.e., *Capsicum annuum L.*, showed polygonal-to-round structures with ill-defined borders and empty center. Cucumber, i.e., *Cucurbitaceae*, showed tall columnar structures, and central area shows of polygonal-to-round cells with central clear areas. Cabbage, i.e., *Brassica oleracea capitata*, microscopically revealed eosinophilic matrix and few empty cells. This was similar to mucous material [Table 1].

**Figure 4:** Microscopic appearance of brown channa

## DISCUSSION

An artifact under the eyes of a pathologist can lead to misdiagnosis that in turn may hamper appropriate treatment to the patient.<sup>[3]</sup> The concept of food getting entrapped in the open carious cavities and reaching the apex is well known.<sup>[3]</sup> Similarly, these food substances may get entrapped into the oral tissues and can lead to misdiagnosis. Lewars in 1971 described six cases of foreign-body reaction because of insertion of food particles into the oral mucosa.<sup>[8]</sup> This study is unique because it presents the microscopic appearance produced by commonly implanted food particles with their probable misdiagnosis which can be an obstacle in diagnosis.

Channa dal (split chickpeas) has a seed coat and cotyledon. Cotyledon showed round-to-oval structures and central pale eosinophilic lobulation. They cluster together to form a group of 15–20 structures. This appearance was similar to acini and alveoli of lungs. Guava showed few eosinophilic acellular elongated structures, and mesocarp showed loosely arranged eosinophilic matrix. This was similar to parasites and myxoid matrix.

Skin, flesh and the seeds are different parts of brinjal. The flesh part of the brinjal showed polygonal pale eosinophilic structures with central clear areas, similar to adipose tissue and oval-to-polygonal structures with eosinophilic area surrounded by a clear halo which is similar to organisms. Few elongated haphazardly arranged eosinophilic structures were evident in chickpea. This appearance was similar to bacilli. The cotyledon of the chickpea showed round-to-oval structures with a vacuolated appearance, which was similar to endospores.

Mesocarp of capsicum revealed round-to-polygonal structures of different shapes and sizes with clear central areas. This was similar to adipose tissue. Cotyledon of urad dal microscopically shows cluster of 5–6 eosinophilic round structures separated by regular partitions. These were mildly eosinophilic with dark central areas. This appearance was similar to organisms. Cortex, phloem, cambium and xylem are different parts of carrot. Phloem showed polygonal-shaped darkly stained eosinophilic structures with fuzzy outlines arranged in sheets similar to epithelial cells.

Tall columnar structures, similar to a cystic lining, were seen in the seed coat of brown channa. Cotyledon revealed round-to-oval structures with central eosinophilic areas surrounded by a clear halo. This can be misdiagnosed as an organism or endospore.

Cucumber has an epicarp, mesocarp and endocarp. Epicarp showed tall columnar structures and central area shows of polygonal-to-round cells with central clear areas. This was similar to tall columnar cells and alveoli. Cabbage microscopically reveals the mesophyll layer which shows eosinophilic matrix and few empty cells. This was similar to mucous material.

Foreign body impactions and their subsequent tissue responses continued to be a source of interest to the researchers. The lack of experience and knowledge about these structures may lead to inaccurate diagnosis and confusion. The implanted food particles in the mucosa can elicit a tissue reaction, referred to as vegetable granuloma or pulse granuloma.<sup>[6]</sup> As seen in our study, many of the

sections can resemble normal or pathologic conditions. All the pathologists should be aware of the histology of commonly impacted food substances. Many times, the patient may or may not recollect a history of trauma or impaction of a foreign vegetable matter into the oral cavity.<sup>[9]</sup> This article highlights the histological aspects of some of the commonly impacted food particles in the oral cavity. Hence, it is important to be familiar and aware of the histological appearances of foods that are frequently encountered in oral tissues.

## CONCLUSION

In this study, various food particles were microscopically analyzed to find out the probable match for the unknown artifact received in any biological samples. It is important to study these to prevent any diagnostic dilemmas. Further studies are required involving various other food particles and their microscopic appearances.

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## Conflicts of interest

There are no conflicts of interest.

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