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Role of Tangential Excision and Skin Grafting in Chemical Burns

P Barath Kumar Singh¹, Ravi Kumar Chittoria²

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Abstract

Chemical Burns most commonly occurs in the industrial workers. Chemicals can injure the cells by exothermic reaction on the surface of the skin, which can also cause the thermal burns. Both acidic and alkali chemical burns are common in industrial workers. Chemical burns are treated by copious irrigation with water, hemodynamic stabilisation and other various methods. The aim of this article is to study the usefulness of the tangential excision and skin grafting in chemical burns.

Keywords: Tangential excision, Skin grafting, Chemical burns.

Introduction

In the military, industrial, and household landscapes, there is a wide and ever expanding range of potentially dangerous compounds. Chemical burns account for only a small percentage of total skin burns, yet they can result in significant morbidity and mortality. Furthermore, chemical burns to the hand and upper extremities are the most common, and as a result, these injuries can result in severe temporary or permanent loss of function. Despite this, there is little discussion of how to treat these injuries in the hand surgery literature. Although the majority of chemical burns just require first aid and wound care, some require surgical debridement and, in rare cases, skin covering and rebuilding. The ingestion of certain

substances can cause serious systemic poisoning and even death. Understanding the distinction between thermal and chemical burns, as well as unique concerns for specific substances, will help patients receive better care.¹

Materials and Methods

This study was conducted in the department of Plastic Surgery at a tertiary care centre. The details of the patient are as follows:

A 45 year old gentleman, with no known comorbidities, a manual labourer at a pharmaceutical company, presented with alleged history of blast injury at a pharmaceutical factory and sustained chemical/thermal burns on 5th June, 2021 at



Fig. 1: Chemical Burns Involving Both hands Circumferentially

3:15 pm at Pondicherry, India. He had sustained second degree burns (superficial and deep partial thickness) over face, bilateral hands, left thigh and bilateral feet which comprised 20 % burns (figure 1). Initial management included copious irrigation of raw areas using normal saline, dressing of the raw areas. On 9th June, 2021 he underwent wound debridement under general anesthesia along with additional procedures such as sucralfate application and low level laser therapy. He also underwent autologous platelet rich plasma application which was obtained by standard double centrifugation protocol using 10ml of patient's blood which was used in 3 sittings. Tangential excision of the necrosed skin removed and prepared for wound grafting.² Tangential excision of a wound is defined as the sequential removal of eschar in thin layers until healthy tissue is reached. Punctate bleeding of the underlying wound bed signals the presence



Fig. 2: Post Tangential excision and skin grafting.

of viable tissue and the end point of excision. Tangential excision can be applied to any eschar of the skin in order to minimize the amount of tissue removed and preserve underlying viable tissue. It is most commonly used in burn surgery. Tangential excision done with the help of the skin grafting blade at the required thickness. Split thickness skin grafting was done after wound bed preparation (figure 2) for wound cover. Healed Chemical burns over the both hands (Figure 3) with movements of the fingers achieved by both active and passive physiotherapy

Results

Chemical burns are treated initially by copious irrigation with water for the benefit of removing the chemical contamination and to prevent further chemical and exothermic reaction to prevent further damage to the skin.^{3,4} It helps in preventing the excess damage to the skin. The damaged skin will be removed by wound debridement and tangential excision. The raw area created post wound debridement was grafted with the Split skin grafting helps in preventing the contractures of the burn area.



Fig. 3: Healed Burns of the hand



Discussion

With the development of infection control, early excision and grafting of burns has become a critical component of any effective burn therapy. An open wound is mostly closed with this procedure, which eliminates the risk of infection.⁵ There is less pain, a faster return to function, a speedier departure from the hospital, and a faster return to rehabilitation. Metabolic requirements are reduced, and the cosmetic outcome is enhanced with fewer scars. If possible, excision is performed between the third and fifth days after the burn, although more time may be required to evaluate which burns are superficial and can heal on their own. No more than 10% of the body's surface area is excised and grafted in a single operating session, and extensive burns necessitate sequential excisions.⁶ To control shock and hypothermia, and to ensure a speedy recovery with early re-establishment of nutrition, the operation is limited to 1 and 1/2 hours. The most common anaesthetic used is ketamine, and viable fat is recommended as the grafting surface. Tangential excision is a type of early excision grafting that can be done alone or in combination with other methods to achieve a certain depth. It is useful in certain types of deep partial skin loss burns, particularly scalds, which are common in youngsters. A thin to moderate thickness allograft is put right away after several slices of necrotic skin are obtained till a punctate bleeding surface is attained in the deep dermis. The preservation of the deep dermis limits the area that can be transplanted, resulting in a graft with better texture and less scarring. Split thickness skin grafting restores epidermal function, avoids further hypothermia, protein and fluid losses, and infection risk, and integrates itself into the healing process, remains the primary permanent source of burn wound closure.^{7,8}

Conclusion

Our experience in management of chemical burns has showed to have positive results with Tangential excision of the burn wounds and skin grafting of the burn area. There was significant improvement

noted with the above methods in healing of raw areas. However, to strengthen the concept, multicentric experiments with a larger sample size are required.

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Role of Stencil in Wound Assessment

P Barath Kumar Singh¹, Ravi Kumar Chittoria²

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Abstract

Wound assessment is the basis of the wound management process in the plastic surgery. The assessment of wound is done by clinical examination, measurement done with scale, video dermoscopy and radiological examination for the assessing the size and depth of the wounds. In this article we will assess the usefulness of the Stencil in the wound measurement.

Keywords: Stencil, Wounds, Assessment.

Introduction

The measurement of the size of the wound helps in deciding the plan of treatment for the specific wounds. In wound cases ultimate goal to control the symptoms and prevent complications, rather than healing the wound. It is important to understand the pathological process of wound development in the patient for planning the treatment for the specific wounds. The detailed clinical examination should include history and duration of ulcer, associated comorbidities, examination of the ulcer along with the specific radiological investigations of the patient. There are various methods by

which wound can be measured like photographic record, comparison, ruler method, graph method, digital planimetry. In this article we will assess the usefulness of the stencil scale (figure 1) in measuring the area of the wounds.¹

Materials and Methods

The study was carried out in a tertiary care hospital in South India after receiving approval from departmental ethical committee. The subject was a 32-year-old male patient with a history of electrical burn 10years back following which he developed a non-healing ulcer on the back. After the initial

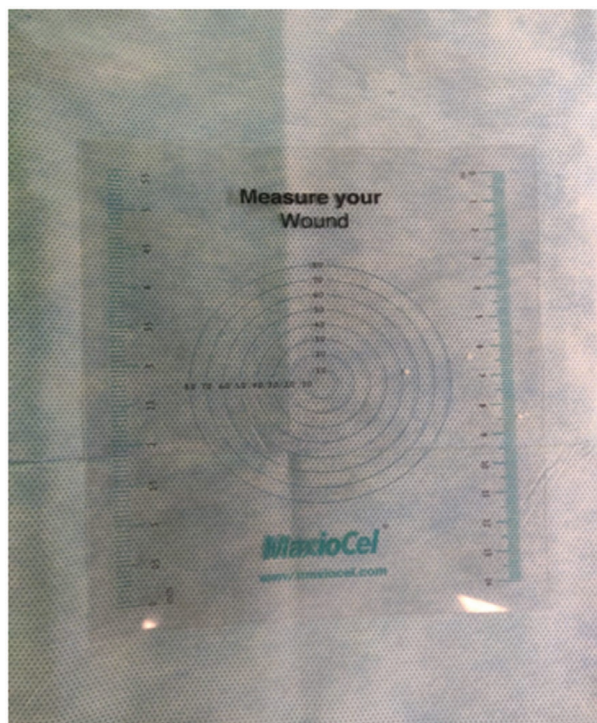


Fig. 1: Stencil for wound assessment

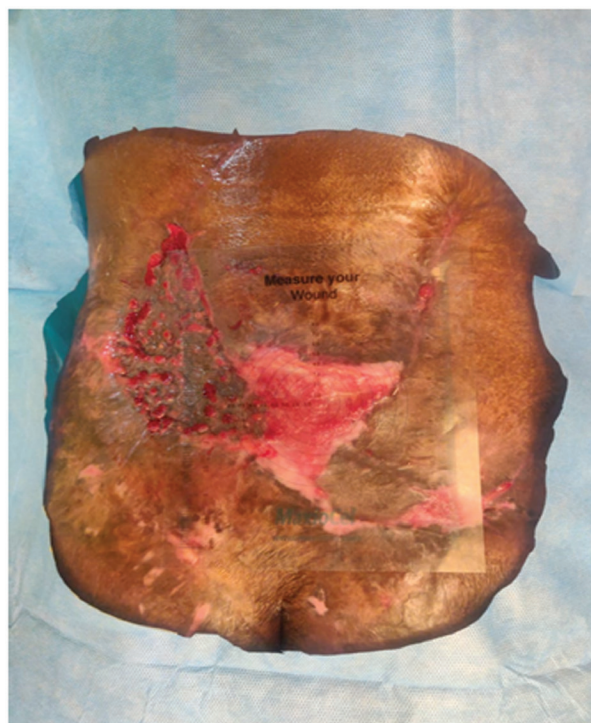


Fig. 2: Measurement of the wound with the stencil

routine investigation, the patient underwent a CT Dorsolumbar scan to rule out osteomyelitis. The ulcer on the back was excised and sent for histopathology to rule any malignant aetiology. After ruling out malignancy, patient underwent transposition flap for the raw area post excision. Post transposition distal part of the flap underwent necrosis for which debridement was done. The raw area post debridement was planned for further procedures for wound cover. The raw area was measured with the help of stencil (figure 2) with the markings in the X and Y axis and circular markings in the stencil will help in measuring the circumference of the irregular wound. The cost of the stencil is 200 Indian rupees easily available in all stationeries in Indian market.

Results

Wound measurement is an important step in its management. Wound measurement gives an idea for deciding the current treatment efficacy and for changing the current treatment. There are various methods by which wound can be measured like photographic record, comparison, ruler method, graph method, digital planimetry.² The stencil scale used in our study is found to be useful in assessing the 2-Dimensional size of the wound as it is easy to measure the area of the wounds as it is transparent.

This method of wound measurement is very cost effective and it is reusable after sterilisation.

Discussion

Wound measurement is an important part of management. Any change in wound area indirectly provides information about wound healing or response to current treatment. Continuation of ineffective treatment would prolong hospital stay and can be avoided by tracking the wound correctly. Therefore, objective technique of accurate measurement and documentation is needed for wound management. Traditionally wound measurement was done by photographic record³, comparison, ruler method, graph method. Clinical photography is being used by most of the plastic surgeon as a part of record keeping and tracking the progress of the disease wound. The methods of measurements of wounds include measuring the wound manually with inch tape, photographic methods which uses software for wound assessment.^{4,5} The Stencil is relatively simple and easy method to measure the area of the wound.

Conclusion

Wound measurement with the help of stencil provides easier assessment of wounds. This

method can be easily adaptable by other clinicians, cost effective than other methods. We need a study involving more patients to assess the validity of the study.

Conflicts of interest: None.

Authors' contributions: All authors made contributions to the article

Availability of data and materials: Not applicable.

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First Record of *Chilodonella hexasticha* from *Botia rostrata* from Arunachal Pradesh, India with a SEM Study

Sukanya Chanda¹, Ashis Kumar Panigrahi², Gyan Deb Barman³

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Abstract

The present study embodies description of *Chilodonella hexasticha*^{1,10} isolated from edible as well as ornamental fish *Botia rostrata* from Dikrong river Arunachal Pradesh, India. This ciliate is 48.25-56.49(50.38±1.57) µm in length and 40.44-48.82(43.88±2.08)µm in width. Taxonomic description of this species have been depicted as per the norms of Lom 1958.² This communication also holds scanning electron microscopic picture of *C. hexasticha* for a detailed and clear illustration of its morphology along with seasonal prevalence, morphometric details. In conjunction with a detailed morphometric comparison of the present species with previously reported species has been done. This data plays a crucial role in the fishery industry as it causes severe disease chilodonellosis, causing mass mortality of fishes. Also it contains the first record of chilodonellid infestation of ornamental fish in Arunachal Pradesh, India.

Context: Though a lot of studies have been done on fish parasites in India but there is relative paucity in case of infestation of ornamental fish parasites on fish fauna of North East India. So keeping this in mind a survey had been done from March 2019 to March 2020 to examine parasitic infection on *Botia* fish along with a morphometric data.

Aim: The objective of the study is to disseminate adequate knowledge regarding the genus *Chilodonella*. This study has also been compiled some published accounts regarding this genera in order to prepare a little but significant informations that is a vital point in the world of taxonomy.

Setting and Design: All authors had participated in the study design. Sample collection and total work has been done by first author and manuscript writing was done by second author. Corresponding author participated planning and supervision of the work. All authors had critically read and approved of the final manuscript

Materials and Methods:

Sampling: A survey has been accomplished in the middle of March 2019-March 2020. Collection of host fishes had been done from Dikrong River of Arunachal Pradesh. For primary study live fishes were lured to the laboratory of the Department of Zoology, Rajib Gandhi University, Arunachal Pradesh, India. In Parasitology Laboratory, Department of Zoology, Kalyani University, West Bengal identification has been done.

Parasitological Examination: A total of 537 number fishes have been minutely observed for detection For ectoparasitic infestation. Body of host fishes mainly Skin, gill and fins were intensively examined.

Isolation of Pathogens: Months of the calendar year the host fishes were collocated extensively. Affected fishes were isolated on the verge of signs of parasitic infestation. Thin smears of gill, fin and skin of host fish had been made on grease free slides. After that slides were dried in air and impregnated for 10 min in 2% aqueous AgNO₃ solution (Klein 1958)¹⁵, washed (distilled water), and placed under ultraviolet ray for 25- 30 min. Using Olympus BX 43F

model (100 X) magnification with an oil immersion lens examinations of these slides were made. With the help of Olympus BX 43F model photographs were taken. In the case of measurements the norms of Lom, 1958² have been followed. Minimum and maximum values have been furnished.

Scanning electron microscopic study:

Thin smears gills were made on grease free slides and fixed it in 0.5 % saline solution and subsequently air dried. These slides then treated with 4% glutaraldehyde in 0.1 M phosphate buffer (pH 7.2) and fixed for 4 h in it. After primary fixation, the parasites were again fixed in 2% osmium tetroxide for 3 h in the same buffer. Dehydration of these have been done using ascending grades of alcohol and passed on it in a mixture of absolute alcohol and amyl acetate at the ratio of 3:1 for 30 min. Afterwards these specimens treated with the same mixture of 2:2 and 1:3 ratios for 30 min and finally treated with amyl acetate solution. For drying these specimens in CO₂ Hitachi Hep-2 critical point drier was used and, mounted them on aluminium stubs and lastly coated with gold in an IB-2 coater. Observations of those specimens have been done using Hitachi S-530 (Japan) scanning electron microscope at an acceleration voltage of 10 kv.

Keywords: *Botia rostrata*, Arunachal Pradesh, Chilodonellosis, Dikrong river.

Key message: This communication is a key to address future questions in the areas of infestation of chilodinid group of parasites in Indian (specially North East India) ornamental fishes and gives a broad field of knowledge to the future researchers of this line.

Introduction

India is a developing country and progressive advancement of fishery sector plays a major role in its economy. Ornamental fish culture or aquaculture acts the prime role in fish industry. And North East India is leading contributor of this field. But this cost effective business having trouble due to parasitic infestation that leads to huge economic losses in this field. *Chilodonella* is one of the potent ciliate ectoparasite of fishes and found mainly in the freshwater and euryhaline environment. This ciliate is the causative agent of severe fish disease 'chilodonellosis'. This parasite mainly affects the epithelium specially gills. The affected fishes secrete excessive mucus and displays signs of irritation, skin lesions. Several reports of fish death caused by *Chilodonella* have reported in Australia³ and South Africa.⁴ It counts immense economic losses in commercial tropical fish stores.⁵ Economic losses due to *Chilodonella* sp. have been reported by Leibovitz (1980)⁵ and Shariff (1984).⁶ There is a lack of information about chilodonellid infestation of ornamental fishes in India. Though in India some sort of work have been done of chilodinid infection on edible fishes by Mitra and Haldar, 2004;⁷ Mitra and Bandyopadhyay, 2012⁸. So, in this regard a survey has been conducted from march 2018 to march 2019. From this pilot study we have isolated and identified *Chilodonella hexasticha* from ornamental fish *Botia rostrata* from Dikrong river, Arunachal Pradesh, India, for the first time.

This ciliophoran species sometime misinterpret with *C. piscicola*. For the first time both the species had been identified by Andre in 1912⁹ from ornamental fish *Carassius auratus*. In 1926 Wenyon¹⁰,

later in 1931 Kahl¹¹ and Ten Kate agreed with the distinctness of these two species. While in 1935 Schaperclaus¹² claimed that both the species are same and Krascheninnikow (1952)¹³ accepted the view. Later Kazbuski and Migala (1974)¹⁴ break the confusion of the taxonomy of this species and clearly conceded on the licitness of both species, viz., *C. piscicola* and *C. hexasticha*.

Both the species have distinct morphological characteristics by which one can differentiate them. The shape of *C. piscicola* is less elliptical with a clear notch on its posterior part of body, whereas *C. hexasticha* has oval body and absence of notch on its posterior end. Number of kineties are also different. Presence of more kineties in case of *C. piscicola* both right (range 7-15) and left (range 12-13) kineties in comparison to *C. hexasticha* which bears five to seven kineties in the right and seven to nine in the left band.

Materials and Methods

Sampling

A survey has been accomplished in the middle of March 2019-March 2020. Collection of host fishes had been done from Dikrong River of Arunachal Pradesh. For primary study live fishes were lugged to the laboratory of the Department of Zoology, Rajib Gandhi University, Arunachal Pradesh, India. In Parasitology Laboratory, Department of Zoology, Kalyani University, West Bengal identification has been done.

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Result

Chilodonella hexasticha (Kiernik, 1909) Kahl, 1931

Taxonomic Summery

Type host: *Botia rostrata*

Host family: Botiidae

Type locality: River Dikrong (27°2'30"N, 93°54'57"E)

Location: Gill filaments

Prevalence: 22.34%(120/537)

Type specimen: *Chilodonella hexasticha*

Lectotype: Slide no-AP/PARA/KLY/CH/45 has been deposited in the Parasitology Laboratory, Department of Zoology, University of Kalyani.

Description

On the basis of twenty specimens this description has been made (table 1) and morphometric comparision among the previous reported species have been also included here (table 2). Body of this ciliophoran is less elliptical with flatten dorsoventral side. Length measuring 48.25-56.49 (50.38±1.57) μ m and width measuring 40.44-48.82 (43.88±2.08) μ m. The dorsal side is devoid of any cilia except a tiny ciliary row on its tips. There are two ciliary system in on the ventral surface of the body. One is right ciliary kinetics and another one is left ciliary kinetics. Both the ciliary systems are loosely aligned and differentiated by a non-ciliary zone (Figs. 1). The right ciliary system is slightly curved and consists of 5-7(5.95±0.57) kineties. On the other side the straight left ciliary system consisting 7-9(7.5±0.59) kineties. Absence of notch in posterior side of the body. Macronucleus is oval in shape. Granular cytoplasm along with a cytostome. Presence of a cytopharynx (Fig. 1).

Table 1 : Morphometry of *Chilodonella hexasticha* (Kiernik, 1909) Kahl 1931, obtained in the present study (n=20).

Characters	Range	Mean	SD	SE	CV%
Length of the body	48.25-56.49	50.38	1.57	0.35	3.1
Width of the body	40.44-48.82	43.88	2.08	0.46	4.74
No. of right kinety	5-7	5.95	0.57	0.12	9.57
No. of left kinety	7-9	7.5	0.59	0.13	7.8

Table 1 contains morphometric details of chilodonellid species. All measurements are in μ m.

Morphometric comparison of *C. hexasticha* obtained in the present study with those of Mitra and Haldar, 2004 and Mitra and Bandyopadhyay, 2012

Table 2 : Contains morphometric comparison of *C. hexasticha* found in present study with previously reported ones

Characters	<i>C. hexasticha</i>	<i>C. hexasticha</i>	<i>C. hexasticha</i>
Host	<i>Nandus nandus</i>	<i>Labeo rohita</i> ; <i>Cyprinus carpio</i>	<i>Botia rostrata</i>
Locality	Churni river, West Bengal, India	Vidyadhari river, Sunderban, West Bengal, India	Dikrong river, Arunachal Pradesh, India
Site of infection	Gills	Gills	Gills
Reference	Mitra and Halder, 2004	Mitra and Bandyopadhyay, 2012	Present study
Length of the body	38.8-59.2 (48.3 ± 6.3)	26.7-54.0 (38.3±1.1)	48.25-56.49(50.38±1.57)
Width of the body	35.7-53.0 (43.2±5.0)	22.1- 49.3 (32.1±0.2)	40.44-48.82(43.88±2.08)
No. of right kinety	5-7 (6.7 ± 0.6)	5-7	5-7(5.95±0.57)
No. of left kinety	6-8 (6.9 ± 0.4)	6-8	7-9(7.5±0.59)

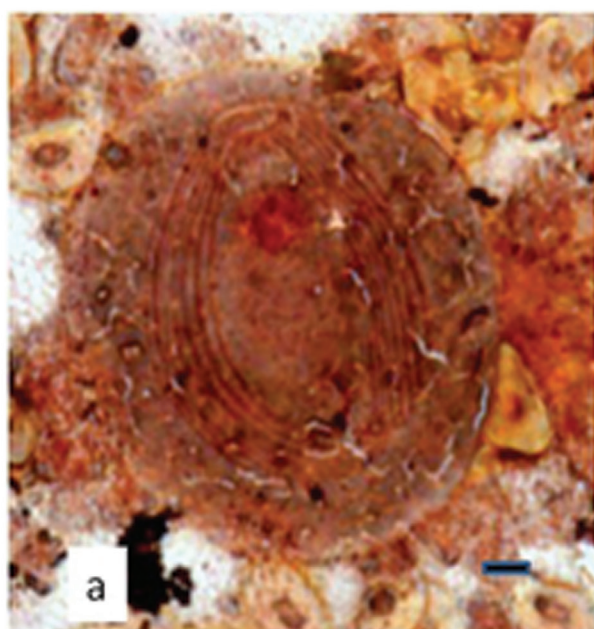


Fig. 1: (a) Photomicrograph of *Chilodonella hexasticha*, stained with 2% aqueous Silver nitrate solution, magnification 100X



Fig. 1: (b) Line diagram of *Chilodonella hexasticha*

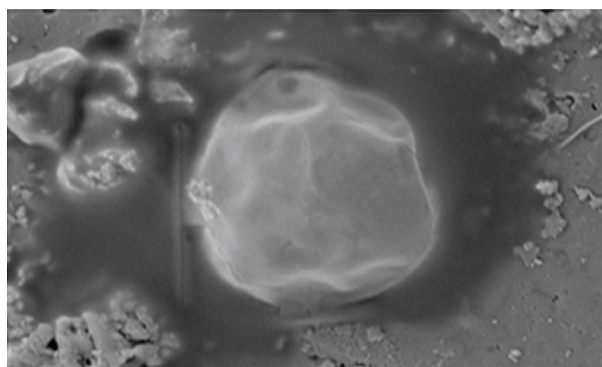


Fig. 1: (c) Scanning electron microscopic image of *C. hexasticha*

Intraspecific variability

During the present study, the specimen shows no significant variability in shape and structure of the denticles

Discussion

The present study reveals first record of *C. hexasticha* infection procured from ornamental as well as edible fish *Botia rostrata* collected from Arunachal Pradesh, India for the first time. Identification of this has been made following the view of Lom and Dykova (1992).¹⁶ In India this species was first recorded by Mitra and Halder, 2004⁷ from freshwater wild fish, *Nandus nandus*. Later, in 2012 Mitra and Bandyopadhyay⁸ reported this species from fingerlings of *Labeo rohita* and *Cyprinus carpio*.

Hence based on the above mentioned data it can be concluded that the present species seems to be new host and new geographical records that has a great significance in the field of parasitology.

Conclusion

In conclusion it can be stated that there is a urge for furthermore investigation on the harmfulness of *Chilodonella* sp. on ornamental fishes in India and a need of appliance of molecular taxonomic techniques to furnish a clear species identification within this genus.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. *J Oral Pathol Med* 2006; 35: 540–7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. *Acta Odontol Scand* 2003; 61: 347–55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone-iodine antiseptics. State of the art. *Dermatology* 1997; 195 Suppl 2: 3–9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. *J Periodontol* 2000; 71: 1792–801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. *Dent Mater* 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovou J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. pp 7–27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online – Trends in suicide by method in England and Wales, 1979–2001. www.statistics.gov.uk/downloads/theme_health/HSQ20.pdf (accessed Jan 24, 2005): 7–18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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