

**TATTOO RELATED MYCOBACTERIAL INFECTION**



*“A Noble Relic of a Noble Race” ((Portrait of Te Wharekauri ) oil on canvas, 1910, Charles F. Goldie, Auckland Art Gallery, New Zealand.*

*“...I shall now mention the way they mark themselves indelibly, each of them is so marked by their humor or disposition....”*

*Joseph Banks, Journal entry, aboard the Endeavour, 1769.*

*The first written mention of the word “tattoo” in the English language is attributed to James Cook, when he returned to England, in 1771 following his historic voyage to Australia and New Zealand. Cook used the word “tattaw” which he adapted from a Tahitian word “tatau”, which essentially meant “an operation”; as the Maori used sharpened bone or shark’s teeth to imprint the skin with their pigments, the whole ritual taking on the feel of a complex operation.*

*Both he and Joseph Banks were fascinated by this Maori custom of body art, which they referred to as “moko”. Most strikingly of all this body work frequently involved the face which gave the Maori warriors a fearsome appearance. Though of course Joseph Banks was intensely interested in the spiritual and cultural aspects of moko, other European explorers who came after Cook, took a rather more pragmatic and sinister view. Some Maori warriors would sever the heads of their victims and then tattoo them as trophies of war. Europeans, both fascinated and horrified by this practice nonetheless began to trade for these heads, to take back to Europe for “scientific purposes” or to sell them on to “gentlemen” who wished to display them in their cabinets of curiosities. Unfortunately what the warriors wanted in return was muskets, with which they could attack their enemies. This sorry situation was no barrier to unscrupulous European entrepreneurs. In the early Nineteenth century a brisk trade developed; tattooed heads, for muskets which would have catastrophic consequences. Unable to supply enough heads from tribal warfare, warriors began to headhunt for more among their enemies. As tribes became armed with increasing numbers of muskets, inter-tribal warfare became far more deadly than in any time previously in their long history. Between 1807 and 1845 tribal warfare had evolved into full scale battle with modern European weapons, a period known in New Zealand history as the “Musket Wars”. Casualty numbers among the Maori reached unprecedented levels.*

*Inevitably as European settlers began to arrive in New Zealand, disputes broke out with the indigenous populations over land ownership. The situation was unique in the history of European conquests of the New World. Unlike the Conquistadors, or the settlers of the Australian colonies, or in Africa or North America, European settlers faced indigenous warriors armed with modern European weapons. As a consequence the British Army had to be called in to protect the settlers. British troops as well as colonial volunteers were sent from Australia, but this did not prove to be any traditional European conquest over Stone Age natives. What followed were the Maori Wars, which were fought over a period of 1845 to 1872. The Maoris, unlike the indigenous warriors of Australia, Africa, or the Americas, were well armed, politically united and well lead. These ferocious conflicts were fought on a very much more “even playing field”. The Maori warriors were fearless, and with their elaborate facial tattoos presented a formidable and terrifying enemy within the dense woodlands of New Zealand. In the end the full weight of the British Empire and its Australian colonies had to be brought to bear in order to prevail, even though Maori numbers were vastly less compared to the situation in the Americas or*

*in Africa. The fighting was intense, bloody and protracted. The Maori tribes were never fully defeated, the war only coming to an end by negotiated treaty.*

*The art of “moko” is now rarely practiced in New Zealand, at least in the form it was during the days of the Musket and the Maori wars. Nonetheless tattooing has over recent decades, undergone a remarkable renaissance, not only among the “warrior classes”, but within the wider society and within all walks of it. There are emerging health consequences in the wake of this rising popularity. Though this popularity has fortunately not led to head hunting or arms dealing as it did in Nineteenth century New Zealand, it has led to some emerging problems in public health such as novel mycobacterial infections.*

## **TATTOO RELATED MYCOBACTERIAL INFECTION**

### **Introduction**

Tattoos are an ancient body art form with origins that trace back as far as the Stone Age.

In more recent times permanent injected tattoos were traditionally seen in males, in particular in those of the armed forces.

Today however they are increasingly popular in young people from all walks of life and of both sexes.

Recent years have seen a tremendous surge in the popularity of tattooing, and in consequence increasing rates of complications are being reported.

Adverse tattoo events include local **pyogenic infection, blood- borne infection** and **hypersensitivity reactions**.

Since 2012, there have also been increasing reports of **mycobacterial infections** associated with tattooing.

**Mycobacterial infection is an important consideration in patients with widespread papular eruption in recent tattoos.**

As the condition is uncommon, and may be confused with hypersensitivity reactions, most cases will be eventually referred to and diagnosed by a **Dermatologist**.

Diagnosis is by biopsy, microscopy and tissue culture.

Treatment requires protracted courses of anti-mycobacterial agents.

**See also separate document on Tattoo Reactions (in Dermatology folder)**

## Pathology

Mycobacteria are ubiquitous in the environment and species such as *M. chelonae* are commonly found in water supplies.

However, they typically only cause clinical disease in the immunosuppressed host, or when high concentrations of the organism are introduced via surgery, trauma or tattooing.

## Organisms:

These can include

1. Mycobacterium tuberculosis
2. Non-tuberculous mycobacterial organisms including:
  - Mycobacterium chelonae
    - ♥ This is a *rapidly growing* form of non-tuberculous mycobacteria
  - Mycobacterium mucogenicum
  - Mycobacterium fortuitum
  - Mycobacterium abscessus.
  - Mycobacterium leprae, (leprosy) has also been reported. <sup>4</sup>

## Sources

Sources of mycobacteria in tattooing include **tattoo inks**, with the chemical composition of differing pigments possibly promoting or suppressing organism growth.

Purple inks (containing manganese) may actually have the potential for inhibiting organism growth, similar to the action of potassium permanganate used in dermatological practice.

The dilution of inks with **non-sterile water** to produce gradations of colour can also introduce mycobacteria.

The chemical composition of some common tattoo pigment colors is as follows:

**Black:** Carbon (India ink), iron oxide, logwood

**Blue:** Cobalt aluminate

**Brown:** Ferric oxide

**Green:** Chromic oxide, lead chromate, phthalocyanine dyes

**Purple:** Manganese, aluminum

**Red:** **Mercuric sulfide (cinnabar)**, sienna (ferric hydrate), sandalwood, brazilwood, organic pigments (aromatic azo compounds)

**White:** Titanium oxide, zinc oxide

**Yellow:** Cadmium sulfide

### **Clinical features**

**Mycobacterial infection is an important consideration in patients with widespread papular eruption in recent tattoos.**

1. Patients are typically systemically well:
  - Afebrile
  - Systemically well
  - Without palpable lymphadenopathy.
2. A of a subacute presentation of 2 - 4 weeks history of lesions developing within areas of recent tattooing.
3. Lesions can be:
  - Pruritic
  - Erythematous-squamous papules
  - Coalesced into plaques
4. Distribution:
  - Large numbers of papules may be seen.
  - The lesions tend to be concentrated in areas of intense shading and/or overlapping colors, where ink injection has been most concentrated.
  - Lesions do not involve non-tattooed skin.

**See Appendix below**

### Differential diagnosis

This will principally be from:

- Pyogenic abscesses/ cellulitis
- Hypersensitivity reactions

**Features will help in distinguishing a mycobacterial infection from a hypersensitivity reaction:**

<b>Mycobacterial infection</b>	<b>Hypersensitivity reaction</b>
Multiple cases from the same Tattoo Parlour	Isolated cases
More prominent in regions of high concentrations of colour	Restitched mostly to regions of a single colour.
More subacute onset (weeks to months)	Acute onset (days)
Solid squamo-erythematous papules	May be blistering reactions, with serous ooze.

### Investigation

Blood tests:

1. FBE:
  - May be normal
2. CRP:
  - May be normal
3. U&Es/ glucose
4. Swab for microscopy and culture of any discharging purulent material, if present.

## 5. Serology for possible associated infection

If the tattoo was not done to high standards of sterile technique or by a reputable tattooist, then other blood borne transmitted viral and bacterial diseases may also need to be ruled out including:

- Hepatitis B serology
- Hepatitis C serology
- HIV serology
- Syphilis serology

### Biopsy and tissue culture:

This will be the principle means of definitive diagnosis.

Histopathology can a suppurative granulomatous reaction with lymphohistiocytic infiltrate in the upper and mid dermis

Modified Ziehl - Neelsen staining should be done for acid-fast bacilli, (i.e mycobacterium tuberculosis) - but this will not demonstrate non-tuberculous mycobacteria

### NAAT:

Tests that detect specific sequences of deoxyribonucleic acid are available in specialized centers.

These tests are nucleic acid amplification tests (**NAAT**) which is a generic term which includes the polymerase chain reaction (**PCR**) test.

### Management

Treatment requires protracted courses of **anti-mycobacterial agents**.

Definitive antibiotic therapy should be directed by **antimicrobial sensitivity studies**.

### Disposition

Differentiation from hypersensitivity reactions can be problematic

If the condition is suspected then referral to a **Dermatologist** is warranted.

An **ID physician** may also need to be consulted concerning the optimal anti-mycobacterial therapy.

## Appendix 1

### *Mycobacterium chelonae* infection:



*Typical lesions of Mycobacterium chelonae* infection caused by inoculation by tattooing. There are multiple erythematous papules within the tattooed regions of the skin.<sup>2</sup>



*Papules Associated with Tattoo Ink–Related Non-tuberculous Mycobacterial Infection.* <sup>3</sup>

References

1. J.W Frew et al. Tattoo-associated mycobacterial infections: an emerging public health issue. MJA 203 (5) 7 September 2015.
2. B.S Kennedy et al. Outbreak of *Mycobacterium chelonae* Infection Associated with Tattoo Ink. NEJM. 367; (11) September 13, 2012.
3. P.M LeBlanc et al. Tattoo Ink - Related Infections - Awareness, Diagnosis, Reporting, and Prevention NEJM. 367; (11) September 13, 2012.
4. Ghorpade A. Inoculation (tattoo) leprosy: a report of 31 cases. J Eur Acad Dermatol Venereol 2002; 16: 494 - 499.

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