LEPROSY: IS AN EFFECTIVE VACCINE POSSIBLE?

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Introduction

Leprosy (or Hansen's disease) is a chronic infectious disease caused by intracellular gram-positive bacteria, *Mycobacterium leprae*. 16 millions of people have been healed in the last 20 years. Nevertheless, the prevalence until 2012 is 189.018 cases per year and in the last year, 232.857 cases have been noticed. There is still a long way to go for the complete cure of the disease, which still is a public health problem. In many patients, the disease just disappeared because the clinical symptoms depends on the immunological state of the patient and they don't develop skin lesions. Depending on the histopathological and clinical symptoms, the different manifestations of the disease are classified according to the Ridley-Joplin classification (table 1). Since 1940, Dapsone was the only administered drug. Nevertheless, years later cases of resistance were diagnosed. Because of this, a multidrug therapy (MTD) that consist on several medicines like Rifampicin, was administrated by OMS since 1995 but relapse cases showed that the drugs were not always effective. It is necessary a therapeutic and prophylactic vaccine that provides an active protection. Nevertheless, this vaccine is not available yet and the only vaccine used to provide protection Bacille Calmette-Guérin (BCG).

Ridley -Joplin Classification	
Paucibacillary patients (PB)	**Multibacillary patients (MB)**
BT: borderline tuberculoid	BB: Borderline –borderline
TT: tuberculoid leprosy	BL: Borderline lepromatous
	LL: Lepromatous leprosy

Table 1. Ridley-Joplin classification

The aim of this review

The aim of this review is to explain the different vaccines that are being developed for leprosy treatment, principally those that are based in the inoculation of attenuated bacillus and the ones based in antigens of the *M.leprae* membrane, explain the efficacy of each one and talk about the role of the immune system in the fight against the bacilli to reach prolonged efficacy and safety to avoid future relapses and to finally eliminate the infection.

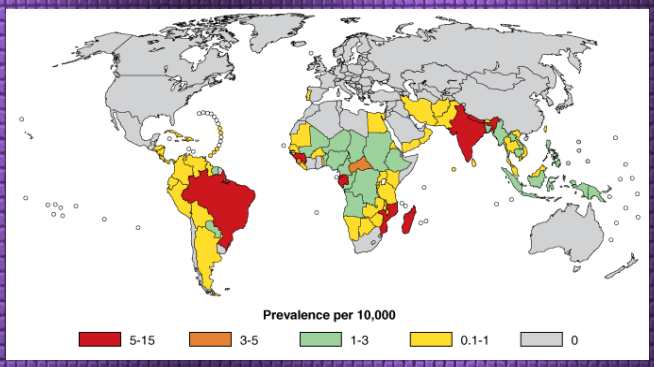

Image 1. Endemic areas of leprosy.

Results

Vaccines based in the inoculation of *Mycobacterium* bacilli

Vaccine	Location	Overall study size	Study follow-up (years)	% protection
BCG	Venezuela	29113 (randomly vaccinated)	5	56
	India	38213 of 171400	6-7	-
BCG+ killed *M.leprae*	Venezuela	29113 (randomly vaccinated)	5	54
	India	38229 of 171400	2-4	64
Mycobacterium w	India	33720 of 171400	2-4	25.7
ICRC	India	22541 of 171400	2-4	65.5

Table 2. Summary of some of the most important vaccine trials with *Mycobacterium sp.* ICRC seems to be the best candidate. Nevertheless, for the Indian trial, the results are not conclusive because the protection is limited to and endemic area (Duthie *et al.* 2011). -: not reported

Vaccines based in membrane proteins of *Mycobacterium leprae*

PGL-I

It's a protein of the surface of M. leprae membrane. It's useful to detect leprosy, principally MB patients because they show this protein in blood.

Group	Sex ratio (m/f))	Mean age (years, range)	BI (range, years)	Serological mean of OD PGL-I (range)
PB (29TT/36 BT)	31/34	33 (18-76)	0 (0)	0.19 (0-1.03)
MB (23BL/42 LL)	37/28	51 (18-100)	3.75 (0.5-6.0)	0.82 (0.08-2.76)
HHC	32/33	36 (19/60)	Na	0.09 (0-0.53)
TB	39/26	38 (20-67)	Na	0.07 (0-0.3)
EC	32/33	35 (18-58)	Na	0.07 (0.01-0.30)

Table 3. The patients that had PGL-I also presented higher levels of IgM. This would be a good indication of infection and could be useful for a vaccine development (Spencer *et al.* 2012).

ML0276

A trial was made with EM005, an adjuvant to improve the response to ML0276. A model of long-term footpad in mice was used.

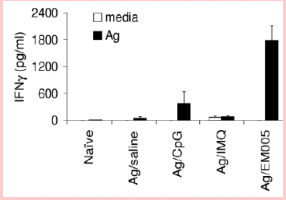

Image 1. ML0276+ EM005 increased the ratio of IgG2a/IgG1 in addition to increase the level of T cells that produced IFN-γ, a potent bactericidal (S. Raman et al. 2009)

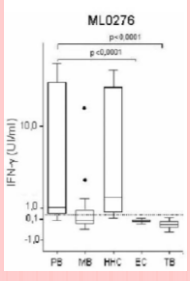

Image 2. ML0276 increase the levels of IFN- γ in PB patients (Duthie et al. 2008)

Conclusions

✓ BCG is the only available vaccine to prevent leprosy
✓ Multidose of BCG conferred a better protection among MB patients and in those previously vaccinated.
✓ The best candidate it could be ML0276 because increases levels of IgG and IFN-γ, a potent bactericidal.

References

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