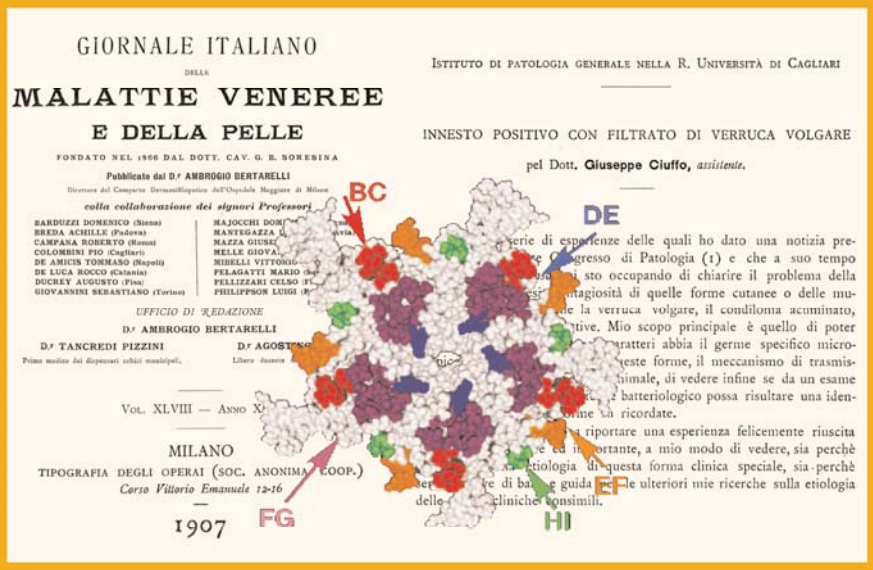
WORLD HEALTH ORGANIZATION
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans

VOLUME 90

Human Papillomaviruses



LYON, FRANCE
2007

WORLD HEALTH ORGANIZATION
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans

VOLUME 90

Human Papillomaviruses

This publication represents the views and expert opinions
of an IARC Working Group on the
Evaluation of Carcinogenic Risks to Humans,
which met in Lyon,

15–22 February 2005

2007

IARC MONOGRAPHS

In 1969, the International Agency for Research on Cancer (IARC) initiated a programme on the evaluation of the carcinogenic risk of chemicals to humans involving the production of critically evaluated monographs on individual chemicals. The programme was subsequently expanded to include evaluations of carcinogenic risks associated with exposures to complex mixtures, life-style factors and biological and physical agents, as well as those in specific occupations.

The objective of the programme is to elaborate and publish in the form of monographs critical reviews of data on carcinogenicity for agents to which humans are known to be exposed and on specific exposure situations; to evaluate these data in terms of human risk with the help of international working groups of experts in chemical carcinogenesis and related fields; and to indicate where additional research efforts are needed.

The lists of IARC evaluations are regularly updated and are available on the Internet at http://monographs.iarc.fr/.

This programme has been supported by Cooperative Agreement 5 UO1 CA33193 awarded since 1982 by the United States National Cancer Institute, Department of Health and Human Services. Additional support has been provided since 1986 by the European Commission, Directorate-General EMPL (Employment, and Social Affairs), Health, Safety and Hygiene at Work Unit, and since 1992 by the United States National Institute of Environmental Health Sciences.

Published by the International Agency for Research on Cancer,
150 cours Albert Thomas, 69372 Lyon Cedex 08, France

Distributed by WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland
(tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int).

IARC Library Cataloguing in Publication Data

Human Papillomaviruses/IARC Working Group on the Evaluation
of Carcinogenic Risks to Humans (2005 : Lyon, France)

(IARC monographs on the evaluation of carcinogenic risks to humans ; v. 90)

1. Genital Neoplasms, Female – virology 2. Papillomavirus Infections – complications
3. Tumour Virus Infections – virology 4. Uterine Cervical Neoplasms – virology
I. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans II. Series

ISBN 978-92-832-1290-4 (NLM Classification: W1)
ISSN 1017-1606

PRINTED IN FRANCE

Cover Legend:

The cover shows the first page of a publication by Ciuffo (1907) who demonstrated — by auto-inoculation — that a cell-free extract of common warts contains an infectious agent, later to be identified as human papillomavirus (see text below).

Superimposed on this text is a molecular structural model of the HPV 6 major capsid protein L1, with surface-exposed loops that contain highly antigenic epitopes (Oroczo *et al*, 2005; reproduced with permission; see also Section 1.2.1). Virus-like particles containing these epitopes have now been successfully used to develop prophylactic vaccines against several high-risk HPVs.

[cover design: Georges Mollon]

Innesto positivo con filtrato di verruca volgare
Dr Giuseppe Ciuffo

Con una serie di esperienze delle quali ho dato una notizia preventiva nel recente Congresso di Patologia (1) e che a suo tempo pubblicherò *in extenso*, mi sto occupando di charire il problema della etiologia, patogenesi, contagiosità di quelle forme cutanee o delle mucose papillomatose, come la verruca volgare, il condiloma acuminato, che sono certamente infettive. Mio scopo principale è quello di poter trovare quale esso sia e quali caratteri abbia il germe specifico microscopico o il virus invisibile di queste forme, il meccanismo di trasmissibilità da uomo ad uomo o all'animale, di vedere infine se da un esame comparativo clinico, anatomico e batteriologico possa risultare una identità fra queste diverse forme su ricordate.

Per ora mi limiterò a riportare una esperienza felicemente riuscita sulla verruca volgare ed importante, a mio modo di vedere, sia perchè ci illumina sulla etiologia di questa forma clinica speciale, sia perchè servi e serve di base e guida per le ulteriori mie ricerche sulla etiologia delle forme cliniche consimili.

(1) Atti del IV Congresso Italiano di Patologia, Paris, Ottobre 1906

Positive graft with a filtrate of common warts
Dr Giuseppe Ciuffo

With a series of experiments, the results of which I presented at the recent Pathology Congress (1) and shall publish shortly *in extenso***,** I sought to clarify the problem of the etiology, pathogenicity and contagiousness of cutaneous or mucosal papillomatous forms, such as the common wart and condyloma acuminatum, which are assuredly infectious. My principal aim is to be able to find which is the specific microscopic germ or invisible virus that is responsible for these lesions and what are its characteristics, its mode of transmission from man to man or to animals and finally to determine whether a comparative clinical, anatomical and bacteriological examination could result in the identification of the responsible agent.

In this article, I am restricting myself to presenting an experiment on the common wart that was felicitously successful and important, the way I see it, not only because it sheds light on the etiology of the clinical form, but also because it has served and will serve as a basis and guide for my future investigations regarding the etiology of other clinically similar forms.

(1) Proceedings of the Fourth Italian Congress of Pathology, Paris, October 1906