MEAT HYGIENE

ALBERTSEN · BENOIT · BLOM · CROFT
DOLMAN · DRIEUX · HOOD · HOUTHUIS
JEPSEN · JOHANSEN · KAPLAN · KOCH
SCACCIA SCARAFONI · SCHMID
SCHÖNBERG · THORNTON

WORLD HEALTH ORGANIZATION

MEAT HYGIENE

CONTRIBUTORS

V. E. ALBERTSEN — R. BENOIT — T. BLOM — Phyllis G. CROFT
C. E. DOLMAN — H. DRIEUX — R. I. HOOD — M. J. J. HOUTHUIS
A. JEPSEN — H. H. JOHANSEN — M. M. KAPLAN — S. O. KOCH
G. SCACCIA SCARAFONI — G. SCHMID
F. SCHÖNBERG — H. THORNTON

WORLD HEALTH ORGANIZATION

PALAIS DES NATIONS

GENEVA

1957

NOTE

Authors alone are responsible for views expressed in the Monograph Series of the World Health Organization

PRINTED IN SWITZERLAND

CONTENTS

WORLD HEALTH ORGANIZATION
MONOGRAPH SERIES
No. 33

MEAT HYGIENE

MEAT HYGIENE

CONTRIBUTORS

V. E. ALBERTSEN — R. BENOIT — T. BLOM — Phyllis G. CROFT
C. E. DOLMAN — H. DRIEUX — R. I. HOOD — M. J. J. HOUTHUIS
A. JEPSEN — H. H. JOHANSEN — M. M. KAPLAN — S. O. KOCH
G. SCACCIA SCARAFONI — G. SCHMID
F. SCHÖNBERG — H. THORNTON

WORLD HEALTH ORGANIZATION

PALAIS DES NATIONS

GENEVA

1957

NOTE

Authors alone are responsible for views expressed in the Monograph Series of the World Health Organization

PRINTED IN SWITZERLAND

CONTENTS

INTRODUCTION

The purpose of this monograph is to bring together the latest experience in the safe processing of meat from producer to consumer. While much of the monograph comprises the contributions and discussions at a WHO/FAO Seminar on Meat Hygiene held in Copenhagen in February 1954, it is not intended as a record of that meeting. The original contributions have, where necessary, been expanded or brought up to date ; several new articles have been contributed ; appropriate illustrations have been widely sought ; and much detail—on laboratory techniques for the detection of meat-borne diseases, and on current practice in meat processing in various countries—has been incorporated in annexes. In its present form, this material should give a fairly rounded picture of the public-health aspects of the processes involved in the preparation, inspection, and marketing of meat and its products.

Since meat is a perishable commodity and its poor handling daily exacts a large public-health and economic toll, there can be no room for complacency over problems of meat hygiene, either in under-developed or in advanced countries. Nations can ill afford the disruption of activities in the home and community caused by meat-borne diseases, not to mention the formidable economic wastage and nutritional losses to the population of two fundamental needs—protein and fat.

The primary purpose of good meat-hygiene practice is, of course, to prevent transmission of disease to man and to provide a safe, wholesome product for his consumption. Thus, meat hygiene is essentially a public-health function. The secondary aims, lying rather in the economic sphere, include reduction of losses in meat and its by-products and prevention of disease transmission to other domestic animals. These are matters of concern chiefly to trade, food, and agricultural authorities.

In many countries the division of responsibility for meat-hygiene supervision among government departments is not clear-cut. Although no standard or uniform pattern exists, it is readily apparent that the effective operation of a meat-hygiene service must be based on close working relationships between the triad of medical, veterinary, and sanitary-engineering disciplines. Since meat hygiene is essentially a public-health function, and the veterinarian

is usually best trained and equipped to deal with diseases transmissible through meat, some health authorities have found it advantageous to include a veterinary public-health branch in their services, to cover meat-hygiene needs as well as other responsibilities such as zoonoses. A closer co-ordination of the activities and interests of groups concerned with meat hygiene has thus been achieved.

This monograph is not intended to serve as a guide or to train those responsible for supervising the soundness of meat from the producer to the consumer ; texts of this nature are already available—for example, Die Ausführung der tierärztlichen Fleischuntersuchung, *by F. Schönberg and O. Zietzschmann, H. Thornton's* Textbook of meat inspection, *and A. R. Miller's* Meat hygiene. *Its aim is, rather, to illuminate recent advances and problems in diverse aspects of this wide subject for the benefit of the responsible authorities in public health and in veterinary science.*

Part I

EPIDEMIOLOGY

THE EPIDEMIOLOGY OF MEAT-BORNE DISEASES

C. E. DOLMAN, M.B., B.S., Ph.D., D.P.H.

Professor and Head, Department of Bacteriology and Immunology, University of British Columbia

Director, Division of Laboratories, Department of Health and Welfare of British Columbia

Research Member, Connaught Medical Research Laboratories (Western Division)

Vancouver, B.C., Canada

INTRODUCTION

Since the dawn of history, man has had to match his wits against two-, four-, and six-legged adversaries in a struggle for existence. Once upon a time, when he won these contests, he ate as much of his opponent as he could stomach. Perhaps in those days, as Hippocrates contended, " men often suffered terribly from their indigestible and animal-like diet, eating raw and uncooked food ... They suffered as men would suffer now from such a diet, being liable to violent pain and sickness and a speedy death ..." [24] With the development of agriculture and animal husbandry, mankind began to depend increasingly for strength and sinew upon the cooked flesh of tamed herbivores. Societies which could not or would not farm, such as the present Eskimo, the Central African, or the Australian aboriginal, sought their muscle-building provender among fish and marine mammals, game, and wild birds. When hunger was acute enough, the occasional foray would be launched against more dangerous beasts, e.g., the polar bear, the lion, and the crocodile.

Although human and insect predators have long outvied the quadrupeds as hazards to man's survival, they are seldom eaten, for cannibalism is generally frowned upon, while locusts and wild honey never did furnish a fashionable diet. Most of the animal kingdom is now at our mercy, and hence we can often indulge our carnivorous impulses at the expense of the vanquished, with varying degrees of refinement and satiety. These impulses sometimes remain individualized but highly transmuted, as in those cunningly disguised beasts of prey, the trout or tuna fisherman, and the duck or elephant hunter—whose trips into the wilds are seldom motivated by hunger—or they may be channelled into the crudely purposeful activities of the modern abattoir and meat-packing plant.

Present-day urban civilization is characterized by an intricate network of arrangements for producing, slaughtering, processing, distributing, storing, and preparing for consumption, the flesh and viscera of certain domesticated mammals and birds, notably the cow, pig, sheep, and chicken. In many countries, the horse, buffalo, goat, and rabbit, as well as the turkey, duck, and goose, also provide substantial amounts of animal protein; while some areas of the globe are forced to depend mainly on feral sources, such as seal, moose, bear, deer, reindeer, and wildfowl, for their meat supplies. (Of course, to some degree all over the world, the rivers, lakes, and oceans yield important supplements; but for the purposes of this paper neither fish nor marine products such as winkles and whales are being considered as "meat".)

Meat is not an essential food—vegetarians often seem to thrive—but is a tasty, easily digested, and highly efficient source of the multifarious proteins of the animal body, from inert horn and flimsy silk to the vital enzymes which make possible the noblest human thoughts and actions. When essential proteins are not replenished by the diet, some form of malnutrition eventually becomes manifest, as in the extreme emaciation or the hunger oedema of prisoner-of-war camps in Europe and the Far East, and the peculiar "kwashiorkor" (red-boy) syndrome in dark-skinned Africans. Low levels of serum protein may also predispose to infection, by hindering the production of immune globulins. Moreover, certain animal viscera, especially the liver, serve as important sources of vitamins A and B_{12}. Crow's liver was an ancient Chinese remedy for anaemia; and roasted ox liver was advocated for eye diseases in the Ebers papyrus, an Egyptian medical treatise dating from about 1600 B.C. In parts of fourteenth century Europe, goat liver was known as a cure for night blindness; while the Newfoundland fisherman's liability to nyctalopia, after overlong subsistence on a diet of unleavened bread and fish, has traditionally been controlled by occasional resort to cooked cod's liver.[53] Again, the Eskimoes of King William Island, who cannot satisfy their vitamin A needs with green vegetables and dairy produce, feast ritualistically on raw seal liver.

Apart from certain rather far-fetched examples (*vide infra*), and a few notorious historical instances of gluttony bringing dire deserts (as in the death of King Henry I of England allegedly from a surfeit of lampreys), heavy meat consumption *per se* appears to bring no ill effects. For instance, some of the nomadic Tartars of central Europe were almost exclusively meat eaters during their conquering heyday in the sixteenth and seventeenth centuries, and yet were renowned for longevity. Nowadays, the Masai tribe of East Africa, the gauchos of certain South American countries, and of course the Eskimoes, consistently eat very large amounts of meat with impunity. Again, the wealthier classes in England from mediaeval