What a lousy outlook

Karl T. Weber

Charles Conrad and his son, Theodore, were seated in their two-toned green 1953 Pontiac, inching through traffic on Broad Street as they made their way to a Phillies game. The 1957 rendition of Philadelphia's baseball club featured star center fielder Richie Ashburn, who regularly stroked singles and doubles while tearing up the base paths and blanketing the outfield.

"Like today, it was a bright, sunny day in June, some 48 years ago," said Charles as he braked the car at yet another stoplight. "Grandfather George was having breakfast here in Philadelphia at the Bellevue-Stratford Hotel on Saturday, June 5. This grand hotel, which had opened on September 4, 1904, has since become a Philadelphia landmark. After breakfast, grandfather planned to travel to Atlantic City, New Jersey, to attend the 60th Annual Session of the American Medical Association. Morning sunshine splashed the pages of yesterday's Evening Bulletin he was reading over a second cup of coffee. He learned that on June 4, Canada decided to build its own navy. On June 5, a Chicago beef trust bought two Argentinian meat packing plants seeking to establish a monopoly. "Ho hum," George thought. But then an item that appeared toward the rear of the newspaper caught your grandfather's eye, a conundrum that aroused the attention of local public health officials. And here begins a fascinating story."

June, 1909, found Philadelphia smothered by an oppressive heat wave. In May and June there had appeared a mysterious skin disease amongst crew members of the private yacht Josephine, which was docked on the Delaware River. Twenty men were stricken by this peculiar itching, eruptive disease. Cases appeared suddenly and often simultaneously, each without apparent cause. Soon thereafter, 33 additional cases appeared among crews of four other boats docked along the River. Dr. Gassaway, a physician at St. Agnes Hospital who cared for these men, was not familiar with the illness. The eruption – a widespread rash of wheals surmounted by a pinhead-sized central vesicle which acquired turbid and later pustular features – primarily involved the trunk, arms and legs, and only slightly the face. Feet and hands were spared. It was suggestive of chicken pox, scabies, or possibly smallpox. There was severe, intolerable itching involving the entire body; some had fever, malaise and anorexia.

Gassaway had notified the local Bureau of Health. Dr. Jay F. Schamberg (JS), a noted Philadelphia-based dermatologist and consultant to the Bureau, was called upon to see the patients. He quickly discerned that this illness was one he first described and reported in 1901, but which was of uncertain etiology. Accordingly, there was no means of controlling its dissemination. Since 1901, JS had seen many new cases, always between May and October. Similar outbreaks had been reported in Bordeaux, Cologne and Budapest. U.S. Surgeon General Wyman was notified. He asked Dr. Joseph Goldberger (JG), member of the Public Health Service, to address this puzzling epidemic. Charles Conrad proudly related to Theodore that Goldberger and grandfather were friends, and this is how George Conrad came to learn how JG, a masterful sleuth, would set out to unravel this conundrum.

Seventy other cases would be identified over the course of the summer, involving both men and women. These cases appeared in 20 separate private residences and low-income boarding houses around the city. Several cases appeared in the same household. Twelve other cases were reported amongst employees of a fashionable hotel near Philadelphia, which threatened closure at the start of the lucrative summer season. By early fall there were no further cases, and for those affected there was no recurrence. Houses neighbouring on or adjoining those of the afflicted were not stricken by the epidemic. Its outbreak was sporadic and involved widely separated segments of the city.

JG met with JS to address and collect epidemiologic features of the illness and to understand its clinical presentation. JG set out in his roadster to visit patients at St...
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Toxic plants and pollen were possibilities, but there was no were isolated and placed on a clean watch crystal, then glass slide allowed JG to identify the mite, a louse. Several remained at home and received essentially similar care JG turned to the microscope to examine straw siftings and “moving particles.” Using a needle moistened in glycerine to capture these particles and provide for their transfer to a glass slide allowed JG to identify the mite, a louse. Several were isolated and placed on a clean watch crystal, then applied to the axilla of another volunteer. After 16 hours the characteristic eruption appeared in the applied area. With these elegant and insightful studies JG had solved the mystery that troubled Philadelphia and other neighbouring cities for nearly a decade. Abroad, illnesses referred to as “barley itch” could now be properly addressed. It was a masterpiece of investigation based on epidemiologic, clinical and basic sciences.

JG began to focus on small insects. The spring and summer prevalence eliminated a number of suspects. It had to be a less well-known critter of very small dimensions, since no one had seen it. It did not travel person-to-person, and with its limited cruising radius a winged insect was unlikely. Humans were not necessary for the insect’s survival since the illness was self-limiting. It had to exist on or in an object with which only certain members of a ship or household would come into intimate contact. Its recent appearance suggested such contact had involved articles recently delivered to a ship or household. Bedding, clothing, blankets, mattresses and beds were next targeted for investigation.

Clothing was eliminated, since JG recognized that patients wore the same articles at home or on board ship as in hospital, and yet recovery occurred only in the hospital. Through further deduction and research it was ascertained that patients had slept on new straw mattresses. This was not so for those of the same household or ship that had been spared. Further investigation would eliminate the mattresses’ cotton topping. The essential factor was its wheat straw composition. Field research would indicate that these mattresses were made by four different manufacturers, all of whom received their straw from the same source in Salem County, southern New Jersey.

Clinical research was now designed to track down the causal factor. JG was personally involved in these studies. He exposed his bare left arm and shoulder between two straw mattresses for one hour. Sixteen hours later, JS identified the characteristic itching eruption on JG’s exposed extremity. Three volunteers were asked to sleep upon mattresses in question. Each developed the eruption within 16 hours. JG took straw from a mattress and sifted particles through the mesh of a fine flour sieve. Sifted particles were divided into two portions and placed on two clean Petri dishes. One was applied to the left axilla of a volunteer for one hour. Sixteen hours later, the eruption appeared where the Petri dish had been applied.

Thus, epidemiologic findings and experimental data implicated new wheat straw mattresses as capable of producing the eruption. What factor, present in straw, was responsible? The second Petri dish was placed under a bell jar and exposed to the vapor of chloroform for one hour. This would kill the suspected acarine, if indeed it were present. These treated siftings were then applied to the right axilla of the volunteer whose left axilla had erupted after exposure to untreated siftings. The right axilla did not develop the eruption. It was now certain that the causative factor resided in straw and had been killed by chloroform. JG turned to the microscope to examine straw siftings and “moving particles.” Using a needle moistened in glycerine to capture these particles and provide for their transfer to a glass slide allowed JG to identify the mite, a louse. Several were isolated and placed on a clean watch crystal, then applied to the axilla of another volunteer. After 16 hours the characteristic eruption appeared in the applied area. With these elegant and insightful studies JG had solved the mystery that troubled Philadelphia and other neighbouring cities for nearly a decade. Abroad, illnesses referred to as “barley itch” could now be properly addressed. It was a masterpiece of investigation based on epidemiologic, clinical and basic sciences.

JG showed the mites to Dr. Nathan Banks, an expert in Acarina in the U.S. Bureau of Entomology. Banks quickly identified them as Pediculoides ventricosus. Another member of the Bureau, Dr. F. M. Webster, would find that this mite preyed on soft-bodied larva or adult wheat straw worms and grain moths found in straw and grain, and which attacked the stems and grains of wheat. The mite’s presence in straw was dependent on these insect parasites upon which it preyed. Its eggs hatched in warm weather, and therefore its depredations were seasonal. The pregnant female, with her distended abdomen and distinctive appearance, produced many sexually mature offspring with fully developed extremities whose suction-like disks and claws were used for attachment of the louse to its prey. During feeding they injected an unknown substance into the skin that resulted in local and sometimes systemic symptoms and signs of the illness termed Schamberg’s disease. A history of contact with grain or straw or the use of a new straw mattress confirmed the diagnosis. To clinch the diagnosis, scraping the lesion and microscopic examination of these scrapings disclosed the presence of the mite. Unlike scabies, the mite did not burrow, and its attachment to the skin was feeble. Therefore, it often was brushed off by friction from clothing. Three forms of cutaneous eruption were recognized: urticarial-vesicular-
pustular type; varicelloid type with a large central vesicle or pustule; and erythema multiforme type.

Ordinarily beneficial in controlling wheat damage, excessive louse growth led to attacks on field laborers or thrashermen in the barn, and unsuspecting dwellers in distant cities who slept on the straw. Others acquired the illness from straw used for packing dishes and mulching plants. There were no geographic limits to its distribution and the dermatitis it induced. Treatment included antipruritics, warm alkaline baths and discontinued exposure to suspected straw. Prevention consisted of sterilizing mattresses by steam or fumigation with sulphur or formaldehyde. Airing mattresses at summer temperature would starve the mite by promoting the escape of insects on which it preyed. Other epidemics that appeared in surrounding states in 1909 and 1910 could now be properly addressed.

Postscript

A mite is an eight-legged creature also referred to years ago as a louse. There are more than 30,000 species of mites. *Pyemotes ventriculosus* (*Pediculoides* renamed) is still responsible for “straw itch” that appears when humans come in contact with these grain parasites, and which are parasitic on insect larvae. Outbreaks of mite bites have followed fumigation of houses for termites, a ready source of mite food. Packing straw, straw bags and straw used for pet animals can be infested with these mites. Another skin ectoparasite (*Acarina*), the scabies mite, burrows into thin skin found on wrists, between fingers and toes, axillae, nipples and under breasts, penis and scrotum. It infects over 2 million Americans each year and can pose a serious problem for the elderly in nursing homes, where outbreaks of scabies have been observed.