Observations respecting degeneration of the pancreas / by C. Handfield Jones ; communicated by H. Bence Jones.

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[*From Volume XXXVIII of the 'Medico-Chirurgical Transactions,' published by the Royal Medical and Chirurgical Society of London.*]

LONDON:

PRINTED BY

J. E. ADLARD, BARTHOLOMEW CLOSE.

1855.

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Received March 23d.—Read April 10th, 1855.

The structure of the pancreas is so well known, that it would be merely tedious if I were to commence this paper with any detailed account of it. I may state that my own observations agree in the main with those of Dr. Hyde Salter, whose essay, in the 'Cyclopædia of Anatomy and Physiology' (part xliv) contains the best description I am acquainted with. I am, however, surprised that he should be unable to "detect nuclei" in the epithelial particles. In some they are indeed either obscured by the granular contents, or have vanished as the cell attained its mature condition; but in the majority, they are plainly visible, and are sometimes double. Moreover, great numbers may always be found floating about free in the water in which the specimen is immersed, mingled with granulous substance. I incline very much to the opinion, that an absence of cells, or a great paucity of their number, is to be regarded, in some cases at least, as an abnormal condition. I doubt whether the epithelium can be considered quite healthy, when it consists solely or chiefly of nuclei mingled with granular and

oily matter. Still I would not express myself too confidently on this point, as I have found, in the case of birds' livers, that no cells or celloid particles existed in specimens which appeared absolutely healthy. Neither does there appear to be any improbability in the idea that granular matter, lying in contact with a nucleus, may be employed in the secretory act, although it is not inclosed in a cell-membrane. Indeed, it has always appeared to me to be a character of glandular epithelium, that its cells are mingled with free nuclei and granular matter in varying proportions. In the kidneys, the salivary and gastric glands, this is very positively the case, and to a less degree in the liver. I hesitate, therefore, to affirm what amount of deviation from the healthy type is implied by an absence or scanty and low development of cells. Perhaps, as long as the same relative amounts of nuclei, granular, and oily matter, are present, there may be no impairment of functional power. The more we study varieties of organized tissue, the more we become convinced that vital endowments are not absolutely linked to certain definite structural features. Who shall assert what shape or form of matter is necessary for the possession of contractility?

Degeneration of the pancreas, of such a kind as might be termed fatty, is the most striking morbid change which I have met with. It has been observed also by Dr. H. Salter, whose description of the change, so far as it extends, I can confirm. The following details of the examination of Case 17 in the table, will convey a good idea of the condition of the gland in an advanced stage of this form of wasting. The glandular vesicles or ultimate cavities are entirely destroyed, no trace of limitary membrane is to be seen; the whole tissue is reduced to a coarsely lobulated mass, which contains a large quantity of oily matter. The epithelium consists of mere shadowy traces of nuclei, with the smallest amount of faint, dim, amorphous matter, containing much oil in a finely divided state. The nuclei do not show a well-marked contour, like normal ones, nor have they refracting contents, nor nucleoli. Sometimes, as Dr. Salter states, there are abso-

lutely no nuclei or cells, nothing but amorphous and oily matter. A gland thus degenerated is of a dirty yellowish colour, soft, lax, and flabby, and often exhibits some whity spots upon its surface, which consist of groups of fat-cells. Similar groups are also present in the interior of the gland, but it is very clear that the wasting process is quite independent of their formation. In Case 30, these groups were numerous, although the glandular tissue in itself was sound. The atrophic state, described by Rokitansky as depending on excessive accumulation of fat, bears evidently the same relation to the one above noticed, as the atrophy of the heart from fatty encroachment does to the true degeneration affecting its muscular fibre.

An example of degeneration in an earlier stage is afforded by Case 19. The pancreas was of firm consistence, and yellow opaque colour. The glandular cavities were scarcely to be seen, except in a few spots, but the epithelial masses retained not unfrequently the shape of the vesicles in which they had been lodged. The epithelium consisted chiefly of nuclei, the cell-particles being wasted or stunted; it contained also much oily matter, and appeared itself to be more abundant than usual. The limitary membrane was destroyed, in great part at least. The tissue was very opaque, little altered by acetic acid. Solution of carbonate of soda dissolved the epithelium (nuclei and granular matter), leaving only the oily molecules abundantly diffused through a translucent mass. I came to the conclusion that the morbid process consisted in a gradual *déperissement* of the limitary membrane, the epithelium accumulating and decaying into an oily mass.

In some specimens, it has appeared to me that the number of nuclei was excessive in proportion to the amount of granular matter, whether this were contained in cells or free. This certainly appears to be an abnormal state, because it is tolerably certain that the granular matter of glandular epithelium is the substance by means of which secretion is effected, whether the secerning act consist in an actual conversion of the granular matter into the product, or in a

filtration through the epithelial layer, or in a resorption of the latter in exchange for the secretion. A true gland having the power of preparing a special secretion, in proportion as this abnormal change took place, would approximate to the condition of the thymus, the spleen, or the Peyerian and solitary glands, which, though chiefly made up of myriads of nuclei, yet form no product that differs very notably from the nutrient blood-plasma.

There is yet another condition of the pancreas which I am inclined to consider morbid, and which is briefly noticed in the 'Manual of Pathology,' p. 576, and in my 'Essay on Fibroid and Allied Degenerations.' In this the gland appears large, of a whity gray pale aspect, and bloodless; its lobular arrangement is well marked, and the lobules are prominent, with intervening depressions. The tissue is firm, and its feel suggests the idea of its cavities being tensely filled. In a specimen I recently examined, the smaller end of the gland was remarkably enlarged, so as to equal almost the size of the right extremity. There is nothing very noticeable microscopically in the condition of the epithelium, it may appear rather stunted, and contain a good deal of oily matter. Although it is difficult, by means of the microscope, to determine whether or not the quantity of epithelium is excessive, yet naked eye observation, in conjunction with our knowledge of the structure of the organ, enables us to feel a certainty that the enlargement of the gland must be owing to an abnormal increase of the epithelial contents of its ultimate cavities. Now, in some cases (I will not venture to say in all) this epithelial accumulation and distension must be morbid, and coincide with impairment of function. For if, as is most probable in the healthy state, the epithelium liquefies and produces the secretion, it is clear that its accumulating so as to distend the gland-cavities must be an exponent of the circumstance that it is not undergoing the normal and necessary change. Such accumulation of the epithelium is met with also in other glands, and constitutes the essence of some morbid states well known to pathologists. Thus, the enlarged pale or mottled kidney is found to have

its tubes more or less distended and obstructed by a bulky granular epithelial growth. The mammary gland is liable to have one or more of its lobules distended in the same way, constituting the chronic mammary tumour. Even the common sebaceous cysts of the scalp seem to be of the same family, as they are sometimes lined with thick layers of accumulated epithelium, or contain the same mingled with their fatty secretion. Cystic sarcoma of the testis, in its non-malignant variety, probably belongs to the same class. All these instances have this circumstance in common, viz., the abnormal increase of the epithelial contents of gland-cavities, with impairment of their secretory action.

Of the thirty cases recorded in the table, there are nine in which the pancreas was found to be considerably degenerated, (Nos. 1, 4, 6, 13, 15, 16, 17, 25, 26.) Five were less diseased, but appeared to be in a somewhat similar state, or in an earlier stage, (Nos. 2, 8, 9, 19, 30.) In three there were some peculiar alterations, which shall be specially noticed, (Nos. 7, 12, 29.) The thirteen remaining were healthy, or nearly so. I propose to examine the data afforded by the table with respect to the two first groups.

The *ages* of the cases constituting the first group vary from 25 to 87, the mean is 45, or, if the two extreme instances be excluded, it is 41·5. Pancreatic degeneration does not, therefore, seem to be specially incidental to advanced age, but rather to affect middle life.

Sex does not seem to have much influence in the causation of degeneration of the pancreas. Of the nine seriously diseased cases, five were females, and four males. This certainly shows an excess on the side of the female sex, especially when it is observed that out of the thirty there are nineteen males to eleven females.

As to *coexisting morbid conditions*, whether immediately concerned or not in producing the fatal event:—In one case there was cancer uteri; in four, there was granular degeneration of the kidneys, associated three times with cirrhotic disease of the liver, more or less marked; in one case all the

other organs were healthy except the liver, which was in that state termed by Rokitansky, "acute yellow atrophy." In another, even at the advanced age of 87, there was no other notable organic change except enlargement of the heart, and emphysema of the lungs. In a third, who had long been in the habit of tippling moderately, who had suffered from rheumatism, and who had occasional attacks of delirium tremens, the organs were fairly healthy, except the heart, which was very flabby, but not fattily degenerated to any extent. The body in this last case was more than usually fat; in one of the cases with diseased kidney and dropsy, there was extreme emaciation. In a case of fever with double pneumonia, where the degeneration was extreme, the organs were all healthy, but the patient was said to have been subject some years to epilepsy.

From these facts it seems to result that there is no special morbid state at all intimately associated with pancreatic degeneration, but that some indication or other will be found to exist of impaired vital power. Cancer, renal disease, old age, the habit of spirit-drinking, may all be exponents or causes of the decay. In the last case of advanced degeneration that I have examined, death occurred from exhaustion, consequent on long-continued and very severe functional disorder of the stomach. There was a notable amount of tubercular deposit in the lungs, a fatty state of the liver, a good deal of degenerative disease of the mucous membrane of the stomach, and very great emaciation. Excluding this case, which does not belong to the table, it is rather remarkable that scrofulous disease did not occur in any of the cases of degenerated pancreas, while it was present in four of those in which the gland was healthy.

The condition of the mid-region of the stomach, and of the duodenum, was microscopically examined in all the series. The former was found healthy in six cases out of the nine degenerated, and the latter in seven. There seems, therefore, to be no corelation between disease of the pancreas and of the duodenum, nor, as far as the evidence goes, between the former and gastric disease. This is confirmed

by the result that among thirteen cases of healthy pancreas there were three in which the stomach, and three in which the duodenum, were diseased; the proportion in both groups being nearly similar.

No symptoms, as far as I have observed, give any intimation of the existence of even the most advanced pancreatic degeneration. The fæces, it is possible, may present some peculiarity, but I have not attempted to examine them. It seems scarcely conceivable that a gland so utterly degraded from its healthy condition could prepare a healthy secretion, but the want of this may be in part supplemented by the glands of Brunner, which have generally appeared to me to be fairly sound. The intestinal secretion, also, has, as ascertained by Bidder and Schmidt, the power of converting starch into sugar, as the pancreatic fluid does, so that the non-digestion of starchy matters would be no necessary result of the destruction of the pancreas.

Of the five cases moderately degenerated, the ages vary from 36 to 57; the average is 47·4, a higher figure than where the degeneration was more advanced. One only among them was a female. There is nothing particular observable in this group with respect to coexisting morbid conditions, except that in Case 9, where death took place after an attack of hemiplegia, connected apparently with hypertrophy of the heart, the patient having been a great drunkard up to the time of his death, the pancreas was the only glandular organ found diseased. The follicles were not destroyed, but the epithelium was very wasted and fatty. The epithelium of the stomach-tubes in the mid-region was also wasted; and the duodenum was the seat of nuclear and granular infiltration. Perhaps these changes were connected with the pernicious habit in which the patient indulged.

Of the three cases in which peculiar alterations of the pancreas were found, one (No. 12) appeared to be in somewhat the same state as No. 19, of which details have already been given. The basement membrane of the glandular cavities, though not destroyed, was less distinct than usual; it was, however, brought more plainly into view by the

action of dilute acetic acid or alkali. The epithelium was very abundant, consisting of numerous nuclei and small celloid particles, and contained a great deal of oil, in the form of molecules and drops. There did not appear to be any interstitial formation except some fat. The gland appeared healthy to the eye, and so did the other organs for the most part, except the kidneys, which were large, probably abnormally so, and showed traces of commencing granular degeneration. I regard the condition as an instance of an early stage of atrophic change.

In No. 7, there was encephaloid disease of the liver, which had involved the right half of the pancreas and the duodenum; the left extremity of the gland was free, but indurated and yellowish, it was not attached to any of the surrounding parts. The glandular cavities were very indistinct, they were partly obscured by an interstitial granulo-homogeneous substance, partly, and more in some places than in others, broken down. Their epithelial contents were very fatty, but the nuclei were very distinct, and pretty numerous. The fatty matter had the appearance of being concrete and solid, and lay imbedded in a material which was rather homogeneous than granular. The minute ducts were occasionally seen, appearing rather wasted, but their epithelial particles still distinct. The conclusion I came to was that this part of the gland had not been affected directly by the cancerous growth, but had been irritated by it, and become penetrated by fibrinous exudation. Rokitansky mentions a similar condition as the result of chronic inflammation. It is worth remark, that while the kidneys were for the most part healthy, the lower end of the right was much indurated, perhaps from the same cause as the pancreas.

In No. 29, death occurred chiefly as the result of cirrhosis of the liver and ascites, there was scarce any other organic alteration except in the pancreas. This gland was peculiarly firm, hard, dense, and presented little of its usual lobulated aspect on the surface, though it was very apparent in the interior, but a number of dead whity spots, which proved to

be disintegrating fat-masses. There was no unusual amount of interlobular fibrous tissue, but the layer on the surface was, I think, denser and closer than natural. When examined in water, the limitary membrane of the gland-cavities was not so evident as it should be, but it was brought into view more distinctly by solution of carbonate of soda. The epithelium, seen in water, was abundant, its nuclei were very numerous indeed, and well formed, but they were mingled with less granular matter than normally, and some showed a decided tendency to develop short fibres. Very few celloid particles were present, and those which were seen were small. The epithelium often formed masses which, examined carefully by a good daylight, with a one-eighth inch glass, were seen to be made up of perfect nuclei, with an homogeneous dim uniting substance imbedding small oil-drops. Traces of cell-membranes were seen surrounding some of the nuclei. The firmness and density of the pancreas in this case, I incline to think, depended chiefly upon the condition of the gland-tissue itself. It is quite possible (as indeed occurred in this very instance) that a great degree of contraction of the liver may be produced by a small amount of fibroid material; the Glissonian sheaths not being thickened to any great extent. In the same way the interstitial fibrous tissue of the pancreatic lobules might have caused induration by its contraction without appearing to be notably increased in quantity; but, as I have said, I think the other view more probable. Analogy would lead us, no doubt, to consider the externally similar alterations as completely identical, but I think it unsafe to follow this guide too closely. Pathological processes, though having a general and obvious resemblance to each other, may differ considerably in their more recondite particulars. Thus, I believe the cirrhosis of the liver in this instance to have consisted in an alteration of Glisson's capsule and its offsets; that of the pancreas in an alteration of the epithelium of the gland-cavities. Both, however, had probably some common causative condition, which operated differently in the different organs.

I conclude this paper with the following remarks :

1. Degenerative disease is evidently of great frequency, and this fact should never be absent from the mind of the practitioner. In fatty degeneration of the heart, in general emphysema of the lung, in Bright's disease of the kidneys, in various morbid conditions of the liver, in wasting of the gastric mucous membrane, and that of the pancreas as now described, we have continual instances of it.

2. Degeneration presents two chief varieties ;—in one, there is simple decay and atrophy of the elements of the tissue, the débris of which are found to be more or less loaded with oil. This is the common fatty degeneration as seen in the heart's fibres, the arterial coats, the liver, the pancreas, the contracted kidney, the cornea (*arcus senilis*), and the opaque white cataractous lens ;—in the other, coincident with or causative of the organ's decay, there is an interstitial growth of nucleated fibroid tissue. Of this examples are seen in hepatic cirrhosis, in analogous affections of the testis, in nuclear infiltration of the gastric mucous membrane and fibroid thickening of its muscular and other coats, in Corrigan's pulmonary cirrhosis, and probably in the so-called hypertrophy of the brain. The homologous condition in the kidney is rare, but is sometimes met with. Much more commonly, however, the exudation in the kidney is not interstitial, but drains off from the Malpighian tufts forming casts of the tubes, and at the same time proceeding from the interwoven plexus, distends the tubes by the formation of a bulky, often fatty epithelium. Thus is produced the large mottled kidney, which seems to become hypertrophied much in the same way as a scrofulous lymphatic gland, viz. by a quantity of fibro-albuminous matter being organized into low celloid forms. Pulpy degeneration of the synovial membrane of joints seems to belong to the second variety of degeneration, as the cartilage and the synovial membrane are gradually wasted away by the encroachment of the new-formed material, whose constitution is essentially the same as that of nucleated fibroid tissue in other parts. The lowest form which the second variety of degeneration presents

is that where the exudation appears as a completely unorganized material, the so-called "bacony matter," accumulated interstitially among the proper elements of an organ, which at the same time waste and decay. This variety of exudation is found in those who suffer under severe cachexiæ.

3. In the first form of degeneration hyperæmia has no concern. In the second it may be a predisposing, or promoting cause, but is not the essential. The two great factors of degeneration, as of healthy nutrition, are the state of the plasma, and that of the organizing force, that mysterious power which originally built up the frame out of albumen, fat, and salts, and still maintains its integrity against counterworking influences. The first form of degeneration shows a simple defect and failure of the organizing force. The second, shows a perversion of it, which gradually shades off into those morbid potencies capable of producing fibrous, fatty, sarcomatous, or cancerous tumours.

No.	Name.	Age.	Sex.	History of Illness.	Post-mortem Examination.	State of Stomach, Duodenum, Pancreas.
1	Prisc. P.	34	F. m.	Ill 1 year, admitted almost moribund. Spontaneous fracture of the right femur had taken place a few hours before. Died shortly.	Marked anæmia. Lungs congested and infiltrated. Kidneys small, pale, healthy. Stomach enormously dilated, reaching down nearly as far as crest of ilium, contained a large quantity of coffee-grounds fluid. The duodenum was also distended, and contained similar matter. No obstruction in intestines. Cancer of cervix uteri.	Stomach in mid region tubes healthy; muscular coat normal. Duodenum healthy. Pancreas lax and soft; its glandular vesicles very indistinct; the whole tissue converted into a mass of granulous matter, imbedding oil-drops, with large fatty masses here and there.
2	Kez. R.	45	F.	Legs swelled 2 months ago. Ascites last few weeks. Health good previously. Never had Rheumatism. Urine very albuminous. Loud systolic bruit at apex.	Heart weighed 21 oz.; mitral flaps thickened and cord. tendineæ, which were also shortened. Old pericardial adhesions and white patches. Pleurisy, effusion, general dropsy. Kidneys very wasted. Liver cirrhotic.	Tubes of mid region of stomach much wasted, with much intervening granular and nuclear deposit. Duodenum healthy. Pancreas rather lax and coarse grained; its gland-tissue not very well seen. The epithelium contains a vast deal of oily matter in the form of minute clusters of oil-molecules.
3	M. Sq.	21	F. s.	Admitted Aug. 18th, ill, confined to bed since April. Not well last 12 months. Has swelling and pain in left hip. An abscess had been opened over left trochanter 2 months ago. She declined, emaciating rapidly, and died November 14th.	Left hip joint disorganized; bones carious. Tubercles in both lungs. A large suppurating cavity in left. Heart, liver, kidneys healthy.	Stomach pale; tubes eminently healthy. Duodenum healthy. Pancreas healthy; glandular tissue distinct; much molecular oil in epithelium.
4	Mr. R.	39	M. m.	Drank much spirit and water. Several attacks of delirium tremens. Urine at last	Heart very flabby, not fattily degenerating to any great extent; valves healthy. Lungs healthy.	Stomach empty; reaction acid; tubes healthy. Duodenum healthy. Pancreas, the cut surface of peculiar dull grayish aspect; the vesi-

				contained some casts and but little uric acid. Died by asthenia, suddenly.	Kidneys and liver tolerably healthy. Body rather fat.	cles almost destroyed, and reduced to a mass of granular matter imbedding very much oily, with here and there groups of fat-cells.
5	Sarah W.	12	F. s.	In St. Mary's 14 days with rheumatism and pericarditis. Joints affected, and heart 2 days after admission. A previous attack 2 years ago. Treated by mercury, and leeches, which drew much blood. Died from dyspnœa.	Body emaciated and pale. Pericardium attached to parts outside, and internally almost universally adherent by thick layers of false membrane. Mitral valves thickened, with fibrinous vegetations on auricular edge. Aortic competent, but similarly fringed on ventricular margins. Lungs engorged with blood, almost consolidated. False membrane on pleuræ. Liver large and congested. Spleen and kidneys healthy.	Stomach appeared healthy; tubes natural. Duodenum appeared healthy, but its mucous membrane was thickly set with nuclei; in some parts congregated into large masses, like those in the stomach. Pancreas healthy.
6	J. I.	30		Ad. Nov. 17th. At work till 10 days ago, when he was suddenly seized with severe dyspnœa, since then confined to bed. Orthopnœa. Complete dulness in right back, with absence of breathing, vocal thrill and resonance. Died Nov. 20th.	Body œdematous and pale. Much fluid in right pleura compressing the lung; upper lobe congested. Left lung very emphysematous; cut surface deep scarlet, dryish, exuding thick dark blood. Heart large; extreme stenosis of mitral orifice; other valves efficient, but thickened. Pulmonary artery very large at origin. Liver hard—2 lbs. 14 oz. Kidneys not healthy. Right kidney, 6 oz. Left, 4½ oz.	Stomach, mucous membrane rather injected; tubes of mid region fairly healthy, but with more fibroid tissue than natural at lower part. Duodenum reddened generally by congestion; its structure appeared healthy, but containing here and there small nuclear masses, and in some parts quite infiltrated with nuclei. Pancreas of yellowish aspect; lobular divisions less numerous than natural. Glandular tissue far advanced in fatty degeneration; epithelium consisted solely of granular and oily matter, contained no cells or nuclei.
7	R. W.	56		Had been ill 8 months before his death. Appetite lost entirely some days previously. Tongue denuded, dry,	Body rather emaciated. Both lungs very emphysematous throughout, and puckered at their apices. Heart firm and healthy, except	Stomach contained some dark brown fluid, partly blood; reaction acid. Tubes broken up; mucous membrane softened. Duodenum healthy in structure, except near pylorus,

No.	Name.	Age.	Sex.	History of Illness.	Post-mortem Examination.	State of Stomach, Duodemum, Pancreas.
				and red. Has nausea and sense of weight at his stomach. Liver enormously enlarged. Legs anasarcous. Orthopnœa 2 or 3 days before death.	that the aortic valves were rather thickened and rigid. Liver enormously enlarged by encephaloid growths, the parenchyma between them was very fatty. Masses of soft encephaloid surrounded the duodenum and the right half of the pancreas. Kidneys nearly healthy; lower end of right very hard; its tubuli obliterated by fat and epithelium.	where it was invaded by cancerous ulcerations. Pancreas free at its left third, hard, and firm; its follicles very much obscured by interstitial granular homogeneous exudation, which also had penetrated their contents. These were very fatty, but the nuclei were very distinct, and rather numerous. The fatty particles appeared solid.
8	J. D.	43	M.	Ad. Sept. 1st, bad health for 1½ year, had frequent cough, hæmoptysis, emaciation. Got cold 10 months ago with hoarseness, which increased. Has now soreness about throat, increased by swallowing, talking, or coughing. Expectoration thin, frothy, and profuse. Voice scarce more than a whisper. He got weaker and more emaciated, could scarcely swallow from pain, and sunk exhausted, Nov. 22.	Lower lobes of lungs firmly adherent; nearly consolidated by inflammatory exudation; gray hepatization in some parts. Upper lobes emphysematous in front. Very small and few miliary tubercles throughout lungs. A cavity of the size of a walnut in the upper lobe of left, lined by a thick dense membrane. In larynx much superficial ulceration beneath the glottis and about the upper surface of cord. vocales. In left half of trachea 3 well-defined round ulcerations. Heart healthy. Liver very congested. Kidneys hard; capsule splits on removal.	Stomach, in splenic region mucous membrane destroyed by softening; tubes in mid region very healthy, but some fibroid formation taking place at their bases. Duodenum, mucous membrane softened in some parts, apparently somewhat thickened by exudation in others. Pancreas, glandular follicles not well seen; margin of limitary membrane often lost. The epithelial contents consist chiefly of nuclei and oily matter, with much less granular matter than is natural.
9	W. D.	57	M.	Sudden attack of hemiplegia on Nov. 25th; recovered consciousness, but	Both lungs in great part consolidated, with some recent lymph on left pleura, and old adhesions	Stomach large; much congested in splenic region; quite pale in others. In splenic and pyloric region tubes tolerably healthy.

				sunk and died, Dec. 1st. Of large make. Had been a great drunkard up to his death. Had a troublesome cough many months.	on right. Heart large, weighing 1 lb 3 oz.; valves healthy; cavities dilated. Kidneys and liver healthy.	Mid region, reaction alkaline; tubes rather obscured by interstitial fibroid tissue, and choked up with remarkably stunted and atrophied epithelium. Duodenum, basement membrane of surface not well seen; nuclear and granular deposit in substance of mucous membrane. Pancreas, follicles distinct, but epithelium very wasted and fatty, and containing scarce any cells or nuclei.
10	E. Trev.	28	M.	Received a blow in front of left ear, 2 months after which a tumour appeared, and grew in size so that at last it was as large as two fists. It originated 8½ years before death.	Body exceedingly emaciated. Tubercles numerous in peritoneum and in lungs. Peritonitis, pneumonia. Heart, kidney, liver healthy. Glands in neck on left side prodigiously enlarged by fibroid hypertrophy, forming a large mass in which softening of fibrinous deposits was taking place at various points.	Stomach in mid region very healthy. Duodenum appeared healthy, but abnormal nuclear formation was taking place throughout the mucous membrane. Brunner's glands healthy. Pancreas healthy.
11	J. B.	4 ms.	M.	Died of gradual wasting; ill from birth.	There was no tubercle; the lungs and all the organs appeared healthy; a little puriform fluid in bronchi.	Pancreas healthy. Duodenum healthy. Stomach in all three regions presented the tubes much obscured by nuclear and fibroid formation, probably from their development being imperfect.
12	J. H.	43	M.	Injury to left hand; after 14 weeks, diffuse inflammation commenced, which extended to arm and side. He got very low and weak, and sunk 1 month after admission.	Both lungs excessively œdematous at bases, and indurated at apices; Oiss of seropurulent fluid in left pleura. Kidneys large, affected with incipient granular degeneration. No purulent deposit anywhere. Other organs healthy.	Stomach healthy. Duodenum showed some wasting of the mucous membrane, and of the epithelium of the Brunnerian glands. Pancreas, the follicles were much less distinct than natural, but not destroyed. The contained epithelium was exceedingly abundant, probably abnormally so.
13	Cath. Reg.	45	F.	Ill about 7 months. Had 2 attacks of erysipelas.	Ascites and general dropsy; lower lobes of lungs much con-	Stomach healthy in every part. Duodenum healthy; absorption of chyle was

No.	Name.	Age.	Sex.	History of Illness.	Post-mortem Examination.	State of Stomach, Duodenum, Pancreas.
				Heart's action weak and irregular; no murmur; pulse very weak. Ascites and an asarca from an early period of illness. Great emaciation. Most marked dropsical tendency. Attacks of hemorrhagic vomiting occasionally. Urine on 3 occasions found free from albumen. Constant orthopnœa. Signs of effusion into both pleuræ. Death occurred suddenly.	solidated; much fluid in pleuræ. Liver contracted by capsulating false membrane. Spleen very small, and its capsule thickened. Kidneys granular. Heart healthy.	taking place. Pancreas, lax, numerous white spots on its surface; its glandular tissue completely degenerated into an amorphous granular and oily mass, in which lay numerous masses of fat vesicles.
14	F. L.	34	F.	Appetite usually good, enjoyed food. Ill 4 weeks, with sickness, which has been increasing. Matters rejected now of fecal colour, sometimes acid, at others not; very copious. A large tumour in epigastric and umbilical regions, only observed 10 days. Died exhausted in 2 days.	Body emaciated. Lower lobes of both lungs much congested; in left, some spots of pneumonic consolidation. Heart and liver healthy, the latter congested. Kidneys tolerably healthy. Glands behind stomach enlarged much. A fibrous tumour in anterior wall of body of uterus. Cervix much enlarged, and ulcerated at one part.	Stomach contracted, pale internally; muscular coat and submucous much thickened, the former most, in the pyloric region. The submucous tissue was condensed, and did not allow the free play of the mucous over the muscular. The mucous coat was whiter than natural in the splenic and adjacent part of the mid region, and presented many linear fissures. A large patch in the mid region was thrown into sinuous elevations; in this part there were pretty distinct traces of the tubes, but in the splenic and pyloric, they were utterly wasted and destroyed. The duodenum was partly degenerated in the same way, but to a less degree. Pancreas tolerably healthy, but nuclei proportionally too numerous in epithelium.

15	J. Wells.	38	M.	Symptoms of fever; double pneumonia; death at end of second week.	Lungs hepatized in the greater part of their extent. Heart, intestines, and kidneys, healthy. Spleen exceedingly soft.	Much nuclear and fibroid formation at bases of tubes in mid region of stomach, and extending up among them. Duodenum healthy. Pancreas, its gland tissue is reduced to a mere mass of granulous and oily matter; there are no cells, scarce any trace of nuclei, and none of gland-follicles.
16	J. Sh.	49	M.	A plumber, large and stout man, of very regular habits, never intoxicated. Suffered from eructation of frothy mucus and flatus, sometimes amounting to vomiting. Spirits depressed; nervous. Died suddenly, soon after a light supper.	Heart, its muscular tissue, and valves healthy; left ventricle thickened. Some atheroma in aorta. Lungs much engorged. Kidneys contracted; surface granular. Liver healthy. Spleen very soft. Brain healthy. Stomach much injected in all its mucous coat, which presented numerous shallow depressions, resembling ulcers. These were of oval, or linear, or irregular shape, about 2 to 4 lines in diameter, with grayish bases.	Tubes of stomach tolerably healthy in all the three regions, excepting the pyloric, where they were obscured by diffused nuclear formation. In the depressions, the tubes were exceedingly wasted by nuclear formation prevading the mucous tissue. Duodenum tolerably healthy. Pancreas lax; no gland cavities with limitary membrane to be seen, but merely a lobulated mass, consisting of nuclei, granular, and abundant oily matter.
17	M. A. E.	56	F.	Ill 7 weeks. Had severe pulmonary attack, orthopnœa. Appetite quite lost; great flatulence. Urine somewhat albuminous. The dyspnœa and debility increased, and proved fatal.	Lungs highly œdematous. Mucous membrane of bronchi red. Heart large, valves healthy. Liver slightly cirrhotic; and kidneys somewhat granular; texture confused. Stomach empty, its mucous coat very much injected all over. Capsule of spleen thickened.	Tubes in mid region of stomach healthy; epithelium abundant, and its particles well formed. Duodenum tolerably healthy, more nuclei in its substratum than normal. Pancreas exceedingly degenerated; gland tissue broken up into a mere mass containing much oil. Epithelium reduced to mere dim, faint traces of nuclei, with amorphous and oily matter.

No.	Name.	Age.	Sex.	History of Illness.	Post-mortem Examination.	State of Stomach, Duodenum, Pancreas.
18	J. R.	30	M.	Rheumatic fever 18 years ago; palpitation and other heart symptoms last month. Systolic and diastolic bruits. Heart's apex lowered; impulse heaving. Illness commenced with pain in epigastrium and dyspnœa, coming on after dinner, and taking an unusual quantity of beer. Urine slightly albuminous. Died suddenly, after 6 weeks' stay in hospital.	Much emaciated. Adhesions of left pleura general, except at apex; less extensive of right, but cavity contained much fluid. Both lungs engorged with sero-sanguinolent fluid. Heart greatly enlarged, weighed 2lb. 10 oz.; mitral valve much thickened. Liver healthy, but adherent to diaphragm. Kidneys much congested, left 7½ oz., right 8 oz. Capsule of spleen thickened.	Stomach, tubes in mid region in process of wasting, with very large subtubular nuclear deposits, and more or less inter-tubular nuclear formation. Duodenum and pancreas healthy.
19	J. S.	36	M.	A painter.—Has had several attacks of colic, last 6 years ago. Since then has suffered much from bleeding hemorrhoids, the discharge coming on at intervals of 3 to 4 weeks. Since it was arrested, 6 months ago, by medicine, has suffered from pain and swelling of abdomen, pain in chest and side, and inability to exert himself much. He had a waxy, pasty, aspect; his urine was highly albuminous, and contained casts. Dropsy came on, and increased to his death, which occurred about 6 weeks after his admission.	General pallor, œdema of lower limbs. Dropsy of tunica vaginalis testis. Right lung œdematous, much fluid in pleura. Left lung infiltrated with abundant sero-sanguineous fluid, and generally adherent. Patches of fibrine on pericardium. Liver congested; capsule white and thickened. Kidneys hard, contracted, granular.	Stomach, mucous coat much injected from stimulus of food. Tubes of mid-region quite healthy. Duodenum fairly healthy. Pancreas of firm consistence, yellow opaque colour. The limitary membrane of the glandular cavities is seldom to be seen, but the epithelium forms masses retaining often their shape. There are no cells in the epithelium; it consists chiefly of nuclei in great numbers, with abundant diffused oily matter. The gland appears to be in process of fatty degeneration.

20	H. T.	35	M.	Had ague at age of 15; from that time till 7 or 8 months ago, had good health. He then caught cold, and had hæmoptysis to a considerable amount. Phthisis set in, and ran its usual course in about 8 months.	Great anæmia. Heart healthy; but left ventricle quite filled with a coagulum of white fibrine. Tubercular infiltration of both lungs, most extensive in right. Cavities in both, one in right had ruptured into the pleura, which contained air and purulent fluid. Kidneys had rough surfaces, were not shrunk; tubes not healthy, some infarcted, others empty.	Stomach of dead whity aspect throughout; reaction of surface intensely acid; tubes in mid region found much altered by the acid. Duodenum appears healthy. Pancreas appears very healthy, its gland cavities are well seen, but the epithelium does not seem normal; it contains very few cells, and too many nuclei in proportion.
21	C. C.	37	M.	Gun maker, admitted Dec. 8th.—Always has had a slight cough, very troublesome last 2 years. Hæmoptysis has occurred in streaks, and latterly more copious. Last 9 months much troubled with dyspepsia. Emaciating for some time. Tongue very red at tip and edges. Has pain at epigastrium on deep inspiration. Urine very albuminous, contains casts. Very little dropsy. After his admission he had vomiting for a day or two, and afterwards persistent diarrhœa till his death, Jan. 14th.	Much emaciation. A very large cavity in right lung, several small ones in left, tubercles in both; recent pleurisy and pneumonia of left side. Heart, liver, spleen healthy. Kidneys contracted and granular. Numerous ulcerations in ascending colon.	Stomach empty; reaction not acid; pyloric region smeared with catarrhal mucus. Tubes of mid-region quite healthy, but their epithelium is scanty. Basement membrane of surface very perfect. Duodenum tolerably healthy; black pigment in tops of some villi. Pancreas, glandular cavities tolerably distinct; epithelium consists of multitudes of nuclei, with abundant oily matter in the form of minute drops. No cells, or only very imperfect ones.
22	F.	24	M.	Injured his back by falling 40 feet; was admitted completely paraplegic as regards	Great emaciation. Sloughs on nates. Heart, lungs, and liver healthy. Peritonitis, with fibrinous	Stomach pale internally; tubes of mid-region healthy. Duodenum healthy; chylous absorption taking place. Pancreas

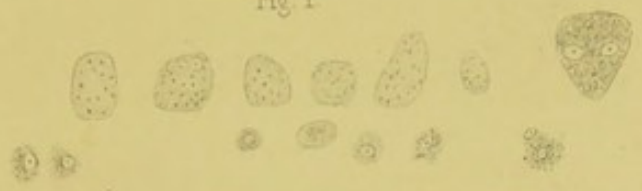
No.	Name.	Age.	Sex.	History of Illness.	Post-mortem Examination.	State of Stomach, Duodenum, Pancreas.
				motion, and nearly so as regards sensation. The bladder was paralysed. The urine generally contained a deposit of ropy mucus; stools passed involuntarily. During last 6 or 8 weeks had frequent diarrhœa. Extensive bed-sores formed; and he died worn out in about 3½ days.	and puriform effusion. Kidneys healthy, except some semi-sloughy spots upon surface of left, very pale. Bladder greatly shrunk; mucous membrane sloughy in some parts, in others inflamed. Much puriform lymph in subserous tissue at back part of bladder. The 9th dorsal vertebra was crushed in some measure, so that it projected backwards, and pressed upon cord, but this organ was still entire.	apparently healthy, but the epithelium is in a wasted condition; it contains no cells, but consists chiefly of nuclei, and abundant diffused oily matter. Limitary membrane of vesicles less clear than it should be.
23	E. T.	34	M.	Carpenter. — Complexion sanguine. Had good health till 2 years ago; pain in region of kidneys last year; under treatment for diabetes last 6 months. The sugar disappeared om the urine while he was confined to animal diet, but after he was allowed some bread and porter, it returned. He got an attack of pleuro-pneumonia, under which he sank.	No emaciation. Right lung congested, but healthy. A large patch of recent lymph on lower and back part of left, the pulmonary tissue beneath the pleura for a considerable depth is consolidated. In upper part there was a small cavity, with thick whitish walls, it was uncertain if it was the remains of a tuberculous or other cavity. Heart and liver healthy. Kidneys healthy, except that their epithelium was exceedingly fatty.	Stomach was much distended, its mucous membrane was of a pale whitish appearance; its tubes healthy in all the three regions. The surface was covered with a quantity of black acid matter, containing a vast number of sporules and mould-filaments, with more or less altered blood-globules. Duodenum and pancreas healthy.
24	J. R.	4	M.	Was ill 1 week, with symptoms of inflammation of lungs. On admission, his face was pale and dusky; lips bluish;	Body pallid, not emaciated. Right lung hepatized throughout; recent lymph in considerable quantity on pleura. Left lung and	Stomach, tubes in mid-region healthy. Duodenum, covered with bilious fluid of marked acid reaction, healthy. Pancreas, the limitary membrane of the glandular

				pulse small, weak, 160; respiration rapid. The physical signs of hepatization of the posterior part of both lungs were observed. He died the same evening.	pleura similarly affected, but to a much less extent. Heart and other organs apparently healthy.	cavities was distinct; the epithelium consisted almost entirely of nuclei and diffused granular matter, with scarce any trace of visible oil.
25	M. A. L.	25	F.	Confined 16 months ago, never well since. Last 6 days constant vomiting of everything but water. Vomited fluid to day is deep yellow. Much thirst; can take no food; skin cool; pulse quick; very deep jaundice; bowels confined, stools at first lumpy and pale, afterwards fully bilious, and passed under her. She became comatose about fourth day, and died 2 days after, having brought up a great deal of blood some hours before death.	No emaciation. Intense universal jaundice. Lungs appeared healthy, but contained numerous patches of blood, which seemed to have been produced by the blood which was vomited passing down the air-tubes. Heart, spleen, and kidneys healthy. Liver small, deep yellow; its ducts pale and empty. Gall-bladder inflamed, containing a greenish mucus. There were some spots of bloody extravasation beneath the serous coat of the intestines. The cells of the liver were broken down, to a great extent, into an oily mass.	Stomach contained a good deal of blackish fluid; reaction acid; surface pale; tubes everywhere healthy. Numerous cells from the tubes in the mucus of the mid-region. Duodenum healthy. Pancreas very lax and soft, of dirty yellowish colour, and showing little appearance of lobulation; the reaction of the fresh cut surface was acid. Its gland-tissue was reduced to a detritus, the limitary membrane was destroyed, and there remained only masses of celloid particles, nuclei, and very abundant oily matter. It was in a very similar state to the liver.
26	S. W.	87	F.	Inmate of workhouse. Had chronic emphysema and bronchitis, got an acute attack supervening on the old, which proved fatal after a few days. Her intellects were failing. Appetite and digestion appeared to be tolerably good.	Body not at all emaciated; some eruption resembling psoriasis guttata on trunk and legs. Much sub-cutaneous and internal fat. Heart large, healthy. Both lungs œdematous throughout, congested posteriorly; bronchi inflamed and smeared with muco-pus. Liver large, firm, and congested. Kidneys slightly rough on surface, tolerably healthy. Spleen healthy.	Stomach exceedingly shrunk, mucous membrane congested and covered with some abnormal mucus. Tubes in mid region much wasted amid abundant nuclear formation, with large solitary gland-masses. Much submucous fat. Duodenum healthy. Pancreas exceedingly soft and lax; reddish-grey colour, far advanced in fatty degeneration. The limitary membrane was lost, the nuclei and celloid particles were dim and faint.

No.	Name.	Age.	Sex.	History of Illness.	Post-mortem Examination.	State of Stomach, Duodenum, Pancreas.
27	N.	56	F.	Regimental clothes maker. Single. Always very delicate. Suffered for 30 years from pain in lower part of chest and in abdomen; weak digestion and attacks of pyrosis. Had sallow look, as if labouring under organic disease. Hæmatemesis to some extent, and copious melœna occurred about 6 weeks before death, and continued 14 days. Catamenia always scanty and irregular. Died suddenly one morning.	Body thin, very anæmic. Lungs pale and healthy. Heart small, exceedingly flabby, valves healthy, fibres very brittle. Liver, spleen, kidneys healthy. Uterus had several small fibrous tumours growing from the surface of the fundus.	Stomach rather distended, contained some highly acid chyme; mucous surface quite pale. An ulcer, the size of a split pea in lesser curvature, nearer cardiac than pyloric orifice. It had not perforated the mucous coat. Tubes in splenic and mid regions very healthy; those in pyloric very much wasted amid nuclear and fibroid formation. Duodenum and pancreas very healthy.
28	J. Dove.	44	M.	Coachman. Two attacks of rheumatic fever in last year, the last 6 months ago. Present attack commenced six weeks ago, with shivering and pain in joints. Last 14 days, giddiness, with pain in back of head. For 2 or 3 months has had a heavy pain in loins, and frequent micturition, especially at night. Has little appetite, or sleep. Left wrist now swollen and inflamed. Bowels regular. Urine, sp. gr. 10·10, albuminous. Arcus senilis. He became soporose for some days, but regained consciousness, and was improving in this respect when he sank from asthenia.	Body pale, rather thin. Heart healthy, but rather large,=15 oz., valves competent. Lungs healthy, but œdematous, and congested posteriorly. Kidneys diseased, mottled, somewhat granular on surface, very soft. Liver and other organs healthy.	Stomach pale internally, mid-region reacted alkaline, its tubes were disintegrating amid abundant nuclear and fibroid formation. The mucous tissue had been rendered almost homogeneous by the alkaline fluid, and was restored so as to show its corpuscles, &c., by acetic acid. Duodenum altered by alkaline fluid like stomach, otherwise healthy. Pancreas healthy.

29	C. Q.	33	F.	Ill 3 months, taken to bed 8 days. Is exceedingly anæmic. Her first symptom was swelling of abdomen. Legs never swollen. Copious hæmatemesis the last 14 days still continuing to some extent. Blood also passed per anum. Digestion for a long time has been bad; has been subject, since childhood, to vomiting and sick headache recurring once a month or oftener. Urine more or less albuminous till her death, which took place in about 4 months from the commencement of illness.	Body very emaciated. Copious ascites. No peritonitis. Heart small, healthy. Lungs healthy. Liver very much shrunken, surface nodulated, traversed, though with some difficulty, by water injected into portal vein. No adhesions on surface. Kidneys not wasted, but their surfaces were not quite smooth. Uterus healthy. Spleen more than double its natural size, rather firm. The origin of the portal vein contained a remarkable firm, white, fibrinous coagulum, filling up the channel; it did not extend into the liver.	Stomach distended by gas; surface quite pale; tubes in all three regions remarkably healthy; some yellow pigment in the lower parts of pyloric tubes appeared to be the remains of former hemorrhage. Duodenum tolerably healthy, but pervaded to a great degree by nuclear formation. Pancreas peculiarly hard and dense, somewhat contracted, limitary membrane of glandular cavities less distinct than normal; epithelium abundant, consists of very perfect nuclei, with small wasted cell-particles united together by a dim amorphous substance, imbedding minute oil-drops. The hardness and density of the gland seemed to depend upon the condition of the epithelium, there was no unusual quantity of interstitial fibrous tissue.
30	W. W.	56	M.	Was attacked, Jan. 5th, with pain in chest, bad cough, loss of appetite, which had previously been very good. On admission, 10 days later, had much dyspnœa, mucopurulent expectoration, and cough. Pulse 80. Respiration 40. He improved for several days, but was attacked, on Feb. 4th, with great dyspnœa and pain in chest, and died next day.	Both lungs congested and œdematous throughout; there was decided hepatization of the back part of the right, and to a less degree of the left. The posterior and lower portion of the right pulmonary pleura was coated with fibrine. Heart quite healthy. Liver healthy. Kidneys flaccid, not shrunk; tubes infarcted; some cyst-like casts, and some traces of hemorrhage.	Stomach was pale internally, uncontracted; tubes of mid region were wasted to some extent, amid a good deal of nuclear infiltration. Duodenum healthy. Pancreas very lax and flabby, the glandular tissue was healthy, but there was a great deal of interstitial adipose tissue. The fat-cells were large, contained opaque whitish masses floating in a clear fluid.

Fig. 1.

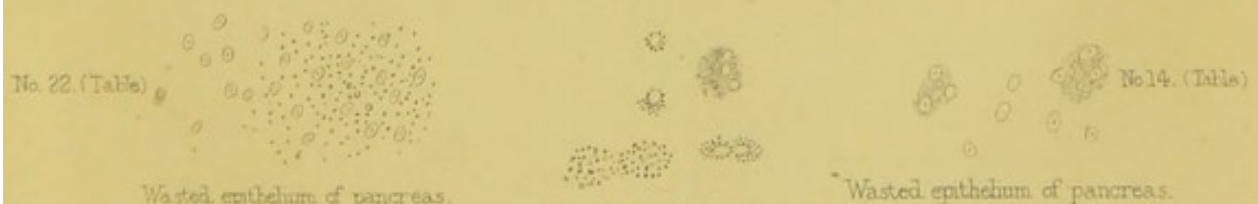


Healthy pancreatic cells.

Fig. 2.

Portions of 3 lobules of pancreas in state of Degeneration.
No 17 (Table)

Fig. 3.



Wasted epithelium of pancreas.

Wasted epithelium from the above pancreas. Fig. 2

Wasted epithelium of pancreas.